

# Shopping Experience 2.0: An Exploration of How Consumers are Shopping in an Immersive Virtual Reality

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**Abstract** Virtual reality creates a sense of immersion. When interaction any business wants to develop an interactive system in an immersive virtual reality, the difficulties are not about how to design a highly interactive interface, but the design of interactive experiences for the consumers. Therefore, the power of interactivity is all about creating experiences in a virtual world. This concept is particularly important in the area of virtual design in ebusiness. The future ebusiness has to enhance consumers' shopping experiences through the interactive design, and trigger their purchase intentions through the design of the interactive experiences. This paper aims to discuss the power of interactivity in virtual shopping domains. Emphasis is placed on (1) the power of interactivity in virtual reality; (2) the shopping experience 2.0: Interactivity, telepresence and vividness; (3) creating consumers' sense of immersion through interactivity and simulation. A pilot research project explored the design of interactivity for upgrading consumers' shopping experiences. Our team develops an augmented reality shop, which is designed with the elements of virtual shopping experience. Based on this designed shop, we invited 61 participants for in-depth interview, after experiencing the augmented reality shop. The result of interview generates six major findings. It highlights the future development of shopping experience 2.0. The research indicates the importance of the human element in the design of interaction. There is a need for future business to studying the human experience closely when developing virtual shopping in virtual worlds for future.

**Keywords** Interactivity, Shopping Experience, Virtual Experience, Virtual Shopping, Immersive Environment

## 1. Introduction

The terminology "Virtual Reality" was initiated by the French writer, Antonin Artaud in his book "The Theatre and its Double" in 1938, "*la réalitevirtuelle*", a virtual reality "in which characters, objects, and images take on the

phantasmagoric force of alchemy's visionary internal dramas"[1]. This definition still fits to describe some features of computer simulated "virtual reality" today. Sherman and Craig [2] gave a brief definition of virtual reality, saying that it represents a computer-simulated stage where users are enabled to interact with the environment through their agents (i.e. avatars) in the environment. To explain this simply, the entrepreneurs setup the entire environment and the avatar's roles for different purposes in the virtual reality. Obviously, "virtual world" refers to the fundamental components that we can see and sense in the virtual reality. These simulated scenery, objects, sound effects, or interactions with avatars and the environment exist in the medium under same rules of the physical world which arouse user's the cognition of "being there"[3]. Physical properties of objects in a virtual reality must be defined critically. Any failure, such as trees floating in the air, or an avatar going through a concrete wall will immediately break the user's engagement with the virtual reality. To achieve this goal, there are THREE areas requiring attention: (1) immersion; (2) sensory feedback; and (3) interactivity. Indeed, the Interactivity in virtual reality refers not only to changes made from the avatar's activities to any objects. Critically, a virtual reality also allows more than one avatar to interact collaboratively in the same virtual environment[2].

Since our economy is getting more and more interactive, with multiple uses of virtual systems[4], designing interaction is not only about what the interface looks like, but how the interaction behaves[5]. Verplank[6] states that the interactive system should be smart and able to understand what users want to do. Therefore, the power of interactivity in virtual design is all about the user's virtual experiences in cyberspace. Interactivity is one of the key components in providing the sense of immersion in virtual reality. Sastry and Boyd [7] stressed that the user's feeling of presence, particularly within the real world applications, is determined by the level of interactivity. In this paper, we discuss the power of interactivity in virtual reality. Emphasis is placed on how to company to upgrade consumers' shopping experiences to level 2.0 in virtual reality. The most essential issue discussed in the paper does

not focus on either the technological issues or the practical design matters, but is concerned with how to trigger further studies of the experience design to enhance the interactivity in virtual worlds and finally explore the importance of developing shopping experience 2.0 for eBusiness. A pilot research study of consumers' shopping experiences, what we called "shopping experience 2.0", is presented to indicate the importance of the human element within the interaction design.

## 2. The Power of Interactivity for Shopping Experience 2.0

Virtual technology is unquestionably one of the most fascinating computer-simulated communication applications. This technology has already become a cash cow in the entertainment industry in North America and it is also welcomed in the fields of social computing (included shopping), psycho-therapy, education [8-10]. It has helped to fulfill the prophecies made on Newsweek on 31 May, 1993 of: "chang[ing] the way to shop, play and learn" and a "zillion-dollar industry"[11]. Greenbaum described virtual reality as an "alternate world filled with computer-generated images that respond to human movements"[12]. Brooks [13] also defined the experience in virtual reality as any in which the user is effectively immersed in a responsive virtual world. According to Brooks, this implies that the users have dynamic control of their viewpoints. With extensive adoption of stereoscopic graphics, sound effects and simulated animations together with the use of head mount displays, tracking devices to manipulate their avatars, users are equipped to interact with objects or other users (or their avatars) in the highly immersive computer simulated environment [2]. Amongst the above definitions, interactivity is one of the critical elements to determine the success of the experience in virtual reality. Steuer[14] identified that vividness and "interactivity" would affect the human experience of telepresence in a VR. In distinguishing the difference between a VR system and a CAD system, the "interactivity" of the system has to be capable of processing massive information transactions from every user, in order to create a synchronized response rate[15]. Sherman and Craig [2] emphasized that interactivity, virtual world, immersion and sensory feedback" are four major elements of experiences in virtual reality. Therefore, the terminology "interactivity" in virtual reality should be interpreted from various perspectives to cover different criteria thoroughly.

In the early 1990s, research [14, 16] in human-computer interaction was focused more on immersion and manipulation between the user and the system in the pre-defined environments. Mine [16] proposed movement, selection, manipulation and scaling as the basic interactions in a virtual world. Steuer[14] defined interactivity as the magnitude to change the context by a user in the simulated environment in real time. According to Steuer, speed, range

and mapping are categorized to determine the interactivity in a virtual environment. Speed refers to the system's response rate in modifying the context subject to the users' multi-sensory input. Range is determined by the quantity of objects that can be maneuvered. Finally, mapping is the consistent linkages of the user's action to the avatars' action or changes in the environment. Apparently, these criteria are retained in navigation aspects where the responsiveness of the system to the user is not mentioned. This definition does not link up in depth with user-to-user or system-to-system interactions. Media communication in computer-simulation and the Internet technology is not limited to the user-computer interaction but can be extended to the connection with the medium and eventually to human-to-human interaction through the medium. As mentioned previously, virtual reality is today a buzzword which can feasibly applied to different aspects. Therefore, it must take full account of the users' choices regarding their participation in the virtual world for various purposes and to fulfill specific needs.

Based on Heeter's definition of interaction [17] and Norman's mental model[18], van der Straaten[19] raised the importance of the users' perceptions of interaction, especially how their interactions with the system, environment and other users can affect interactivity in a virtual world. He proposed that quality of Purpose, Participant, Medium and Content (PPMC Model) can all alter the interactivity in virtual reality[19]. First of all, according to van der Straaten[19], the Purpose of designing virtual reality must be well defined. This should include the vision, participants' authorisation to modify the environment, activities they can do, or how to satisfy their intentions. In a virtual farm, for example, if the participants cannot observe their plants' growth or have nothing to harvest in a reasonable (virtual) time, it will shortly be abandoned and become a desert. Second, Participants' cognitions and personal backgrounds can alter their involvement in virtual reality. Thus, companies should develop their environments as closely as possible to real life in order to maintain adaptability once the participants have entered. On the contrary, it is not surprising to find low interactivity when a participant enters a virtual world which is not interesting for him/her. Third, Medium refers to the hardware's capability for speed, range and mapping in response to the participants' manipulation. Finally, the properties of Contents in a VR must be consistent with their counterparts in the real world to maintain the users' immersiveness. Obviously, unless a user is visiting Na'vi or there is a specific purpose, flowers or insects in virtual worlds should not grow in the darkness[20]. Moreover, socio-interaction factors, such as feasibility to communication with other users, or even the instructional manual, are also important factors that ebusiness practitioners have to consider.

Indeed, interaction is a continuum of actions and reactions between humans, objects and the context[17], which makes experience happen[21]. Referring to the main

concern of this paper about the interactive experience for virtual shopping, the virtual reality works not only as a medium for virtual communication and promotion, but also to trigger consumers' shopping intentions in virtual worlds. In a real-world example, once a consumer enters a fashion shop, the context in the shop becomes modified as existence of a potential consumer. Simultaneously, through a series of cognition processes, the consumer is acquiring a series of shopping experiences through watching mannequins, touching (feeling) merchandise, receiving services provided by the salesperson, noticing the interior decoration, or listening to background music played in the shop. No doubt what has been underpinning the rapid evolution in virtual technology in recent decades is the desire to bring consumers into an "upgraded" shopping experiences in virtual reality. However, as was discussed earlier about the importance of bringing high levels of interactivity into virtual reality, the design of interactivity is even more essential for business success. ebusiness practitioners should place a strong emphasis on creating stimulated virtual shopping environments with high levels of interactivity. Through the design of interactivity in a virtual shop, consumers can enter a completely new arena of the shopping experience – the shopping experience 2.0. It is a challenge to ebusiness practitioners, but nevertheless interactivity is very powerful.

### **3. The Shopping Experience 2.0: Interactivity, Telepresence and Vividness**

Ebusiness practitioners need to be aware that the human being is not designed to interface with computers[2]. Winograd[22] suggested, some time ago, that to achieve a successful interaction design requires the ebusiness practitioners to make a paradigm shift from looking only at the computer interface to understanding how people use the system. Interactivity, to users, must be authentic and responsive[2]. According to Klemmer, Hartmann and Takayama [23], ebusiness practitioners should not stay in a comfort zone of tangible affordance but should aspire to insert human cognition processes such as thinking through doing, performance, visibility and risk into design products or interfaces. The mission of interaction design, therefore, is to develop a "storytelling" platform that arouse the users' interests and allows them to interact freely within the destined environment. Subject to this mission, ebusiness practitioners should seek balance between cognitive affordance, physical affordance and sensory affordance throughout the Human-Computer Interface design [24]. As some researchers have claimed[2, 14], interactivity is a crucial factor in providing users with a sense of presence (i.e. telepresence or immersion) and vividness. These factors determine or predict the user's virtual experience. So, how does interactivity influence the sense of presence and

vividness and further mould our virtual experience?

First, it is useful to take a look at some definitions of "sense of presence" that have appeared in the literature. Zeltzer[25] described it as a situation in which a person is mentally attending to the state somewhere else apart from his physical environment. Schloerb[26] defined the sense of telepresence as the degree of the user's cognition of being present physically in a computer-simulated environment. Similarly, Slater, Linakis, Usoh and Kooper[27] described immersion as synchronized transmissions of the user's proprioceptive response to the system and rendered as a matching avatar's motion or scenery changes in virtual worlds. Sheridan[28] postulated that the system's capability to transmit multi-sensory information and to control the relationship of sensors to environment can both influence the user's cognition of presence. Slater et al. [29] expressed the belief that the user's sense of presence is a valence. Since users are attending to more than one environment at the same time (virtual reality vs. real world), if they cannot get thoroughly immersed in virtual reality, they will easily be detached and turn their responses to the real world. According to van der Straaten[19] engaging interaction and comprehensible interaction arouse (and maintain) users' interests and transmit sensible information to them. To conclude, the users' cognitive interactions and the effectiveness user-system interaction have direct impacts on maintaining the sense of presence that influences their virtual experience. The extent of interactivity in a virtual reality will be one of the direct impacts to the level of immersion[30].

Furthermore, according to Steuer[14], vividness refers to the depth and breadth of the content presented in virtual reality. These parameters relate to the speed of transmission from the system to the output devices (Head mount display or 3-D monitor). In simple words, the more detailed the virtual environment is, the more vivid the virtual world will be. However, a high definition output creates a burden on the system to process massive contents. As a consequence, this can cause delays in the presentation to the output device. This also means that the user-system interactivity will then be depreciated[19]. All in all, the vivid interaction within the user-system enhances the users' experience, which raises their interest to revisit in future. This is a crucial factor for creating stimulated virtual experiences for consumers in upgrading their experience to 2.0, and should be explored further by ebusiness practitioners and academics. Nonetheless, it is necessary for the ebusiness practitioners to be precise in allocating the intensity of the content presentation in order to balance the vividness and optimize the user-system interactions[31].

### **4. Creating the Consumers' Sense of Immersion through Interactivity and Simulation**

The video game console of today does not only serve the

purpose of domestic entertainment, it has become a key home electrical appliance. Many people have been seeking hedonic experiences within interactive simulated environments for over three decades [8]. A system can only be detained as a display system for user's watching 3D graphics if there is no interactive element involved. Interactivity is one of the fundamental elements to determine virtual experience[2]. It is also a crucial factor influencing the sense of presence, directly enhancing social vividness but correlating inversely to the output vividness. Virtual experience, as an intensive computer-simulated playful environment, is a feasible way of allowing the user to generate hedonic experiences during navigation. In comparison with traditional 2D online shopping interfaces, interactive 3D product visualization converts the consumer's role from a passive observer to an active learner [32]. According to Li et al.[33], the features of zooming and rotation time saving to screen unessential information] during product inspection and raises purchase intention. This idea was also supported by Schlosser's [34] suggestion that the increased vividness of product information can enable text and picture-based specifications to be transformed into storyboard formats. Likewise, direct manipulation of the product enhances the consumer's enjoyment, this being one of the things the consumer seeks for engagement in a virtual shopping environment [32]. In addition to product manipulation, the consumer's physical interactions, such as walking, looking around and communicating the product's potential to others can also maintain immersion and social vividness in the virtual shopping environment [35]. The feasibility of selecting background features such as lighting or music playback subject to the consumer's emotions can also enrich personalized experience.

Along with what we discussed early, some researchers [14, 17, 36] have defined interactivity as being a characteristic of any medium in which the user can influence the form and content of the mediated presentation or experience. Johnson and Levine [37] explained that the fundamental nature of virtual reality allows participants to interact with other participants, objects and spaces in order to influence the subsequent course of events. According to Johnson and Levine, the current virtual environments, which are attracting masses of users, allow participants to build friendships, communities, societies and even cultures that enrich their experiences, just like in the real world. Furthermore, virtual reality not only establishes highly social environments for participants, it also provides richly expressive environments in which they can become immersed, by applying multi-sensory simulations such as sound and visual cues, hyperrealistic perspectives, high levels of interactivity and rich textures[37]. Immersion is indeed an intense feeling of self-location within the computer-simulated reality[38]. To create immersion, simulation is one of the crucial methods of bringing consumers to an immersive virtual world. Indeed, simulation takes many forms, from computer renderings of 3D objects and environments to computer-simulated virtual

realities with high levels of interactivity[39]. Simulation is a method of presenting reality with all of its physical and social system interactions, indeed it is a model of a system[40, 41]. This idea is supported by the work of Sastry and Boyd[7], who stated that the level of interactivity users experience within a simulated environment is more important than the richness and faithfulness of available images to create a feeling of presence. All in all, the above discussion provides ebusiness practitioners with a clear mental map for designing high levels of interactivity to upgrade consumers' shopping experiences to 2.0 in immersive virtual environments.

## 5. Studying Shopping Experience 2.0: A Pilot Project

The hyperrealistic stimulation of virtual reality is now commonly applied to multiple aspects and levels of daily life. We believe that most human activities can be virtualized, for instance shopping experiences. Technology is no doubt changing the way that ebusiness practitioners, manufacturers and retailers interact with consumers. Brown [4] stated that the power of computers is their flawlessness, particularly in providing consumers with instant one-to-one service. For example, in the Sainsbury E-shopping system in the UK, consumers are able to 'take' products from the shelves and move them by wearing a headset and other digital apparatuses. Likewise, in the motor distribution sector FORD has created a virtual reality system for consumers to "actually" drive the newly launched Galaxy multipurpose vehicle. These virtual shopping systems facilitate the entire buying process of both sales and consumers. Neither party needs to be present physically during the process. Time and money are saved. In the fashion business, Virtual Model Inc (<http://www.mvm.com/en/shopping/index.php>) has created a series of digital platforms to foster online apparel shopping since 1997, for example, My Virtual Model™ Dressing Room, My Fit™ and BrandME™. These products enable consumers to "try on" clothes on the Internet. In particular the latest product, BrandME™, has successfully attracted many big brands such as H&M, Adidas, Speedo, and Levi Strauss & Co. Similarly, Richard MacManus, who is the Founder and CEO of ReadWriteWeb, has created a virtual shopping application called Visual Shopping Mall (VSM) to allow consumers to purchase products from all the shops in the Mall, globally [42, 43].

Shopping experience 2.0 in virtual reality depend on complicated relationships between the consumers' shopping experiences and the hyperrealistic stimulations. It is essential for ebusiness practitioners to explore the power of interactivity in order to enhance the consumers' shopping experiences. This pilot project aimed to explore consumers' shopping experiences and hyperrealistic stimulations in an immersive virtual environment. Based on the findings and implications of this research, researchers can discover relationships among phenomena with an ultimate view to

predict, and in some situations, suggest approaches for strategic planning for interaction design in the future E-Shopping spectrum.

Ebusiness practitioners should establish a paradigm to provide them a reference for how people think about something[6]. The interaction design of this project was based on Verplank's[6] FOUR-Step process for interaction design: (1) motivation – errors or ideas: in this step, the ebusiness practitioners studied the problems from human (user) perspective in order to grasp some ideas for interaction design; (2) meaning – metaphors and scenarios: the ebusiness practitioners used a clear metaphor to connect things, objects and systems within the design; (3) modes – models and tasks: ebusiness practitioners established a conceptual model in this step to provide the project team with a clear picture of what users are thinking about the system; and (4) mappings – displays and controls: the design of the display system is a crucial task for ebusiness practitioners. The ebusiness practitioners designed some kind of displays and controls within the interactive system. A reassuring feedback mechanism [5] was applied in this project to assure the design of the interactive system.

For the purpose of this project, a virtual shop (See figure 1) was built to explore consumers' shopping experiences and hyperrealistic simulations in an immersive virtual environment, in particular their interactive experiences. Participants providing data for this project were asked to wear a head mounted device and use a hand held remote control and a foot sensitive device to immerse them into the virtual shop and perform the shopping activities (See figure 2).

In this highly interactive virtual environment, participants can be involved actively in creating a multisensory and high interactive experience by being able to change the visual and spatial sense apparel shop allowed the users to customize their shopping experiences (See figure 3). The initial results of this research project provided some useful insights for improving the interactivity of this virtual apparel shop.



Figure 1. The virtual shop

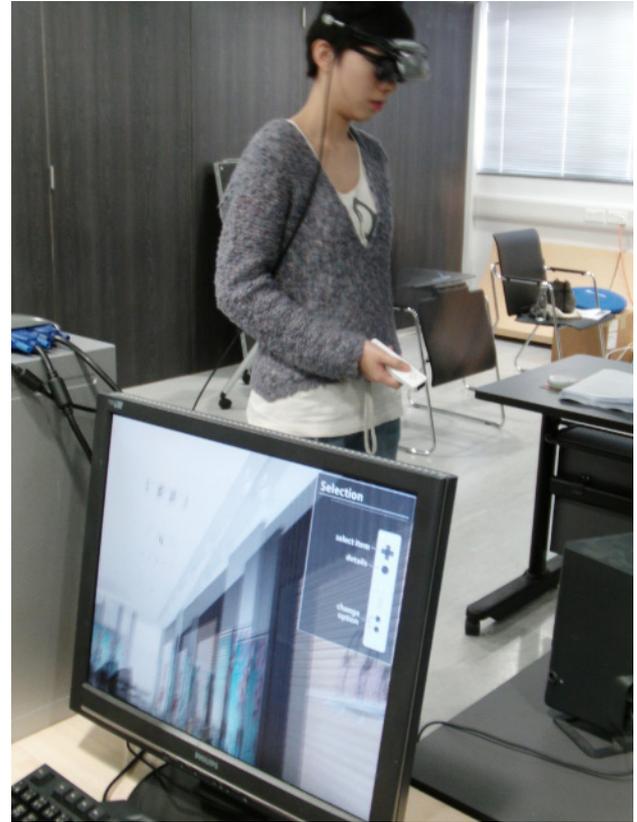


Figure 2. Consumer's virtual experience in virtual shop



Figure 3. Customizing consumer's experience

## 5.1. Method

A total of 61 participants joined this pilot research project. Our team invites the participants to experience the interactive virtual shop in our interactive virtual lab for 15 minutes. The participants are able to looking around, working around and browsing the virtual product within the digital composed virtual environment. After the 15 minutes

experiencing of the virtual shop, the participants are invited in the in-depth interview. Our research team would interview the participants about their virtual shopping experience in the virtual shop.

## 5.2. Findings

Some primary insights have been found from this study. Some of the major comments on the design of interaction for developing the shopping experience 2.0 are (1) more advanced technology is needed for fitting, photorealistic rendering and better display and control devices. This is because the over simplified 2D polygons led to an unrealistic experience during their shopping process; (2) it is difficult to “walk” around the shop and control one’s own motion; (3) some of the participants felt dizzy after the virtual shopping experience; (4) real photographs of the product are needed; and (5) the shop lacks the human factor and it would be preferable to incorporate it into a Virtual Social Collaborative Network (VSCN). These experiences supported Rosedale’s [44] vision of virtual reality as a connector rather than to isolate people, since social interactions are essential for humans as we consume information. In fact as the observer throughout the whole data collection process, the research team realized that most of the participants spent some time familiarizing themselves with the navigation and control devices before they could truly experience the shopping activity in the virtual shop. All in all, this pilot project explored some implications from both consumer and business levels. At the consumer level, their virtual shopping decision-making process was affected by additional 3D features of visual merchandizing and comments from unknown shoppers co-existing in the public social network instead of solely plain texts and images. This human interaction is not about either the interface design of the system or the computer-simulated virtual environment, it is about the interaction of human touch. This finding is essential for ebusiness practitioners as it pinpoints the need to pay more attention to studying the human interaction in the real world. Similarly, at the businesses’ level, more criteria should be considered when developing virtual shops, such as, offering and maintenance of various shop schemas to customize the consumer’s experience. This is about the power of interaction between consumers and the virtual space. Therefore, ebusiness practitioners should study the authentic shopping experience in the real world in order to bring this human-environment interaction to the virtual world. All in all, the shopping experience 2.0 stems from the interactions between an individual, social networks and the environment. Therefore, a social collaborative network is essential in enriching consumers’ shopping experiences.

## 6. Conclusions and Implication

An effective design of virtual experiences must be functional and purposeful, thus helping the participants to

engage, compel, memorize and enjoy the process [45]. This is because the participants’ total experience is the key for success [35]. The pilot research project described in this paper has provided us with a significant insight about the role of experience in designing interaction. Interaction is all about creating experience, and the computer is only a vehicle [6]. In this case, ebusiness practitioners should pay more attention to designing the shopping experience aspect of the interaction instead of focusing only on designing computer interfaces with advanced technology. Experience design is emerging as one of the most important research domains for ebusiness practitioners. In fact, experience design is not a new idea, its history can be traced back to the earliest human impulses to develop ceremonies, rituals and architecture [45]. Our society is moving rapidly from a service economy to an experience one [46]. Walt Disney was one of the pioneers to emphasize the design of experiences. He believed that economic value is achieved by the consumers’ enjoyment and memories of the experiences [45]. Another example is the Danish futurist Rolf Jensen [47], who created a model called “The Dream Society” to articulate the experience economy. He emphasized the quality of the experience that is able to provide participants with a memorable dimension. He also highlighted SIX major human needs that should be targeted: (1) adventure; (2) togetherness; (3) caring and being cared for; (4) self-definition; (5) feeling safe and secure; and (6) being able to demonstrate our convictions. In view of art and design, Laurel [48] used theatre performance as an example to illustrate the importance of experience design in changing audiences’ roles from passive observers to active participants: Jane Prophet’s TechnoSphere (1994-95) focused on the interactivity of artificial life forms [49]. These projects provided audiences with a unique virtual experience. Moreover, a huge research study of augmented and mixed reality systems, called “Equator-Technical Innovation in Physical and Digital Life”, was carried out in eight academic institutions in the United Kingdom over a six-year period [50]. This project also provided participants with an upgraded shopping experience. Accordingly, an experience is supposed to engage participants from multiple perspectives, including the type of participation and type of connection [46]. To explain this further, the type of participation is concerned with whether the participation is active or passive; and the type of connection with the external or internal environmental relationship. Nonetheless, making the shopping process into a distinguishing personal experience for the consumers should be one of the essential factors underpinning the design of interactivity in virtual reality. These areas of research undoubtedly need further exploration, particularly with the rapid development of virtual technologies.

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