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International Journal of Technology for Business (IJTB)

Fashion Virtual Reality in E-commerce

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Abstract

The Virtual Reality (VR) and Augmented Reality (AR) economic impact is expected to hit US$ 29.5 billion in 2020. Brands (Volvo / L'Oréal) and retailers (Carrefour / Lowe's) have built on-site VR facilities which offer more attractive shopping experiences than traditional environments. The restricted and inconclusive results of the retail hunt, however, call for further studies on how to create more productive online shopping environments. There are some types of VR and so many applications for it in the Fashion Industry, as interactive mirrors and glasses or apps and webs to feel like if you were shopping and trying all the clothes without moving of the sofa. Online purchase is expected to be more secure because the consumer can virtually try outfits before buying. This paper analyses the consumers experience using an experiment with female undergraduate students. The experiment was conducted to determine the feasibility of using VR fashion retail store models in designing store layouts and understanding how shoppers communicate with shops.

Keywords: Fashion, Virtual Reality, Augmented Reality, Shopping Online, E-Commerce

1. Introduction

Virtual reality (VR) is one of the latest advances in technology that has great potential for the fashion industry because VR provides a very realistic computer-simulated world. In order to gain customer awareness, fashion retailers are able to incorporate and experiment with VR in stores. In their retail stores, fashion brands such as Tommy Hilfiger and Topshop set up VR runway shows to offer shoppers a three-dimensional, front-row view of runway shows. In the holiday season, J.C. Penney also introduced VR to their stores to connect customers with memorable experiences. Although VR is still limited to a few special events in retail stores, VR is expected to be a stable and significant part of the regular business soon. In several areas, VR has already proven its feasibility

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and usefulness as a research tool. VR has been used to treat patients with phobias and anxiety disorders, control pain, and teach skills. Rendering virtual environments effectively is very appealing to researchers in an applied field. While VR hasn't been used much by retail researchers, VR can be an extremely appealing tool for researchers interested in studying customer in-store interactions. While the advantages are obvious, some of the technical difficulties that VR technology presents for fashion retailers remain largely unknown due to the lack of fashion retail VR studies. For example, in architecture where the emphasis is on the structural design of buildings with the minimum number of decorative items, the previous use of VR is most common (Brainsins, 2019; Business Insider, 2019).

Research also indicates that understanding the reaction of consumers to new technology such as VR and communicating obstacles and technology implementation criteria are essential to developing successful digital retail environments and improving the shopping experiences of consumers (CardBoard360, 2019). This research adds to the body of literature on retail technology use and provides practitioners and researchers with an overview of the benefits and challenges of using VR and customer reaction to VR stores; the paper further discusses how strategically realistic digital stores environments can be introduced to create engaging and entertaining experiences. In this article we will talk about the differences between Virtual and Augmented Reality and the evolution of the virtual reality. Also, about the v-commerce and the types and applications of it. Finally, the paper discusses an illustrative example of such technology in Virtual Reality shop.

1.1 Virtual and augmented reality

Virtual reality (VR) is an artificial simulation or reconstruction of a real-life environment or situation created by a computer. It immerses the client by making them feel like they perceive the virtual world on their own, mostly by enhancing their vision and hearing. VR is usually accomplished by using a technology-equipped headset such as Facebook's Oculus and is used primarily in two ways (Circulotne, 2019):

- For recreation, entertainment, and play (such as video and computer games, or 3D films, head mounted display) to create and improve an imaginative reality.
- Boost real-life learning by developing a reality model where people can practice beforehand (such as pilot flight simulators).

Virtual reality is possible by means of a programming language known as VRML (Virtual Reality Modeling Language) that can be used to create a series of images and define the types of experiences that are possible. Augmented Reality (AR) is a software that adds computer-generated enhancements on top of an existing reality to make it more realistic by interacting with it. AR is built into applications and used for integrating virtual components into the real world on mobile devices in such a way that they complement one another but can also be easily separated. It is used on telecasted sports games to view score overlays and to pop up 3D emails, images or text messages on mobile devices. Technology industry leaders also use AR like holograms and motion-activated commands (Connectad, 2019).

1.2 Evolution of virtual reality

Virtual reality is slowly but surely creeping into the consciousness of the marketing and business communities. The quick evolution of virtual reality is a sign that, in one sense, the future has arrived. The origin of virtual reality dates back to the Second World War. The US Navy contacted MIT (Massachusetts Institute of Technology) for the possible creation of a flight simulator suitable for training bombers. The project was called Whirlwind and its construction was completed a few years later in 1951. It was only 8 years later that USAF (United States Air Force) took over the project under the name of "Claude Project" and a civil use of 3D technology appeared.

Throughout the 20th century, various virtual reality systems have been created. In 1962, Morton Heilig built the Sensorama, a machine that displays wide-angle 3D stereoscopic images with stereo sound, wind and scent effects, and a moving seat. In 1968, Ivan Sutherland built The Sword of Damocles, a virtual reality helmet that showed stereoscopic images with wireframe models. In 1978, an MIT team led by Andrew Lippman produced the Aspen Movie Map, a program that allowed the user to walk the streets of the city of Aspen, through actual footage of the site, and interact with certain buildings, allowing them to see their interior and historical data. In 1984, the Baltimore headquarters of the Six Flags amusement park chain premiered The Sensorium, a 4D movie theater that combined a film with stereoscopic projection, vibrating seats, and aromatic effects. In 1987, Nintendo launched the Famicom 3D System and Sega launched the Master System, both virtual reality helmets with shutter lenses. In 1991, Sega announced the launch of the Sega VR, a virtual reality helmet with LCD screen and stereo headphones for arcade machines and video game consoles. The device was introduced to the public in 1993, and was announced to cost $200, but was never marketed. In 1994 it launched the Sega VR-1, a motion simulator that incorporated a helmet with polygonal three-dimensional graphics and head movement tracking. In 1995, Nintendo launched the Virtual Boy, a virtual reality helmet with a monochrome parallax screen. That same year, Forte launched the VFX1, a virtual reality helmet with stereoscopic image, head movement tracking and stereo headphones. In 2012, Palmer Luckey presented the first prototype of the Oculus Rift. virtual reality helmet. The customer version was launched in 2015. In 2016, Sony launched the PlayStation VR,64 while HTC and Valve launched the HTC Vive (Kersten, Tschirschwitz, & Deggim, 2017).

While virtual reality may currently be top of mind, this is not the first time. In the 1990s, when 3D gaming was introduced, virtual reality saw a similar boom. Gaming companies introduced 3D videogames, such as virtuality's VR arcade pods and Nintendo's Virtual Boy. Movies, such as the Lawnmower Man, Virtuosity, and Jhonny Mnemonic, portrayed new, immersive cyber-worlds. Books, including Snow Crush and Disclosure, similarly depicted this new type of reality. However, the technology was not able to keep pace with these unrealistic portrayals in the media. The 3D arcade games suffered from poor graphics, expensive prices, time lags, and low computing power. Eventually, these products failed, as consumers became unsatisfied with the technology, and the boom was over.

A similar hype began when Facebook acquired Oculus for USD 2 billion in 2014 and we note that over the last 2 years there have been over 225 VC investments in VR/AR, raising USD3.5 billion in capital (Eurostat, 2019). So, what has changed that differentiates the current state from the 1990s flop? The answer is the technology, in our view. Today, computers are powerful enough to render realistic virtual words. Additionally, the mobile phone industry has improved the price, size, and performance of displays and sensors. Today's technologies have improved on the inefficiencies present in the 1990s (Goldmansachs, 2019). As a result of this progress, companies have become involved. Figure 1 depicts the timeline of investment in VR growth.

Company	Date	Details
Qualcomm	Jan-12	Raised seed funding for the mobile augmented reality startup Blippar
Google	Apr-12	Introduced augmented reality glasses, Google Glass, to the public
Sony	Mar-14	Sony announces Project Morpheus, later renamed PlayStation VR
HP	Mar-14	Launched Aurasma 3.0, an augmented reality platform that it acquired through Autonomy
Facebook	Mar-14	Acquired Oculus, a virtual reality startup, for $2bn
Samsung	Sep-14	Revealed its own head-mounted display, Samsung Gear VR, partnering with Oculus
Google	Oct-14	Invested $542mn in the startup Magic Leap
Intel	Apr-15	Invested in Series A funding for the virtual reality startup WorldViz
Apple	May-15	Reportedly acquired Metaio, an augmented reality software maker
Disney	Sep-15	Led a $65mn funding round in Jaunt, a VR content startup
Microsoft	Oct-15	Acquired Havok, a 3D physics engine used for videogames
Comcast & Time Warner	Nov-15	Participated in a $30.5mn funding round for NextVR, which captures live events in VR
Apple	Nov-15	Acquired Faceshift, a facial recognition capture and animation company
Fox	Jan-16	Acquired minority stake in Osterhout Design Group, a VR/AR HMD maker

Figure 1: VR growth and investment

1.3 V-commerce

Voice Commerce, better known as V-commerce, is about e-commerce through voice assistants. Through this, any customer can order a product using voice command. This type of commerce is becoming a trend and will not take long to become fashionable, so companies must get ready in order to provide these services to their customers. Although voice assistants already allow consumers to buy things, when a user orders a generic item, companies still do not know how the purchase will be made, or what they must do to be the first to appear in the search results. Therefore, there is still a long way to go, but one must put all the effort in order to to be updated in such a competitive market (Lujo Digital, 2019).

1.4 Benefits of V-commerce

For many companies, integrating voice assistants among their services can be a great opportunity to improve the experience of their customers, in addition to creating new possibilities of purchase and customization. One of the advantages of voice commerce is that the customer can have access to the products in a faster and easier way. In addition, it will also have a more personalized experience, as companies will be able to collect data from a customer and use them in future purchases. In this way, customized individual experiences are created for each consumer.

Brands that collect information about the behavior and preferences of their customers are able to create and develop much more effective marketing strategies. For this reason, it is said that information is power. The use of mobile devices is deeply rooted in today's society. For this reason, many companies had to adapt their websites to these, so they could attract a greater number of customers. This is exactly the same with voice assistants. Brands need to include them in their marketing strategies to attract more consumers (Marketing Directo, 2019).

For owners of small and medium businesses, V-commerce means having one more means to achieve sales, so they should risk and invest in this type of technology. In addition, including voice commerce in business can

become a new way of interacting with customers. In short, voice commerce is here to stay, as consumers are becoming more and more demanding and therefore prefer their shopping experiences to be better, more intuitive and more simplified.

1.5 Types of virtual reality

1.5.1 Immersive virtual reality

Toils and technologies are used so that the user can enjoy a 3D environment in a virtual world through living and realistic experiences. They are usually created using computers and what really allows the user to participate in this experience are a series of devices (HDM helmets) to capture their position and movements and represent them in the virtual reality environment. Examples of this type of virtual reality are the virtual glasses (Minuto et al., 2019).

1.5.2 Non-immersive virtual reality

The second case is characterized by the use of the computer like immersed virtual reality but with the difference that it reflects an unreal world, is the case of video games. The fashion company Louis Vuitton is one of the few fashion companies that uses virtual reality through video games. In short, what the fashion companies are looking for through E-commerce is to get closer to customers and provide them with greater experience in terms of products, they choose to use immersed virtual reality, which despite not being a fairly advanced subject, is currently booming at a rapid pace.

1.6 Applications of virtual reality

1.6.1 Immersive

The field covered by virtual reality in E-commerce is quite broad but as we have explained above the immersed virtual model is based on the use of magic mirrors where through a camera the dimensions of the person are analyzed and one can try on the clothes without needing to change, which is much more comfortable. This idea began to be incorporated in physical stores, in the changers themselves, but technology firms are currently thinking of creating an application attached to the webcam of the computer that analyses the structure of the person who uses it, thereby enhancing the e-commerce of the company, since customers do not have to move to the physical store and thanks to the application will get a greater confidence of the product (Muñoz & Olarte,2019).

The use of virtual glasses will increase customer satisfaction going far beyond the use of the magic mirror. Here not only are customers allowed access the products, but through the use of glasses can see the shop in 3D and move within it. This generates a sensation in the client that is very exciting because being something different from what they are used to means an experience rather than a simple purchase, it is as if they were suddenly on another planet. In addition, those companies that do not have physical store are beginning to opt for the virtual reality of their products in 3D (Revista ITNow, 2019).

Finally, both the magic mirror and virtual glasses are essential to promote e-commerce. Fashion and technology are two points that reinforce it and are constantly increasing. In addition, more and more companies are using

virtual reality because customers have a greater knowledge of the product, second because they do not need to go to the store to purchase their product which saves them time and therefore having greater satisfaction (Shiptimize. 2019).

1.6.2 Non immersive

Non-immersive virtual reality is a virtual reality that most people possess without knowing it. It consists of different hardware, e.g. monitor, keyboard, mouse, joystick, etc. Non immersive virtual reality uses means such as the one currently offered by the internet in which we can interact in real time with different people in spaces and environments that do not really exist. Non-immersive virtual reality offers a new world through a computer window. In the case of the e-commerce websites of fashion companies, this is a positive point. Consumers can be informed of the status of the order and have an automated after-sales service. Following are some examples of enterprises that use virtual reality and augmented reality:

- ZARA: In this case the company chooses to put a special collection within its fashion line, the Zara studio, which allows interaction through mobile devices. The user only has to download an application and point the camera of the mobile or the tablet for the desired model to analyze it more closely. If the consumer is interested in buying, the process is also very simple. On the screen itself, there is a button at the bottom called "buy the look", on which the customer can click to purchase the piece. There is also the option to make the purchase through the online store, which is important for the brand to enhance e-commerce and be closer to achieving its objectives: attract, convert, sell and loyalty.
- DIOR: Here the company creates "Dior eyes" that is to say, its own virtual reality helmets, created with 3D printing so that fashion and brand enthusiasts can, for a few moments, feel the adrenaline that is lived in the backstage of fashion shows. It is digital reality and simulated with a high degree of immersion, which manages to capture a consumer in constant search for something different, attractive and that the user feels part of, in addition to providing a great experience.
- GUCCI: It is the digital leader in the world of fashion as it bets on digital tools for interaction in its own boutique, such as Gucci Wooster (Soho, New York), where customers can view their garments and personalized accessories in real time, as well as large 3D screens for which no glasses are needed, and that seeks to create an experience that envelops them and brings them into the world of the Italian brand.
- TOMMY HILFIGER: Here the company introduced in several flagship stores the Samsung Gear helmets, to give greater interconnectivity between the purchase and the user experience. The American brand Tommy Hilfiger has created virtual reality glasses with which the runway show can be seen in three dimensions and with a 360-degree view. To see it the consumer needs to wear a device similar to a pair of diving goggles called Samsung GearVR , which comes with ribbons that adapt to the head of the wearer. The experience can be enjoyed in New York, London, Paris, Milan, Amsterdam and a few other cities.
- LOUIS VUITTON: This case is more particular because it chooses to use virtual reality through a video where the protagonist of the Final Fantasy video game series appears with different bags of the brand. The character's name is Lightning and she travels through fantastic worlds in search of her captive sister and takes the idea of heroine to a new dimension. It is logical that the Maison Louis Vuitton explored the infinite possibilities of the virtual universe and asked this fantasy character to interpret the essence of a heroine since it is a brand that has always broken the established limits of dreams and reality.
- INDITEX: Offers a limited collection of women's and men's garments that can be purchased only through the internet. A shop equipped with the latest technology where customers can make changes or returns, pay without going through the checkout and take advantage of the suggestions of mirrors-screen with RFID technology (radio frequency identification) that show clothes and styles to customers in real size. In addition, the Inditex group has launched a Massimo Dutti Virtual Reality store. When a customer places an order through Massimo Dutti's online platform, they receive, along with the package, an envelope containing small Virtual Reality Glasses and instructions for accessing the store. To visit the experience, the customer needs to place their mobile phone in the glasses and access the corresponding section on the Massimo Dutti website. From there, the customer can move within this virtual scenario by simply moving their head and accessing the cards of each item or playing the video of the campaign by looking at one point or another.

- AMAZON: Continues to lead the ranking of the largest e-commerce companies. The e-commerce giant has introduced an intelligent mirror that will be equipped with several cameras and sensors, which will allow the consumer to get an accurate idea of how that person fits with garments on sale.
- ALIBABA: It is the giant of Chinese e-commerce that is betting strongly to implement this trend in their websites and create the first virtual e-commerce platform where one can see the items on sale in such way that as if it is physically in front of them.

1.7 Accessibilities of VR nowadays

In terms of Augmented Reality, according to Marxent, an AR development company, there are three types of Augmented Reality Applications. For starters, there are free and low-cost AR applications. These applications generally offer limited free tools or periods of experimentation, for example, a very basic 3D storytelling service. On the other side of the spectrum, there are vertical AR solutions for an industry. This software aims to solve problems for the industries through more advanced technology than the one currently offered, which means that it is very complicated. This option is considered too advanced for a single online store. It is more suitable for the e-commerce sector as a whole. But there is an option in the middle of the table, which is ideal for an online store. AR development companies specialize in creating a unique experience based on brand guidelines, differentiating them from other stores. In Marxent, for example, the price of these personalized experiences starts around 22-26 thousand euros. As for virtual reality applications, the price levels are very similar, because they also start with a very basic set of tools, with an average level suitable for online stores, followed by 3D games and MMORPG, and the costs vary between 4.4 and 88 thousand euros.

2. Case study

As part of this research, participants were invited to the simulator for about 30 minutes to experience the virtual shopping process. Participants were asked to submit their previous shopping experiences on the internet in order to evaluate and analyze the online shopping environment. To give participants a greater sense of immersion and interactivity, three tools were given to the participants: (1) a head-mounted screen, (2) a hand-held controller and (3) an interactive stepping pad. For example, participants could select the merchandise, zoom in and zoom out to view the product features, rotate and view the products from different angles, buy the items they wanted, as well as change the music and lighting effects. The interactive stepping board provided an opportunity for participants to freely tour the shop.

2.1 Discussion

The study investigated how to provide a shopping experience for interactive and hedonic clothing in order to enhance the pleasure of customers and increase their purchasing intention. The results of this study provide empirical support for the application of stereoscopic screens, immersion and computer-simulated world to potential online shopping habits for readers. Most participants in this research described their hedonic shopping experiences in the Future Shop as creative, fun and exciting. The results showed that most respondents believed that the VR has the ability to outdo the conventional web-based shopping activities and blend with the consumer's real-world apparel shopping. However, some shortcomings still remain in this research, such as no substantial interpersonal interaction in the experiment and overall adoption process, and no suitable feature and digital attempt on activity connections were offered to consumers during their shopping. Strategies to address these limitations will be developed in the future. In this experiment there were no scope to try on clothes. It is also very relevant from a managerial perspective that many customers have suggested that they do not have an online fitting feature to try and examine the product during their virtual shopping process.

The results of this study were consistent with the findings of other studies that experimented in fashion shopping supported by immersive technologies. Findings supports that these technologies can contribute to stronger purchasing intentions than passive brand presentations on conventional web-based shopping practices. In terms of integration, interactivity and vividness, the VR greatly extends the limits of online shopping. Innovativeness in innovation has important moderating impacts on the interaction between behavior and the use of the online clothing store. Future studies may pursue the purchasing motives of customers and evaluate their experiences of various product modelling techniques in online retail activities for brand analysis and entertainment. Also, an essential part for further inquiry is the view of the storeowner and/or professional technology programmers.

In addition, to facilitate consumer displays and create store atmospheres close to those in real-life retail stores, a well-organized digital shop is required. In virtual apparel retailing, interpersonal communication and virtual fitting functions should be developed to improve interactions between consumers and retailers as well as between consumers themselves. Nevertheless, the findings of this research may be beneficial to retailers and roles in other managerial domains. This research demonstrated its importance by providing a better view of the shopping experience in the VR for other researchers. The findings of this research provided empirical evidence to academics and marketers that the use of VR promises to enhance the buying intention of consumers and enrich their hedonic shopping experience.

3. Conclusions

The paper analyzed the various issues related to next generation online shopping such as VR and AR, in addition to assessing current state of the use of technology in online shopping experience. In general, we can say that the virtual reality in e-commerce is growing despite of the high cost. In our case we have been able to observe user's experience of online shopping with the aid of AR and VR technologies.

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