

VR and AR in the Digital World: The Impacts on Consumer Purchasing Intentions

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Abstract. Consumers are becoming increasingly more dependent on technology for most of their day-to-day activities as technological breakthroughs continue to be made, and with the on-set of a global pandemic that has only amplified these effects, VR and AR technologies are likely to become predominant mediums for connecting with consumers within a variety of industries shortly for their ability to truly immerse consumers in the shopping experience. Because VR and AR are relatively new technologies, it is essential to factor in the TAM (Technology Acceptance Model) to help predict the way consumers will react to such new technologies based on their current perceptions. By considering the future of the commercial and consumer world, this paper aims to address the changes and impacts that the adoption of these technologies will ultimately have on consumers and their purchasing intentions.

Keywords: VR; AR; Consumer Purchasing Intention.

1. Introduction

1.1 Research Background

Under the background of a fast-growing technological age and being hit by the COVID-19 pandemic, people rely on their devices to interact with one another more than ever. The COVID-19 pandemic has lasted over three years, and yet people still feel its strong impact on their daily lives. As the pandemic continues, people can only use the internet to interact. However, screen-to-screen interaction has also increasingly caused a barrier between people, even forcing people only to know how to interact when given a screen instead of face-to-face communication with other peers. Furthermore, many people are craving more immersive experiences than just a screen-to-screen interaction. At the same time, the metaverse is becoming a predominant topic of discussion where researchers delve deeper into the future possibilities of Augmented Reality (AR) and Virtual Reality (VR) technologies in the technology, entertainment, and media industries. Additionally, because of such a particular period of the COVID-19 pandemic, more technological innovations are being invented to boost interactions between people. Thus, the usage of VR and AR has grown exponentially and taken up various functions in a large selection of industries.

1.2 Research Gap

VR and AR technologies are being developed, widely spread, and utilized and will play a large part in our day-to-day lives in the future. The consumer market is no different as it is also experiencing changes that VR and AR technology will bring when they are integrated into the shopping experience. However, although there is a strong indicator of VR and AR technology dominating the markets, many still do not have a clear view of how it will influence consumer behavior or, more specifically, consumer purchasing intentions. Thus, this research plan aims to fill a significant gap in the influence of VR and AR technology on consumer purchase intentions. Before the pandemic hit, consumers had the flexibility of time and the ability to visit physical stores to buy their items. However, people cannot leave their houses after the pandemic due to self-quarantining regulations. Thus, VR and AR may come into use when displaying virtual 3D images of the item and giving the consumer a more immersive experience akin to an actual physical purchasing scene. Therefore, VR and AR are

prospected to play a significant role in influencing consumers' purchasing behaviors. A study by Suh and Lee used a lab experiment to empirically test the effects of VR on consumer learning and the moderating effects of the product types [1]. It showed that consumers were quickly able to adapt and learn under the supervision of VR technology. Kazmi, Ahmed, Soomro, Hashem E, Akhtar, and Parmar used a within-group experimental design where the subjects were after being exposed to a stimulus for AR experiential marketing and shown that because AR allows the products to become visually more appealing and eye-catching, it offers a holistic experience for consumers and thus, results in a more positive attitude in user purchasing intention after being exposed to AR [2]. The problem that is being researched, how AR and VR can influence consumer purchasing intentions, is very significant to the contemporary society many are living in. Because of the COVID-19 pandemic, many companies struggle to keep up their sales of products they have manufactured or are marketing. As VR and AR industries grow, companies have to adapt and benefit from influencing consumer purchasing intentions or behavior. Thus, this research is based on the context of COVID-19 and how it will propel further technological innovations, such as VR and AR, and how they will affect consumer purchasing intentions. Furthermore, the motivation of this paper is to investigate the profiles of Generation Zs of the digital age, one of the most prominent influencers and users of technology. The central motivation of the research question is predicting how the commercial and consumer world will evolve in the future as new and rapid technological change continues to escalate. Additionally, since the research question encapsulates and discusses how humans function psychologically and with interaction with technology, human psychology, and the digital age will also be taken into account when conducting the research.

1.3 Structure of the Paper

In this research paper, the aim and plan are to utilize SWOT analysis for big tech companies that are also investigating the possibilities for VR and AR technologies, gather useful data from the literature reviews that will be read, and how it will impact people mentally and physically, as well as use Porter's Five Forces Analysis when evaluating the market for AR and VR, assessing its competitiveness among other tech devices. By taking experiences present in the world around us, customers are often looking for an experience to buy. Moreover, companies trying to sell products are trying to deepen and build a stronger connection with their customers. As seen in VR and AR technologies, their immersive ability is high. The customer can view the product and company more closely and intimately, thus satisfying their need for a captivating experience. Hence, this research paper will investigate the implications of how AR and VR technologies may be integrated within the world of consumerism, advertising, and marketing, as well as create out-of-the-box experiences for customers and help companies build stronger customer relationships.

2. Literature Review

2.1 Definition, Background, and Development

Research on the Technology Acceptance Model (TAM) has a long history. Davis first proposed the TAM model in 1989, an essential tool in predicting behavior for various technologies afterward. The Technology Acceptance Model (TAM) posits that two factors determine whether a computer system will be accepted by its potential users: (1) perceived usefulness (PU) and (2) perceived ease of use (PEOU). Much research has shown that the TAM model is a robust model for technology acceptance behavior in various IT, across all products, levels of expertise, and countries. PU here is defined as a measure of an individual's subjective assessment of the newly-introduced technology product's utility in a specific work-related activity. PEOU is defined as how easily an individual perceives and uses the technology in terms of cognitive effort.

2.2 Important Results and Application

Literature reviews concerning and implementing the TAM model are listed below as strong evidence for this research plan of action. Faizah Abd Majid in 2019 utilized variables such as the PU and PEOU to identify the relationship between VR and AR technology and the following consumer's consumption and purchase behaviors in South Korea, such as figuring out how the consumers perceive the introduction of the new technology to their daily lives [3]. Fussell and Truong investigated the factors such as PEU and PU that stem from the TAM model and how it affects students' intentions to use VR technologies [4]. Their research has conducted a quantitative research method with a survey consisting of students from pilot schools in the US who have all watched a basic video about VR technology as a mechanism for flight. According to the 475 valid responses indicating PU and PEOU, participants of the survey responded that they still highly doubt the usage of VR technology in their flights today, thus, implying low confidence of respondents in utilizing such technologies today. Sarkady and others studied the TAM model that was utilized to investigate whether consumers are willing to apply VR models to pursue the sense of happiness they experience when visiting tourist sites and attractions in real life [5]. The researchers have conducted a quantitative research design with a survey to measure PU and PEOU of VR technology in travel. As a result of their questionnaire, they had 4 out of 6 of their hypotheses confirmed. The most significant result was the relatively high value of PEOU, suggesting that the ease of use of VR technology in traveling justifies the potential assumption that the consumers are more inclined to travel virtually.

Pavlou and Fygenson utilized the TAM model when researching how consumers behave when purchasing goods and services online [6]. The paper uses a longitudinal study with online consumers to utilize the TAM model to explain and predict the process of e-commerce adoption by consumers. The research stressed the importance of trust and concluded that technology adoption variables (PU and PEOU) are strong predictors of e-commerce adoption, justifying the integration of trust and technology adoption variables within the TAM model. Venkatesh, et al. used longitudinal field studies and surveys at four organizations to test the validity and reliability of their integrated model, which they constructed previously consisting of the TAM and TPB models among six others [7]. Variables of the TAM model, such as PU and PEOU, helped explain individual acceptance toward new technology.

The final integrated model of the Unified Theory of Acceptance and Use of Technology (UTAUT) was concluded to explain 70% of the variance in intention. Gefen, Karahanna, and Straub researched online purchase intentions based on the TAM model (PU and PEOU) and the influence of trust in the e-vendor [8]. Through data collected from experienced repeat online shoppers, the researchers show that consumer trust is as important to online commerce as the widely accepted TAM model variables such as perceived usefulness and ease of use. IN HIS PAPER, Stuart J. Barnes puts forward the value VR has in the marketing world by looking at its influence on consumer engagement [9]. Barnes analyzed the psychological factors that may play a role in consumers' expectations and preferences in VR environments and the PU and PEOU. One of these factors is self-construal, which he defines as an individual's nature/relationship with other people. Barnes argued that self-construal relates to social media use and word of mouth; it determines the individuals' attitudes towards different brands and technologies and their purchasing intentions. Other factors include impulsive tendencies (when an individual acts without thinking or planning) and locus of control (how an individual perceives the events in their life as being controlled by themselves or by external influences). Barnes looked at these and more psychological factors to analyze them concerning consumers' PU and PEOU. The outcome of integrating VR technologies into marketing, according to Barnes, will be "affective, cognitive and behavioral (conative) change at the individual level."

Authors Mariano et al. studied the use of VR in marketing and its role in producing satisfactory consumer experiences [10]. They discussed successful applications of Extended Reality technologies (XR), including VR, such as the popularization of e-commerce. Based on previous works on virtual experiences in marketing, they propose that the integration of more XR technologies will undoubtedly enhance consumer behavior on a large scale by stimulating the users' sensory elements and

enhancing the customer experience as a whole. They predict that interactive and immersive technologies will shortly become ubiquitous and lead to new marketing opportunities. Their study is largely based on the TAM and how the widespread use of these technologies will ultimately impact the purchasing intentions and behaviors of consumers.

2.3 Summary of Main Results and Evaluation

Together, these studies have proven the effectiveness and impact The Technology Acceptance Model plays on consumers or new users using a new device technology. Overall, the studies also highlight the TAM model's usability on e-commerce or introducing high-tech products like VR and AR technology. Collectively, the studies also outline a critical role that the TAM model will play when VR and AR technologies are massed, produced, and used for marketing and consumer purposes. However, many of these studies were performed under the con-text where the pandemic has not yet hit the world. Thus, there may be gaps in their conclusions that lead us to question what further conditions need to be satisfied for the VR and AR technologies to be further integrated into our already secluded lifestyles. Thus, following the COVID-19 pandemic, other factors have to be reconsidered, for example, the slowing down of the global economy, the prices of such gadgets, and the availability of such technology in our period.

3. Method

3.1 Research Design

A variety of methods and factors are used to assess the impact of VR and AR. For example, as the literature review summaries show, previous studies have based their criteria and methods for selection on doing a longitudinal study or survey to test the effect of VR and AR on participant behavior and intentions. However, as materials are insufficient to conduct such a complicated and expensive experiment, an alternative way is chosen to assess the research object and its possible impact on consumer intentions — by using the SWOT Analysis. Furthermore, qualitative case studies are also a well-established approach in researching and experimenting with the research question and its possible results. Qualitative methods offer an effective way of having a well-rounded view of the research object; thus, the research design concludes with literature reviews and SWOT analysis.

3.2 Research Object

The research object that is being researched is the Apple VR headset (Figure 1). "Apple VR" is Apple's rumored virtual reality headset that has multiple analysts and reports pointing toward it having an expensive headset with cutting-edge technology arriving in late 2022. Although Tim Cook, Apple's CEO, believes the potential of AR is more than VR, virtual reality is more easily produced than the "Apple Glasses" that Apple also promises. Thus, a mixed-reality "Apple VR" could give developers and Apple's designers a warmup run for "Apple Glasses" and test its effects on consumers and the niche market that Apple is targeting. As one of the largest leading companies in the big tech industry, Apple will be prospected to produce VR glasses that may very well represent how the future industry will function accurately.

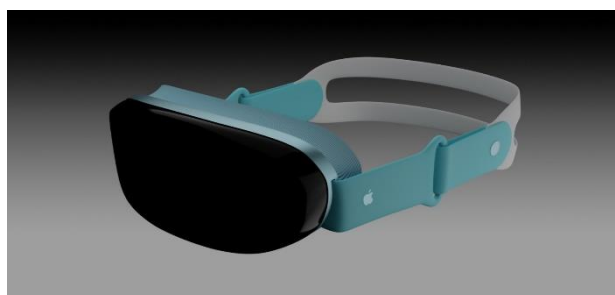


Figure 1. Apple VR

3.3 SWOT Analysis

3.3.1 Strengths

Table 1. Cooperation

Characteristics	Convenience/Connectivity	Heaviness/Weight	Display
Apple VR	Does not require connection to external sources.	Uses fabric as an outer covering so it is lighter.	Has a higher resolution display, such as using an ultra-high resolution 8K display.
Other VR products	Requires connection to PC or console.	Uses metal, thus is heavier.	Lower resolution due to technology setbacks.

As can be shown in Table 1, unlike other VR products such as Playstation VR or Valve Index, the Apple VR does not require a connection to a PC, console, or other external processing software, making it an individual and more available product for consumers to choose from. Furthermore, the outer fabric covering of the Apple VR headset will keep the headset's weight lighter than other VR headsets from other big tech companies. Apple VR will also have a higher resolution display, such as using an ultra-high resolution 8K display, than those found in existing VR products now. Such high resolution will allow for more realistic environments being projected by the product. Furthermore, Apple is also incorporating foveated rendering in their product. This technology tracks the user's eyes, only prioritizing graphical detail in the section the user is looking at so that portions of the virtual image in the user's peripheral vision have downgraded quality. This will present high-fidelity graphics more efficiently, without any noticeable drop in visual detail.

The impact of these features is deemed to be very large as Apple is the first to make such drastic advancements in VR headsets that make it dramatically different from other VR products. This gives Apple a competitive edge over the other products in the market. Furthermore, as VR consumers are looking for an immersive experience, Apple satisfies this condition more than other products through its high-resolution displays and non-reliance on other external processing sources. Thus, this makes the product individual and more accessible to a larger demographic of consumers who want VR immersive experiences.

3.3.2 Weaknesses

To minimize the headset's size, Apple reportedly removed the area in the front of the lenses that VR devices typically reserved for users who wear eyeglasses [11]. However, disposing of that space would require an alternative solution for near-sighted people. If Apple plans on allowing clients to order custom prescription lenses, they should insert these into the headset over the VR displays. However, selling prescription lenses would require Apple to work within regional authorities' regulations. While patents do not usually predict a final product, Apple filed one that would use fluid and stress to modify the user's prescription. However, it is not always clear whether Apple would use this patent for VR, AR, or neither. This weakness will also have a significant impact on the target market of the VR products of Apple since, according to the Vision Council of America, about 75 percent of the adult population worldwide uses vision correction products, and 64 percent of that wear eyeglasses [12]. Thus, if Apple plans on introducing Apple VR without the space for users with eyeglasses to utilize, it would prove to be a significant setback on the product's utility to users who wear glasses. Furthermore, the Apple VR will be priced very highly — above the "\$300 to \$900 of

its rivals" and possibly as high as \$3,000 [11]. This means that people who are financially less well-off will not be able to purchase VR technology. Thus, this is also a major weakness in the VR product, which severely limits the kind of people or consumers to have access to the product.

3.3.3. Opportunities

Apple's major opportunity to expand this VR product is its major difference from other companies' products in terms of reliability on external sources and graphic quality. As Apple VR does not require an external source of control to connect its VR headset, it allows users to have more flexibility in the software they buy. They would not have to purchase other Apple products to connect the VR headset to. Thus, although the company takes the VR headset out of its Apple Ecosystem, they use it to exchange for a wider demographic of target consumers. Hence, this allows the company to spread its VR headset wider and more globally.

3.3.4 Threats

Apple wants to make its VR and AR gadgets replace the iPhone and other gadgets it has created — an accomplishment that would be heavily delayed and obstructed if the Apple VR is priced heavily and does not take care of the demographic in poverty or possess vision problems. For other companies' VR products where they consider these problems such as price and users that have eyeglasses, it would prove a major advantage in competing against Apple. Conversely, for Apple, this would be a major threat to their target demographic of users to utilize their product with ease.

4. Results and Discussion

As humanity is increasingly interconnected through the conveniences of technology, the products need to allow customers to leave a strong sense of emotion or a traceable memory of using the product to foster their growth. VR and AR technologies, however, are innately borne by the sellers to achieve this sense of emotions that facilitate customers in building memorable experiences and interactions in the virtual world; yet, VR and AR technologies still pertain to some weakness that degrades people's perception of ease of use and usefulness of technologies as best reflected in the swot analysis.

Out of numerous and notable strengths of VR and AR technology, one of its strengths is its ability to provide immersive storytelling [13]. Owing much of issues to the outbreak of COVID-19, where lockdown policies have unprecedentedly affected people both physically and psychologically, mental problems have been one of the most significant illnesses requiring pharmaceutical cures. In response to the need for pharmaceutical treatments to solve mental illnesses, VR could be one of the most stimulating ways of solving illnesses like depression. VR's immersive Mechanism of Action (MOA) functions as a core of VR's purpose. MOA provides 3D images that provide context while stimulating various senses. As such, VR "creates empathy with an inspirational message that takes patients on a journey, captures their full attention, draws them into an encounter with pharmaceuticals, and coerces them into exploring their options while ensuring a memorable experience" [13].

However, the use of VR confronts some weaknesses that may have to be improved to allow wider populations behind the media to "dissolve" VR into their lives. From the producers' perspective, one of the most prominent weaknesses of producing VR is its high costs. While investments in games could be justified as game development targets mass media and thus experiences vast economies of scale where average total costs could be broken down per customer, investments in a "one-of-a-kind VR system" require a more systematic and costly approach. However, through the lens of customers, the compatibility of VR remains one issue that has to be solved to reach a broader customer base. Suppose the VR technology's primary purpose is to create a virtual reality for customers to escape from harsh struggles they confront in their lives. In that case, it should exist without a conflict with customers' habits.

It has long been discussed that the implementation of VR and AR technologies faces high barriers of entry and compatibility issues due to its short history. However, this paper realized that the common factors that most of the research about VR technology conducted worldwide acknowledge

the PEOU of VR technology is high in numbers, suggesting that the customers may easily take the use of VR.

5. Conclusion

Taking into consideration the growing needs of consumers during a global health crisis, the findings presented in this paper highlight the implications of a world where VR and AR technologies drive the technology, entertainment, and media industries. Research into different studies conducted regarding the acceptance of VR and AR technologies demonstrates that although people still lack a concrete understanding of how the adoption of these new technologies will influence consumer purchasing intentions, potential consumers have a high PEOU for VR and AR. As previously mentioned, desires for more interactive and immersive experiences beyond mere screen-to-screen interaction are rising. One can only predict that the gradual integration of VR and AR technologies into the world of consumerism and marketing will evolve to fulfill these needs. VR and AR serve as vital tools that will influence the way customers choose to buy a product. However, they will also serve as valuable opportunities for companies to establish more profound, intimate connections with their customers.

The data collected from the literature reviews show that the TAM indeed plays a large role in determining consumers' perceptions or reactions to a new technological device, specifically VR and AR technology. These studies have proven that many people already had relatively positive attitudes towards such technologies and high PEOU.

Apple's rumored VR headset serves as a case study that one can study to see how other VR and AR technologies will perform when they become more popular and mainstream in the future. The SWOT analysis clarifies that while Apple has a competitive edge over other companies as the company continues to make unprecedented advancements in technology, the headset's cost is its major weakness and flaw, making it inaccessible to certain demographics of people.

VR and AR technologies will only continue to rise in popularity. They will become even more widely adopted by a wide range of industries and companies due to both the rapidly growing advancements in technological breakthroughs as well as ever-changing customer expectations and behaviors. This paper has shown that while not much is known about the future of these technologies, one can undoubtedly say that VR and AR will only enhance the customer experience and make it more immersive and interactive in the sense that consumers will be able to enjoy connections with companies on a much deeper level than before, satisfying both companies need for brand-loyal customers as well as customers' need for a more captivating experience.

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