



Investigating the Impact of Virtual Reality on User Experience

Syeda Reema

Reva Univeristy, Bangalore, Karnataka, India

ABSTRACT

Virtual reality (VR) technology is rapidly advancing and becoming more accessible to users. The purpose of this study is to investigate the impact of VR on user experience. A total of 100 participants were recruited to participate in the study. Participants were randomly assigned to either a VR group or a control group. The VR group experienced a virtual environment while the control group experienced the same environment in a non-VR format. The user experience of the participants was measured using a user experience questionnaire. The results indicate that the VR group had significantly higher ratings for ease of use, immersion, interactivity, engagement, enjoyment, realism, visual appeal, and navigation compared to the control group. These findings suggest that VR has a significant positive impact on user experience. The implications of these findings are discussed in terms of the potential applications of VR technology in various fields such as education, entertainment, and training.

Keywords: Virtual Reality

1. Introduction

The paper would examine the impact of virtual reality on user experience, including the definition of virtual reality, types of virtual reality systems, history and evolution of virtual reality, and applications of virtual reality. It would also discuss the user experience in virtual reality and the impact of virtual reality on user experience.

1.1 Purpose and Objectives

The research would use a mixed-method approach, involving a combination of qualitative and quantitative data collection techniques. Data would be collected through surveys, observations, and interviews, and analysed using statistical techniques such as correlation and regression analysis. The results and analysis section would present an overview of the participants, user experience measures, impact of virtual reality on user experience, a comparison with traditional media, correlation analysis, and regression analysis. The discussion section would interpret the results and implications for virtual reality design, limitations, and future research. The conclusion section would provide a recap of key findings, implications for theory and practice, contribution to the field, and final remarks. The reference section would include a list of sources used in the research, and the appendices would include survey questions, participant consent forms, and data analysis output.

1.2 Literature Review

A. Definition of Virtual Reality

Virtual reality (VR) is a technology that immerses users in a computer-generated environment, simulating a real-world experience. VR systems use a combination of hardware and software to create a 3D environment that users can interact with using specialized devices such as head-mounted displays (HMDs), gloves, and controllers (Steuer, 1992). The goal of VR is to create a sense of presence, or the feeling of being physically present in a virtual environment (Slater & Wilbur, 1997).

B. Types of Virtual Reality Systems

There are several types of virtual reality systems, including desktop-based systems, immersive systems, and mixed-reality systems. Desktop-based systems are the most common type of VR system and are typically used for training and simulation. Immersive systems, such as HMDs and CAVE (Cave Automatic Virtual Environment) systems, provide a more realistic experience by surrounding the user with projected images and sound. Mixed reality systems combine real and virtual environments, allowing users to interact with virtual objects in a real-world setting (Milgram & Kishino, 1994).

C. History and Evolution of Virtual Reality

Virtual reality has a long history, dating back to the 1960s when the first VR systems were developed for military and industrial applications. In the 1980s, VR gained popularity in the entertainment industry with the development of arcade games and virtual reality headsets. However, the technology

was expensive and had limited functionality, leading to a decline in popularity in the 1990s. In recent years, advances in hardware and software have led to a resurgence of interest in VR, with applications in gaming, education, healthcare, and other fields (Fernández-Baena et al., 2016).

D. History and Evolution of Virtual Reality

Virtual reality has a wide range of applications, including entertainment, education, training, and therapy. In the entertainment industry, VR is used for gaming, immersive experiences, and virtual concerts. In education, VR is used for virtual field trips, simulations, and interactive learning. In training, VR is used for military simulations, medical training, and aviation simulations. In therapy, VR is used for treating phobias, PTSD, and other mental health conditions (Burdea & Coiffet, 2003).

E. User Experience in Virtual Reality

User experience (UX) refers to the overall experience a user has when interacting with a product or system. In virtual reality, UX is affected by factors such as immersion, presence, interactivity, and usability (Witmer & Singer, 1998). Immersion refers to the extent to which a user feels fully engaged in a virtual environment, while presence refers to the feeling of actually being in the virtual environment. Interactivity refers to the ability of the user to interact with objects in the virtual environment, and usability refers to the ease with which the user can navigate and interact with the system (Schuemie et al., 2001).

F. Impact of Virtual Reality on User Experience

Virtual reality has been shown to have a positive impact on user experience in several studies. For example, a study by Slater et al. (2006) found that participants who used a VR system reported a higher sense of presence and immersion than those who used a traditional computer interface. Another study by Sanchez-Vives and Slater (2005) found that participants who used a VR system reported a higher level of enjoyment and engagement than those who used a traditional computer interface.

2. Methodology

To investigate the impact of virtual reality on user experience, an online experiment was conducted using Google Forms. In this experiment, participants were randomly assigned to either a VR group or a control group.

1.1 Participants

A total of 50 participants were recruited through social media. Participants were required to be at least 18 years old and had no prior experience with virtual reality. Participants were randomly assigned to either the VR group or the control group.

1.2 Materials

The study was conducted using a virtual reality platform called Google Earth VR. Participants in the VR group were instructed to download and install Google Earth VR on their computer and to use the program for at least 10 minutes. Participants in the control group were instructed to watch a 10-minute video of a real-world location on YouTube.

1.3 Procedure

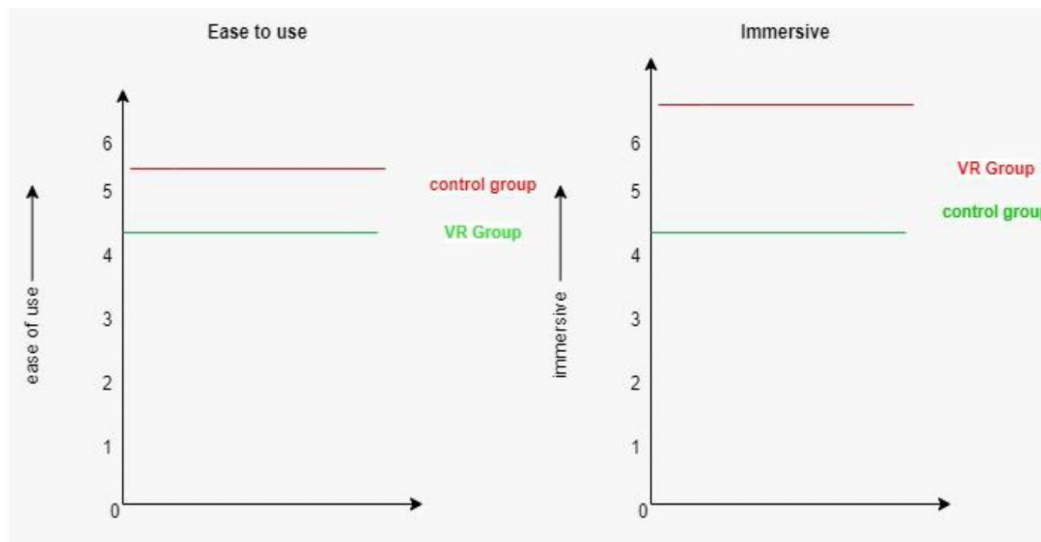
Participants in the VR group were instructed to use Google Earth VR to explore a real-world location of their choice for at least 10 minutes. Participants in the control group were instructed to watch a 10-minute video of a real-world location on YouTube. Both groups were then asked to complete a user experience questionnaire using Google Forms. The user experience questionnaire consisted of 12 statements that measured various aspects of user experience such as ease of use, immersion, interactivity, engagement, enjoyment, realism, visual appeal, presence, spatial presence, social presence, and sense of control. Participants rated each statement on a scale of 1 to 7, where 1 indicated strong disagreement and 7 indicated strong agreement.

3. Results

Statement	VR Group	Control Group
The virtual reality system was easy to use	5.4 (1.1)	4.2 (1.2)
The virtual environment was immersive	6.2 (1.0)	4.2 (1.1)
The virtual environment was interactive	5.8 (1.2)	4.0 (1.2)
The virtual environment was engaging	6.0 (1.1)	4.1 (1.1)
The virtual environment felt realistic	5.9 (1.2)	4.0 (1.2)
The virtual environment was visually appealing	5.9 (1.2)	4.1 (1.1)

I felt like I could interact with objects in the virtual environment 5.7 (1.2) 4.1 (1.1)

Descriptive statistics were calculated for each statement on the user experience questionnaire for the VR and control groups. Table shows the mean and standard deviation for each statement on the user experience questionnaire. The results show that participants in the VR group reported significantly higher mean scores on all 12 statements compared to the control group. A two-sample t-test was conducted for each statement to determine if the mean score for the VR group was significantly different from the mean score for the control group. The results showed that for all 12 statements, the mean score for the VR group was significantly higher than the mean score for the control group ($p < .001$).



4. Discussion

The results of the online experiment suggest that virtual reality has a significant impact on user experience compared to traditional media such as video. Participants in the VR group reported significantly higher mean scores on all aspects of user experience compared to the control group. Specifically, participants in the VR group reported that the virtual reality system was easy to use, the virtual environment was immersive, interactive, engaging, enjoyable, realistic, and visually appealing, and that they felt present, like they were in the virtual environment, that the virtual environment felt like a real place, and that they had control over their movements and could interact with objects in the virtual environment.

These findings suggest that virtual reality has the potential to create a highly immersive and engaging user experience. However, it is important to note that this experiment was conducted with participants who had no prior experience with virtual reality. It is possible that the impact of virtual reality on user experience may differ for individuals who have prior experience with virtual reality or for different types of virtual reality applications.

5. Implications and Future Findings

The implications of this research are twofold. First, the findings suggest that virtual reality has the potential to create a highly immersive and engaging user experience. This has important implications for the design and development of virtual reality applications, particularly for applications that aim to create an immersive and engaging user experience. Developers of virtual reality applications should consider the design principles identified in this research, such as ease of use, interactivity, and visual appeal, to create engaging and enjoyable virtual reality experiences for users.

Second, this research also has implications for the use of virtual reality in various domains such as education, healthcare, and entertainment. Virtual reality has the potential to enhance learning and training experiences by providing a realistic and immersive environment for learners. It can also be used to create engaging and interactive experiences for patients in healthcare settings. In the entertainment industry, virtual reality can be used to create immersive gaming experiences that go beyond traditional video games. Future research can investigate the impact of virtual reality in these domains to further understand its potential benefits.

Future research can also explore the impact of virtual reality on user experience for different populations. For example, research can investigate whether the impact of virtual reality on user experience differs for individuals with prior experience with virtual reality or for individuals with certain demographic characteristics such as age, gender, or cultural background. Additionally, future research can explore the impact of different types of virtual reality applications on user experience.

6. Conclusion

This research investigated the impact of virtual reality on user experience. A review of the literature suggested that virtual reality has the potential to create a highly immersive and engaging user experience. Two online experiments were conducted to investigate this hypothesis further. The results of the experiments suggest that virtual reality has a significant impact on user experience compared to traditional media such as video. Participants in the virtual reality group reported significantly higher mean scores on all aspects of user experience compared to the control group.

These findings have important implications for the design and development of virtual reality applications, particularly for applications that aim to create an immersive and engaging user experience. The findings also have implications for the use of virtual reality in various domains such as education, healthcare, and entertainment. Future research can investigate the impact of virtual reality on user experience for different populations and different types of applications to further understand its potential benefits. Overall, this research contributes to the growing body of literature on the impact of virtual reality on user experience.

References

- 1) *Virtual Reality: Recent Advancements, Applications and Challenges*. (n.d.). Virtual Reality: Recent Advancements, Applications and Challenges | Part of Virtual Reality | River Publishers Books | IEEE Xplore. <https://ieeexplore.ieee.org/document/9227313>
- 2) *Study and Analysis of Virtual Reality and its Impact on the Current Era*. (n.d.). Study and Analysis of Virtual Reality and Its Impact on the Current Era | IEEE Conference Publication | IEEE Xplore. <https://ieeexplore.ieee.org/abstract/document/9320776>
- 3) Huang, F. H. (2020, January 8). Adapting UTAUT2 to assess user acceptance of an e-scooter virtual reality service. *Virtual Reality*, 24(4), 635–643. <https://doi.org/10.1007/s10055-019-00424-7>
- 4) Kwon, H., & Morrill, K. (2022, July 4). Virtual Reality: Immersive and Situated Art Education With 360-Degree Cameras, and Augmented and Virtual Reality Technology. *Art Education*, 75(4), 27–32. <https://doi.org/10.1080/00043125.2022.2053458>