

VIRTUAL REALITY APPLICATION FOR NEW SHOPPING EXPERIENCE INTEGRATED WITH SOCIAL DISTANCING COMPLIANCE

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Abstract

It has long been challenging to go shopping and maintain social distancing. Even though online shopping has been around for a long, consumers still prefer to purchase in person; maintaining social distance while shopping got difficult when COVID-19 was proclaimed a pandemic. Social distance became a tactic that nations worldwide started using to help keep their residents secure. According to many studies, social isolation is used to slow down or stop the spread of potentially infectious or highly contagious diseases. They went on to say that the measures of social isolation entail the partial or total closure of social activities. This study addresses the compatibility of both systems with Virtual Reality (VR) shopping. For starters, virtual reality emphasizes utility in online purchasing because it concentrates on efficiency and efficacy, which accomplishes the practical purpose. However, virtual reality systems are all about having fun and immersing the user completely, which also serves a hedonic purpose. The research's goal in a virtual reality application is to replicate a particular store. Customers can visit the virtual reality section of that store to use this application, which will be available there. There will be staff to assist consumers in ensuring they are socially isolated. Customers can then experience virtual reality shopping using headsets available in the store. Customers can browse the store as if it were there, examine the products, hold them, read information such as ingredients or directions, hold, read the descriptions of items and if they like an item, they may add it to their cart, check out, and do much more. An application for virtual reality was developed that simulates a tiny grocery store based on the findings of this investigation. The program included a few more elements to increase user satisfaction and provide consumers with a fresh, fun experience.

Keywords: Integrated, Process innovation, Shopping experience, Social distancing compliance, Virtual reality.

1. Introduction

The rapid evolution of technology is improving humans' daily activities, ensuring efficiency, safety, and comfort. Things like augmented reality, virtual reality, the metaverse, self-driving cars, and much more are being invented to guarantee people's satisfaction [1].

Although people have seen these improvements in many attributes of their lives, there seems to be a gap in carrying out a simple yet necessary activity such as grocery shopping while ensuring peoples' safety. On 11 March 2020, the World Health Organization announced Covid-19 as a pandemic, and the world stopped. Grocery shopping became nearly impossible to maintain social distancing.

Shopping while maintaining social distancing has been a struggle for a while. Even though online shopping has been around for a time, people still prefer shopping in person, as indicated in the literature review section discussed later. Shopping while maintaining social distancing started becoming an issue once Covid-19 was announced as a pandemic. Countries worldwide began implementing social distancing to help keep all citizens safe [2].

Musinguzi and Asamoah [3] described social distancing as an effort to help slow down or stop the spread of a disease that could be highly contagious or infectious. They clarified that social distancing measures involve a partial or complete closure of social activities, including transportation, businesses, and much more that may require social contact and help spread the disease. Based on that, social distancing was a measurement taken by many countries worldwide to help limit the spread of Covid-19 [4].

Sun et al. [4] in another study on Polish consumers to find the average number of online shopping transactions before and during the Covid-19 pandemic. Wiścicka-Fernando [5] created a survey and received 102 responses. 71 out of those responses said they use their mobile phones to shop online. The study concluded that the total online shopping transactions done before the pandemic were 235 (the average number of monthly transactions is 3.31). In contrast, the entire online shopping transactions done during the pandemic were 439 (The average number of monthly transactions per person is 6.18).

Although a vaccine has been made, people are still witnessing new variants. Unfortunately, it seems that countries are starting to lift some of the Covid-19 restrictions. Countries like Finland and France allow travellers without having to undergo pre-entry tests if the travellers are fully vaccinated [6]. It means that if anything like the Covid-19 pandemic occurs again, people will have to maintain social distancing while shopping.

Peukert et al. [7] discussed those information systems are usually divided into practical and hedonic methods. Figure 1 could help clarify the difference between utilitarian and hedonic.

This study discusses that VR shopping can achieve both systems. Virtual reality focuses on usefulness in shopping as it focuses on productivity and effectiveness, achieving the practical goal. At the same time, virtual reality systems are all about fun and making the user highly immersed in the design, which also fulfils the hedonic purpose.



Fig. 1. Utilitarian vs. Hedonic [8].

People started heading towards online shopping to help with social distancing. People who already had such systems began improving, and people who didn't have such systems started working on having one. There is no doubt that this move helped many people during the pandemic; however, this method could be improved by introducing virtual reality shopping while maintaining social distancing.

Virtual Reality applications are used frequently in many sectors, such as surgery. Sukotjo et al. [9] conducted a study to determine the students' perception of VR applications for implant surgery. The study concluded that many students found the VR application helpful in aiding learning.

Virtual reality applications are not only used in surgery, but it is also used for activities such as landscape design teaching. Li et al. [10] conducted a study to promote the digitalization level of landscape using VR technology. The results showed that VR technology helped aid the investigation before project planning, support the conceptual project design, and much more. It shows how VR can be used in many scenarios and ensure a successful and efficient result.

The research aims to simulate a specific store in a virtual reality application. This application will be available in that store in a virtual reality section where customers can go to this section and use the application. Staff will guide the customers on how to use the application and ensure that the customers are socially distanced. Customers will then use virtual reality headsets in the store to experience virtual reality shopping. The customers will be able to explore the store as if it were real, examine the items available, hold the articles, read things on the items such as ingredients or instructions and if they are happy with the item, they can place it in their cart. Additionally, staff members can edit the stock of the items available in the shop, such as refilling the shelves.

2. Methodology

The rapid evolution of technology is improving humans' daily activities, ensuring efficiency, safety, and comfort. Things like augmented reality, virtual reality, the metaverse, self-driving cars, and much more are being invented to guarantee people's satisfaction [1]. This study uses the methods as shown in Fig. 2.



Fig. 2. Prototyping model in software engineering.

It is the start of the prototyping model, and in this phase, the requirements of the systems will be identified. The requirements will be gathered using fact-finding procedures. This stage is crucial since it establishes the requirements for the application's completion and the end date for the prototype. Planning and designing will be done on how the application will work based on the results gathered from the requirements phase. It will help to plan the prototype and give a brief idea about how the application will be implemented and used by the users.

The application will be tested, and the requirements will be evaluated to see if the prototype meets all the needs or not. As previously mentioned, the system cannot be tested by strangers since the COVID-19 restrictions are still being implemented in the current country of residency, so close family members will be testing the application for external opinions.

Based on the results gathered from the testing and evaluation phase, the prototype will be fixed and improved, and phase 4 will be repeated for further testing and evaluation. This loop will keep on going until the prototype meets all the requirements. The final application will be developed and undergo routine maintenance to decrease the chances of downtimes and prevent failures that would cause large-scale issues.

2.1. Fact-finding techniques

The fact-finding techniques were divided into two (2) categories, and they were primary and secondary techniques. Given that the project is addressing a new technology with a new idea, it is important to ensure that it addresses real issues and could help people solve those issues without complicating the managed project.

The primary fact-finding technique that was used in this project was questionnaires. The reason is that questionnaires are easy to distribute, would help gather as much information as possible in a short amount of time, and have a wide reach as it usually isn't long, encouraging participants to answer them.

The total number of responses that were received from this questionnaire was 23. All the questions in this questionnaire were answered, and the main goal was to figure out what people who had never used VR liked and disliked about traditional shopping methods, as shown in Fig. 3.

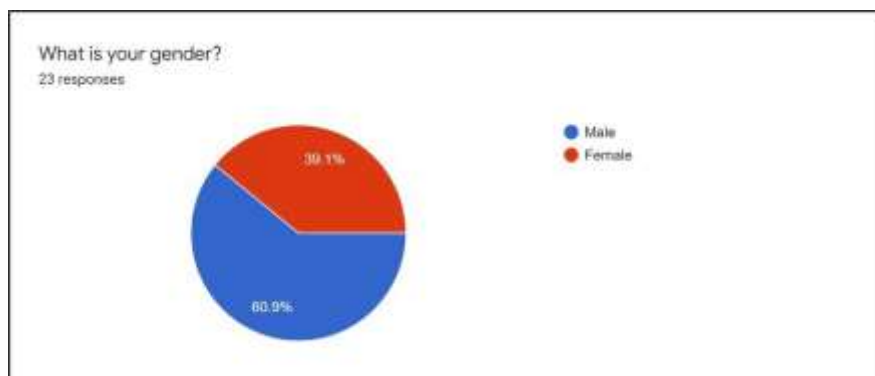


Fig. 3. Responses from NV S1, Q1.

As shown above, there were mixed responses when it came to gender. Around 14 of the respondents were males, and the remaining were females. Later, for a response from NV S1, Q2, as shown in Fig. 4.

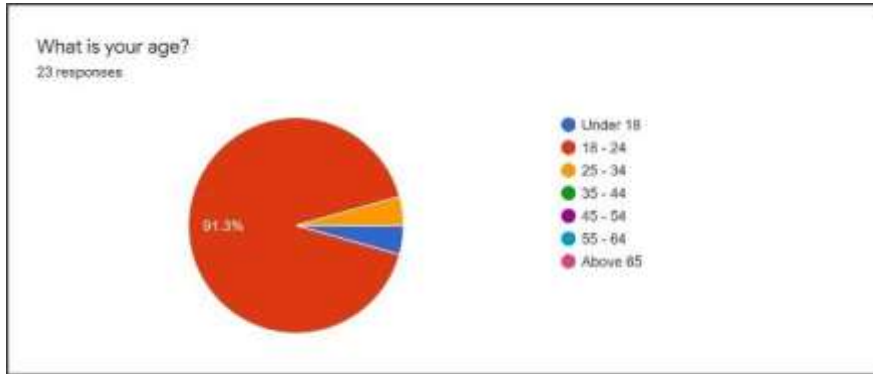


Fig. 4. Responses from NV S1, Q2.

As seen, most respondents were between the age of 18 to 24. Although this result shouldn't be an issue, the author would have preferred to receive answers from people of different age groups—another result for a response from NV S1, Q2, as shown in Fig. 5.

It is crucial to note that this does not imply that most respondents do not conduct internet shopping, as it is feasible for someone to complete both in-person and online shopping. The issue is not how much a person spends in-store vs online.

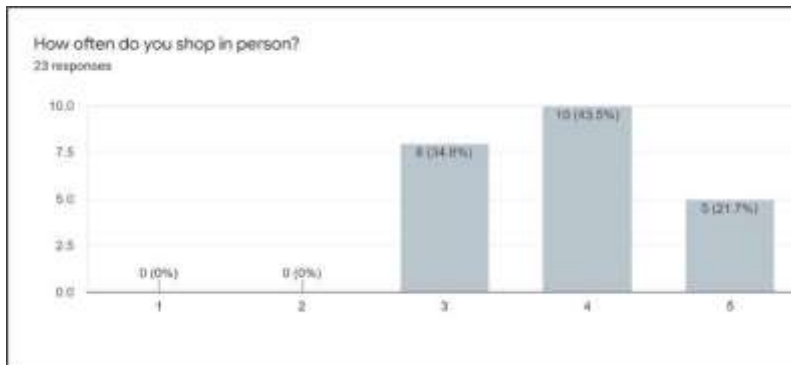


Fig. 5. Responses from NV S2, Q1.

2.2. Oculus quest 2

The VR headset will undergo a few processes to prepare for application development. You'll need a Facebook account first because Oculus Quest 2 is a Meta company. The Oculus mobile app must then be downloaded after that. The user must sign into the app using their Facebook account once it has been downloaded. The headset will then be updated and set up, and the pairing process will begin.

2.3. Unity

The main application that was used to develop the whole project is Unity. Given that Unity can be used to create many applications, such as 2D applications, 3D applications, and VR applications, certain steps will have to be performed in the beginning to begin the VR application development. Once Unity Hub is downloaded, an editor will need to be installed. The edited version of this project is 2020.3.35f1, as shown in Fig. 6.

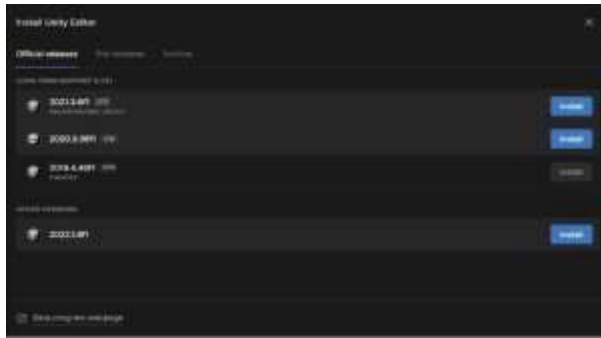


Fig. 6. Install Unity Editor.

2.4. ProGrids

This package helps move things such as walls and furniture in a grid to ensure that all the environment is in line. It was used to ensure that the walls and the floors were placed in line and that there were no gaps, as shown in Fig. 7.



Fig. 7. ProGrids Package.

2.5. ProBuilder

This package helps create assets for the application. It was used to develop the products in the shop, some buttons, the keypad, the pen used for the keypad, the shelves, and much more, as depicted in Fig. 8.



Fig. 8. ProBuilder package.

2.6. Asset used.

The word assets here means objects that are in the application. It contains things like the items the users can purchase, the environment, such as the floors and the walls, trigger areas, such as the ones used by the cashier, and much more, as shown in Figs. 9, 10, 11 and 12.



Fig. 9. Apple asset.



Fig. 10. Orange asset.



Fig. 11. Cashier station asset.



Fig. 12. Cart asset.

3. Result and Discussion

With Covid-19 cases rising at the time of this report, social distancing is still important. Although people are starting to return to their normal life, chances are beginning to rise again, so it all depends on us to keep ourselves and our loved ones safe. It is important to note that viruses will always appear and disappear as this is natural. Based on that, this project's idea was created, and it was to create a virtual reality application for a new shopping experience integrated with social distancing compliance.

Based on the outcome of this research, a virtual reality application was created that simulates a small grocery store. This application allows users to go shopping, explore the store, hold, and leave items, read text on items, place items in a cart, checkout, and much more. The application had some additional features to make the application much more enjoyable and to provide the users with a pleasant and new experience.

The application had two (2, 11) main targets: customers (people who shop frequently) and stores. Therefore, some functions were created to help staff members keep the virtual shop running. Staff members can spawn items, restock shelves, maintain stock records such as the number of items sold and spawned, and save those records manually. The application also has an automatic saving feature which saves the records automatically in case the staff members forget. Those records are held on an external file in situations where the application might crash.

The constraints encountered were like what was anticipated. The hardware to create this project wasn't cheap; some additional hardware was hard to get. The hardware being considered were things such as gloves and vests, which help the user feel something happening inside the application, and a virtual reality treadmill allowing the user to control how they move in the VR application. Another limitation mentioned was that finding people who could provide professional reviews would be hard because COVID-19 cases were high.

It would allow the users to meet in the virtual reality application; they can speak to each other, shop together, and much more. In addition to that, the user would love to make the assets look more natural.

4. Conclusions

This paper suggests shopping in virtual reality (VR) as a substitute to allay concerns about offline shopping and maintaining social distance. Oculus Head 2, Unity, and C# scripts were used in the development of the proposed VR application, which enables customers to enter the virtual world, conduct transactions there, view final prices, and settle their purchases offline. This VR application can be recommended as a solution, according to the results of the usability testing, which show a high degree of tester satisfaction.

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