Designing an AR wayfinding app prototype for Art Museum using double diamond UX design framework

ABSTRACT

The research pictorial shows creating an AR wayfinding mobile prototype for art galleries following the double diamond design framework. People usually fail or get lost inside the art gallery while looking for art. It needs to be solved to create a better visitor experience inside the art gallery. The project focuses on using Augmented Reality (AR) technology to find the way inside the art gallery so that the visitors do not get lost inside. The pictorial explains creating the prototype by following the UX process and using different software to make the AR prototype possible.

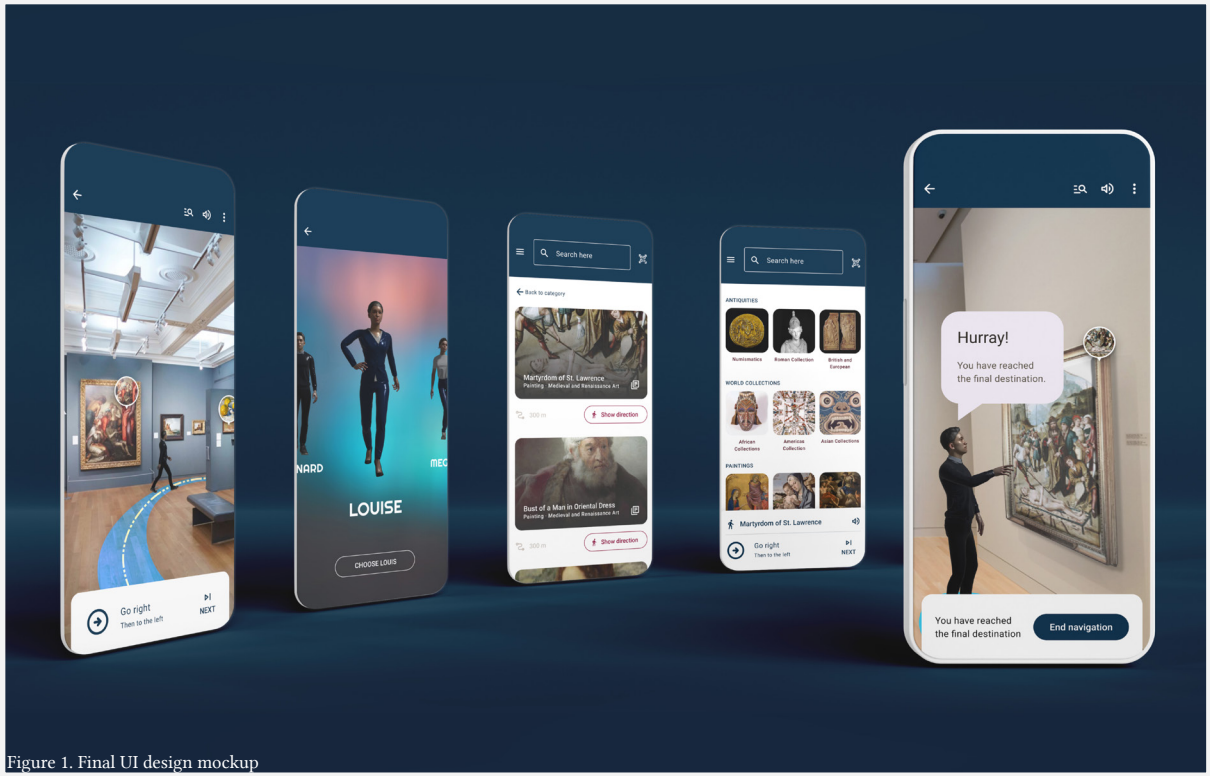

Figure 1. Final UI design mockup

Figure 2. Mockup of a person using the prototype inside gallery

INTRODUCTION

The art gallery has wayfinding issues on its premises. It needs to provide better clear directions for the people visiting the gallery. People usually start looking for the entrance of the gallery from outside of it, which is not an ideal way to find it and can lead to confusion. AR Way Finding system that would be more intuitive and easier for people to use when they enter the premises and will show them how to proceed towards their destination, which would create a better experience (Kim et al., 2015).

BACKGROUND RESEARCH

There are many ways to navigate visitors inside the gallery. The most common way to provide wayfinding is by labelling signs on the wall. However, it can be problematic because visitors might miss those labels, or they might not be able to read them if they are in a different language or have poor eyesight. Many art galleries rely on audio tours (Vanmunster et al., 2021) or signs with descriptions to direct visitors through the exhibitions, but these methods are not always effective. It is where Augmented Reality (AR) comes in; using AR technology provides a way for people to find their way through an exhibition without getting lost. This system could be improved by utilizing AR technology in smartphone devices since

most users carry smartphones with them (Ko, Chang and Ji, 2013).

When people come to an art gallery and do not find their desired exhibit, it leads to frustration. Therefore, galleries are quickly integrating AR wayfinding into their exhibits. AR Wayfinding allows gallery visitors to go through the galleries and exhibits easily by being guided by a virtual guide that appears on the visitor's smartphone screen. AR can help visitors be more engaged in the art because they will not be looking around all the time and searching for a particular exhibit.

AR can guide what to see with a gallery map and give a general idea of the location of exhibits. The user can then use this information to navigate the gallery more easily (Dieck, Jung and Dieck, 2018). AR Way Finding can help solve this issue by overlaying information onto physical signs, floor maps, and other art pieces throughout the gallery.

FRAMEWORK & DESIGN SYSTEM

A UX framework establishes a foundation that focuses on and supports the challenge. For example, the double diamond framework is one of the various frameworks for a UX project; however, this pictorial concentrates on the double diamond framework. The two diamonds reflect a process of broadening or deepening one's understanding of a problem (divergent thinking) and subsequently taking action (convergent thinking) (What is the framework for innovation? Design Council's evolved Double Diamond, 2015).

This prototype was made for the Android operating system. Google's Material You (Material Design 3) design system was used for the high-fidelity design in Figma. It is the most widely used design system for android.

Figure 3. Design System (source: Material 3 Design Kit,2022:online)

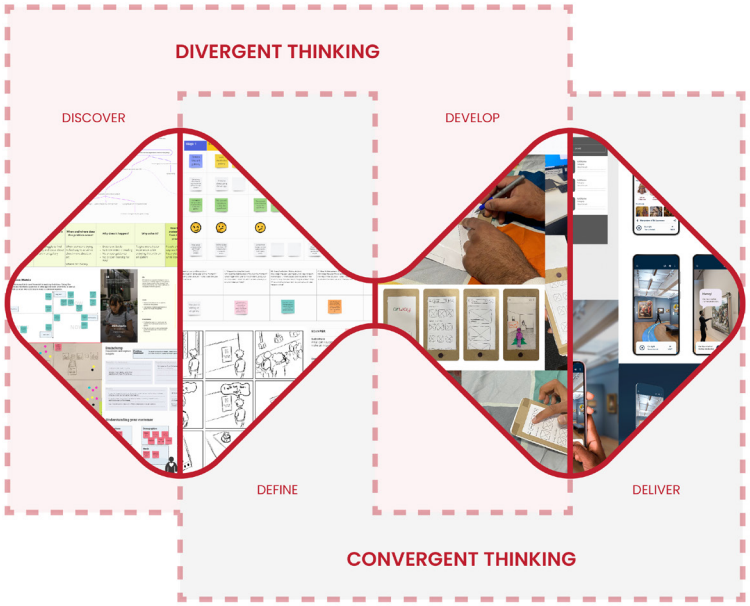

Figure 4. Double Diamond design framework

UX PROCESS

Ideation

Primary and secondary market research was conducted before getting into the ideating phase to learn more about the problems faced by people in the art gallery. The problems were pointed out once the research was done and ideating around the problems started. ‘Why does the problem need solving?’ and ‘Who benefits from the problem?’ have been identified through the ideation.

How Might We, Decision Matrix & Mind Mapping

The problem was then reframed to be more precise using the data gathered in the ideation. Finally, many ‘How Might We (HMW)’ were made to choose one from them using the decision matrix. ‘HMW’ brings out a lot from the mind while writing.

From the decision matrix, three of the ‘HMW’ ideas were highly feasible and could be made in a brief time: HMW make people find their way to particular artwork in the art gallery?; How might we reduce the number of people inside the art gallery at a time?; HMW create an audio tour app which is accessible to everyone?

Mind mapping was done for the three chosen HMWs, which created more ideas about the solution, and pointed out a single solution: HMW make people find their way to particular artwork in the art gallery?

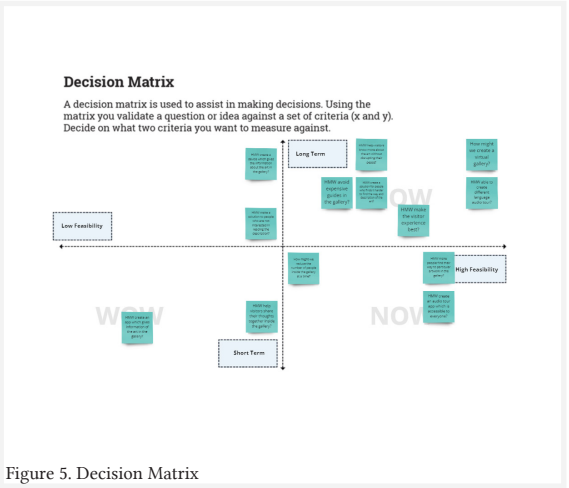

Figure 5. Decision Matrix

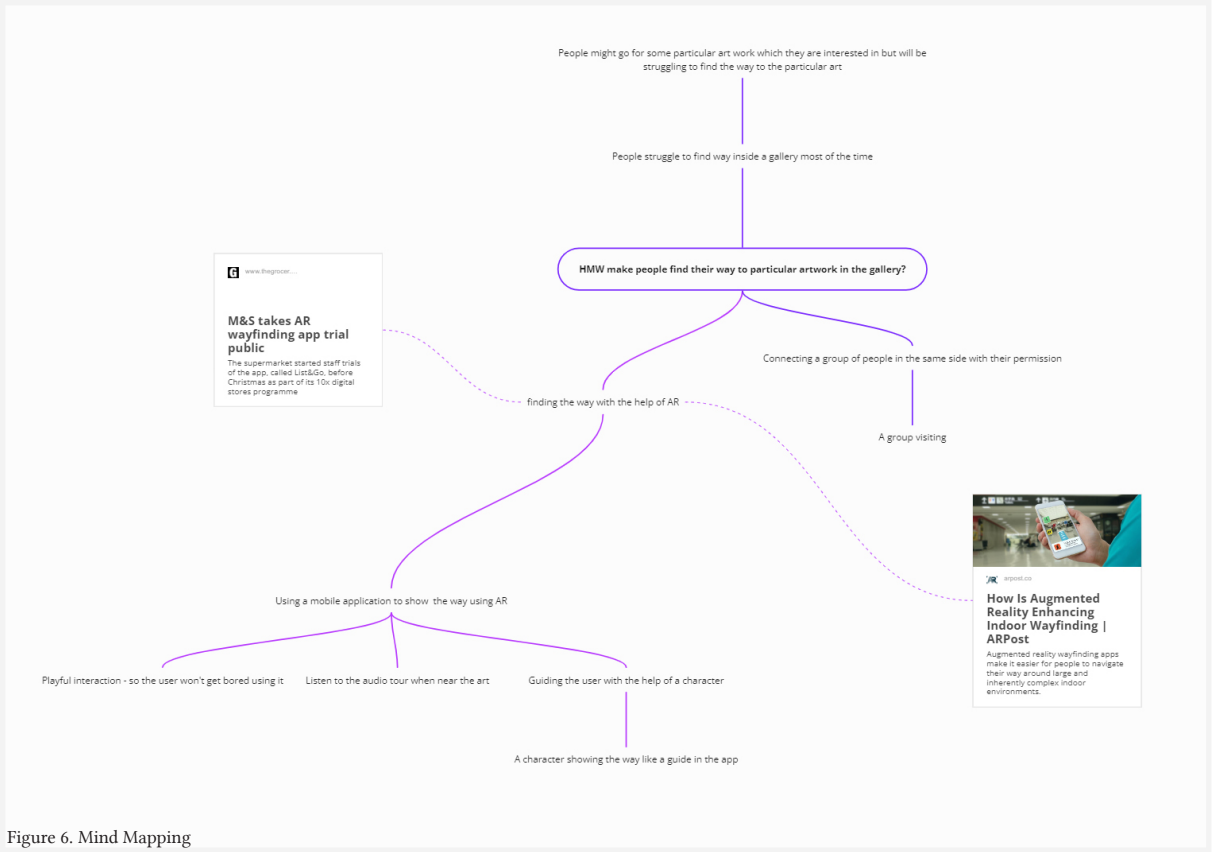

Figure 6. Mind Mapping

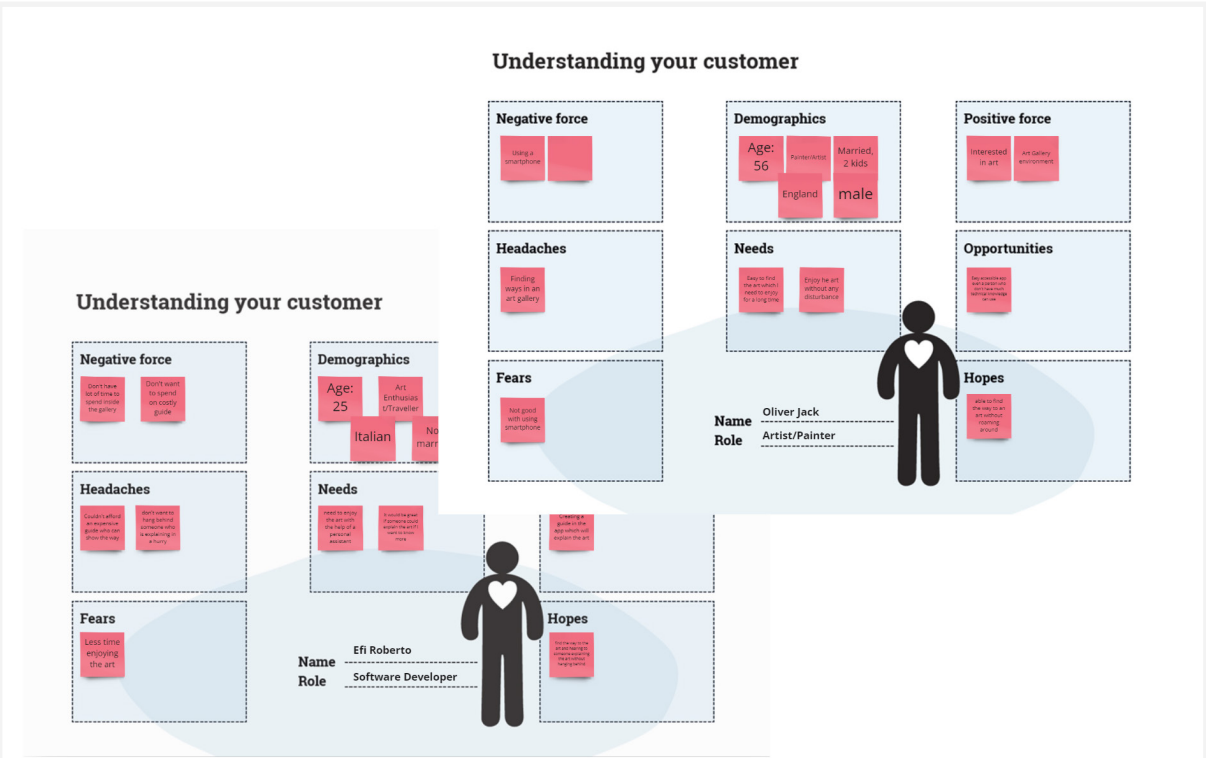

Figure 7. Understanding the user

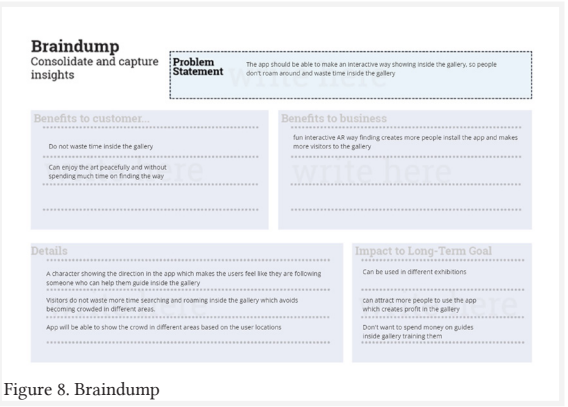

Figure 8. Braindump

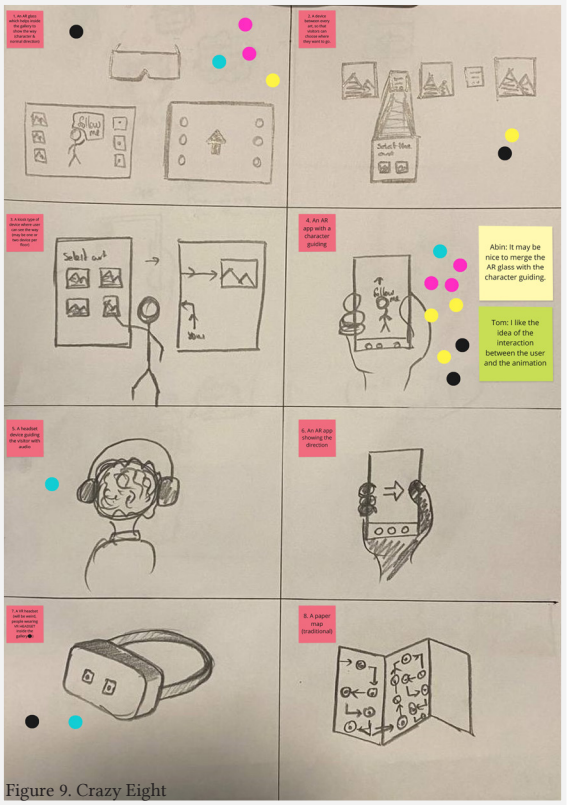

Figure 9. Crazy Eight

Understanding the User, Braindump & Crazy 8's

The collected data was then utilized to create a user profile for the project and data from reputable sources. In order to better understand the user's pain points, a brief survey was done. According to the research, different individuals visit the art gallery for different reasons. Crazy 8's was created to illustrate the various solutions implemented in the scenario. Then they were subjected to dot voting to choose the best solution.

Crazy 8 helps to bring out lot of ideas within 8 minutes. Two crazy 8s were drawn at first, but the first one was very having very few ideas and most of them were similar which was not a good crazy 8. So the second crazy 8 was drawn to bring out different solutions for finding the way.

Persona

Two personas were created of two distinct characters who visit the art gallery. These personas were utilized throughout the project to improve the user's experience. Personas should always be based on data (McGinn and Kotamraju, 2008), which implies they should always be made up of a group of people. The demographics of the users visiting the art gallery, as well as case studies about art gallery visitors, were gathered from the internet from reputable websites and articles (Visits to museums and galleries, 2019; Museums - taking part survey 2019/20, 2020; Developing wayfinding systems in museums, 2019; Museums and galleries monthly visits, 2022; Yoshimura et al., 2016; Visitor Figures 2020, 2022).

Figure 10. Persona - Efi Roberto

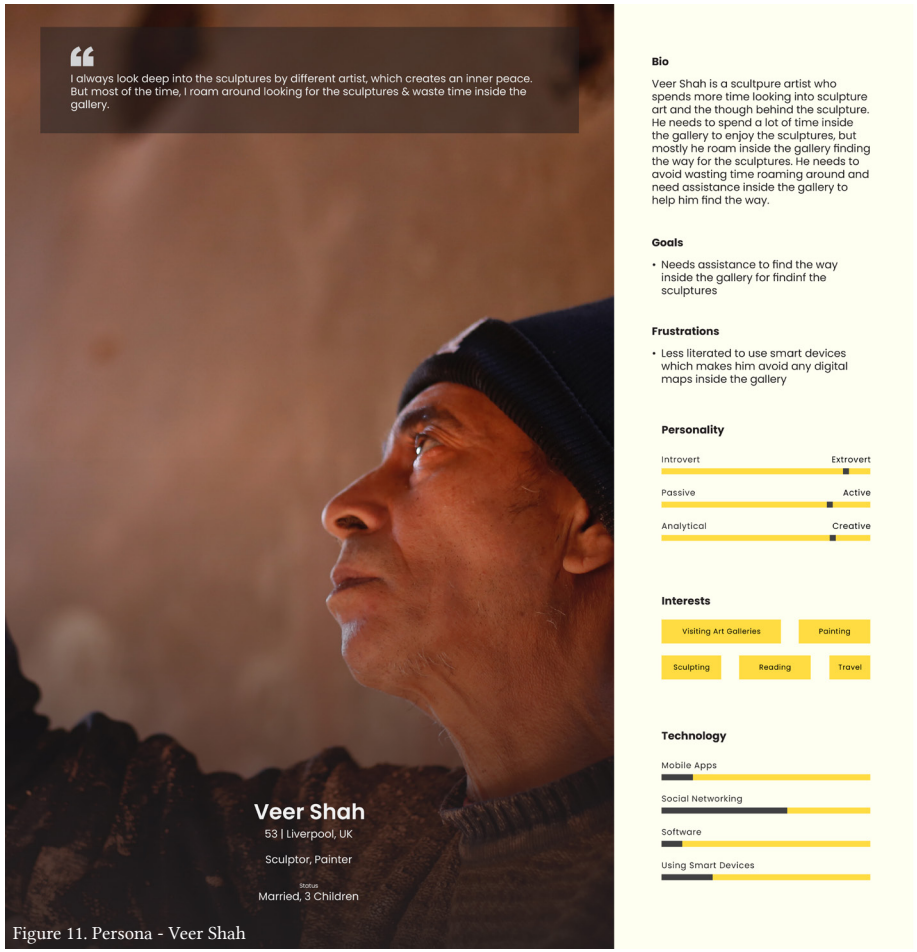

Figure 11. Persona - Veer Shah

User Journey, Storyboard & User Flow

The storyboard was made to help comprehend the user's journey from the beginning to the end of the problem. The storyboard clarified the user's dilemma and demonstrated the solution with drawings. The user's issues are depicted in the user's journey and storyboard.

According to Wikström et al. (2011), storyboards help practitioners concentrate on one component or problem at a time. As a user-centred design method, storyboards may be used to address problems by putting ourselves in the user's shoes.

As a guide, personas were used, and the optimal user flow was established that many people could readily comprehend: illiterate, educated, and non-technical. Furthermore, because many users will be using the AR app, it should not be difficult to use.

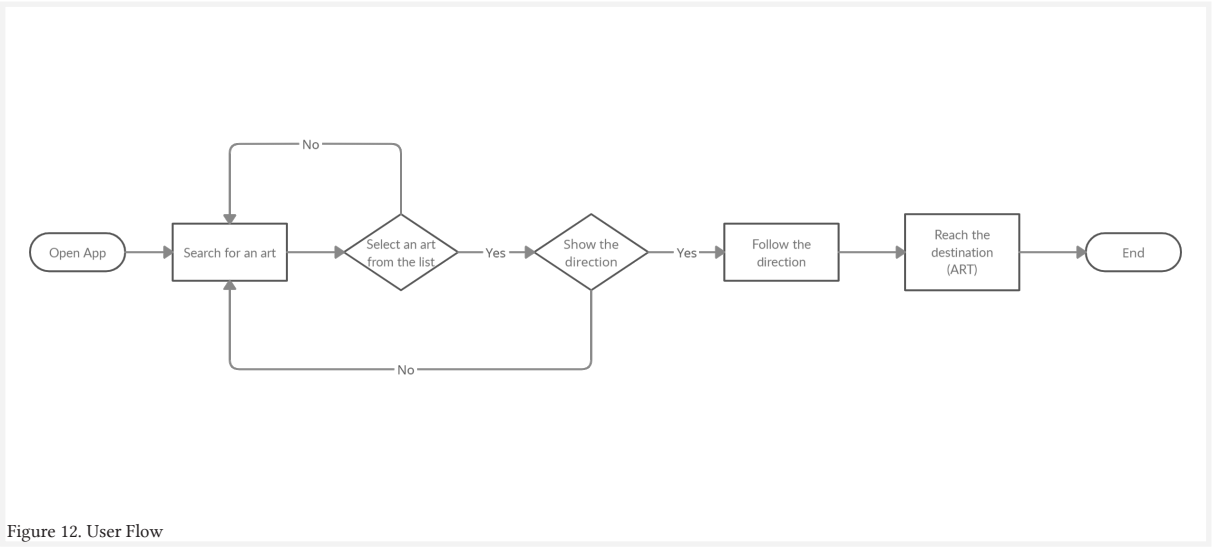

Figure 12. User Flow

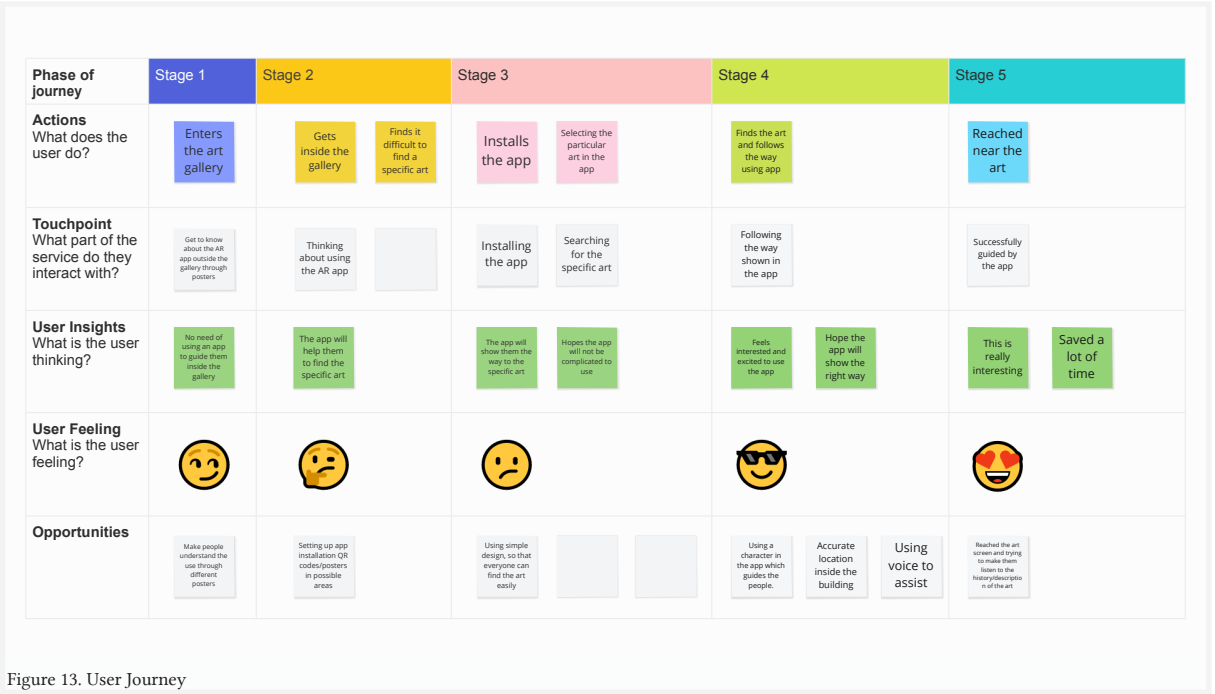

Figure 13. User Journey

Figure 14. Storyboard

The storyboard depicts a situation where a user enters a gallery and finds it difficult to navigate. Then recognizes that he or she requires assistance and discovers the arway app through the gallery's posters. The user was then intrigued that he could figure out the route using AR software.

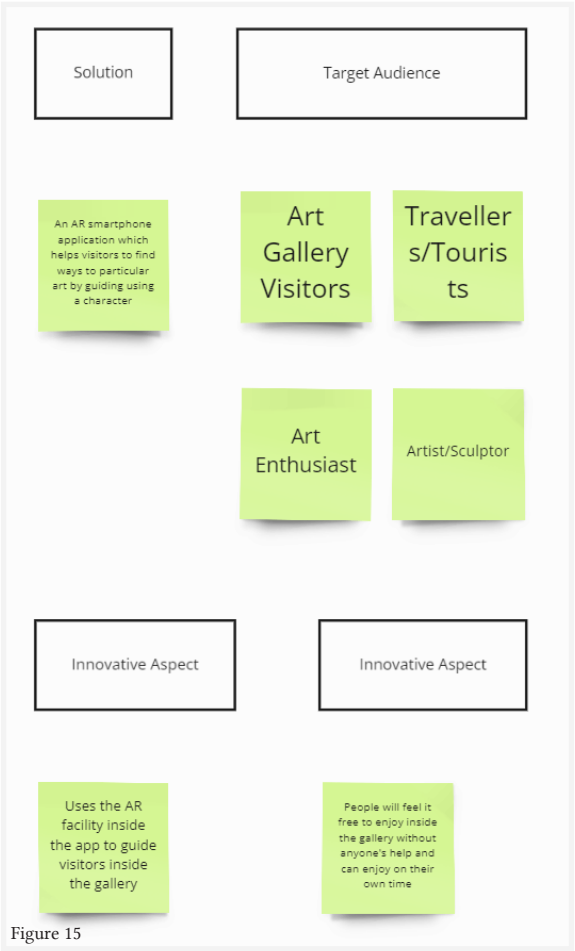

Figure 15

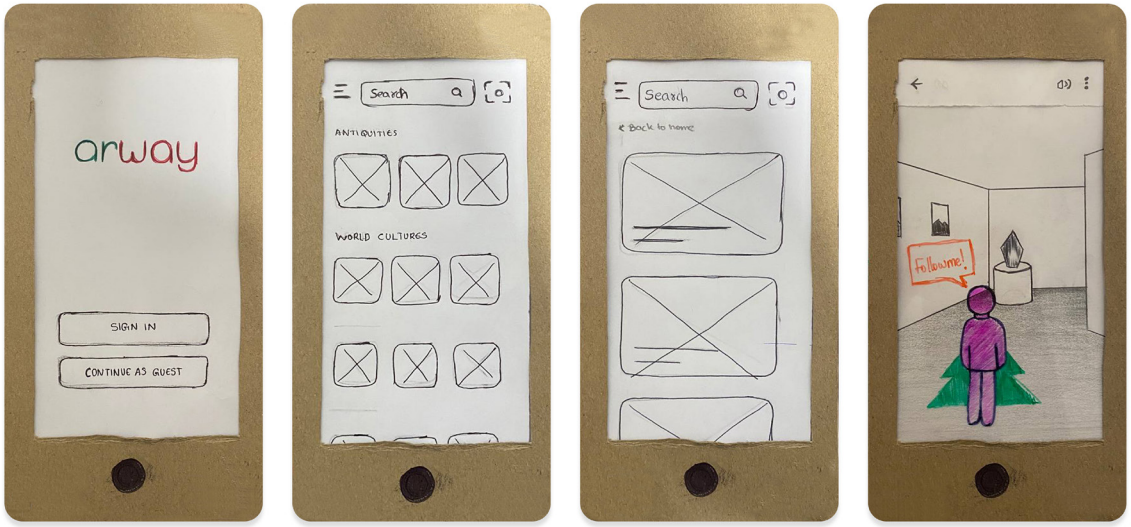

Figure 16. Wireframes

Wireframe & Low Fidelity Prototype

Personas should always be considered while creating wireframes. Because the personas produced will represent the majority of the targeted consumers. We should always develop screens that are usable by users that share the personas' traits. For the wireframe's first stage, many sketches were created. In this stage, the paper wireframe approach was applied. The best components from all of the developed wireframes were then picked as the initial stage of the wireframe to be tested.

Since this is an AR app, the user needs to be able to interpret the wireframe in a variety of different ways. Initially, the AR screen was built using an interior drawing of an art gallery, with distinct layers for the character, direction cards, and menu. The character and the direction were then sketched on an acetate sheet to give it a more AR sense. After that, the wireframes were tested with a group of users to collect their feedback.

The users were allowed to participate in a sketch test during the usability study. On an acetate sheet placed on the screen, users were instructed to sketch the adjustments they needed. Some user doodles indicated that they did not require the 'direction


Figure 17. Wireframe testing


Figure 18. Sketch Test

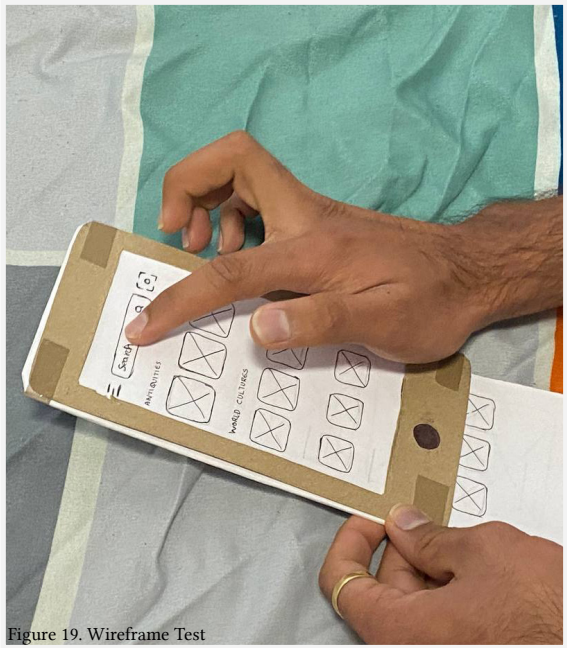

Figure 19. Wireframe Test

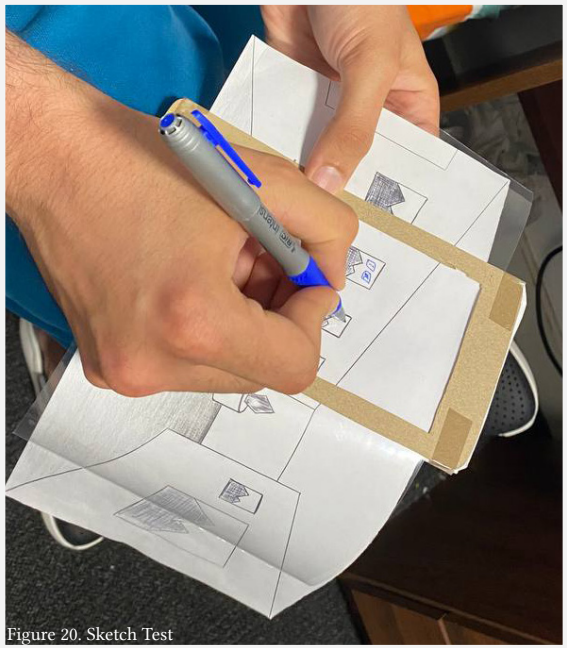

Figure 20. Sketch Test

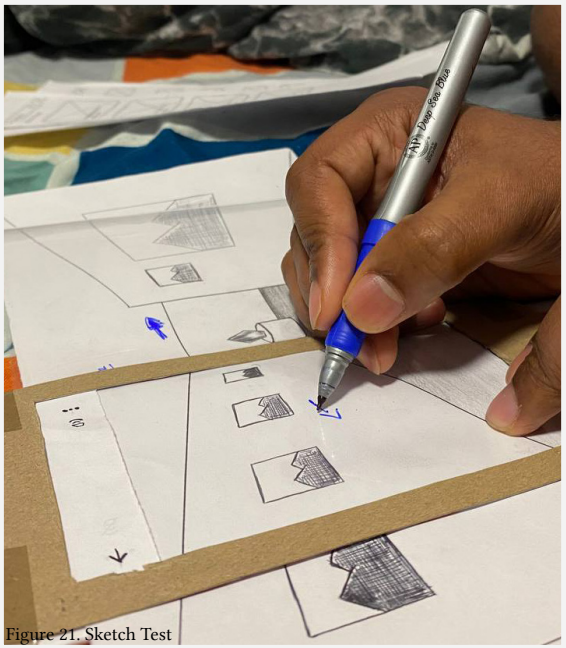

Figure 21. Sketch Test

card' on top to follow the path. Instead, they should include 'art name,' a better option. If the user moves the screen out of the direction they need to move, one of the participants proposed producing 'vibration.'

Following the usability research, low-fidelity screens were created with the improvements that needed to be added/ removed from the wireframe.

High Fidelity Prototype

The proposed improvements, i.e. the user needs, were applied after testing the low-

Figure 22. Sketch Test

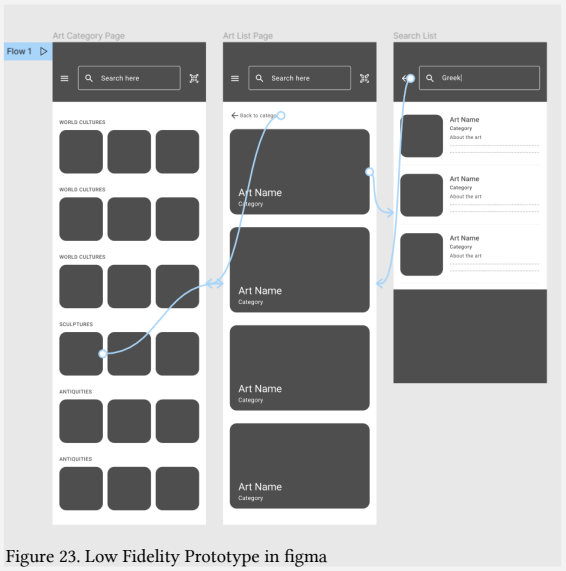

Figure 23. Low Fidelity Prototype in figma

fidelity with the users. For example, one of the participants required the user's distance from the art so that the user would not just go to the art that was far away. The app can also include a function that will allow users to add other arts to a list, called an 'ART TOUR,' so the user can experience different art of his interest along the journey, as suggested by the user.

The AR screen prototype was made with Protopie. Protopie provides the ability to prototype using a camera and video, a key feature of the AR app. Although Protopie was not utilized extensively for the project, it was used to simulate the

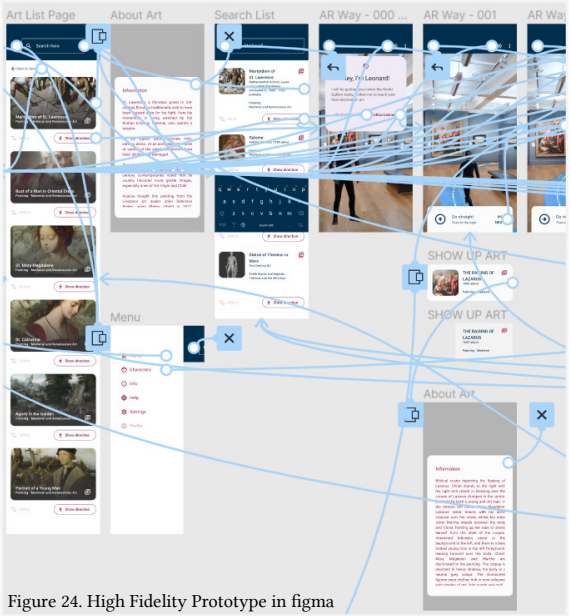

Figure 24. High Fidelity Prototype in figma

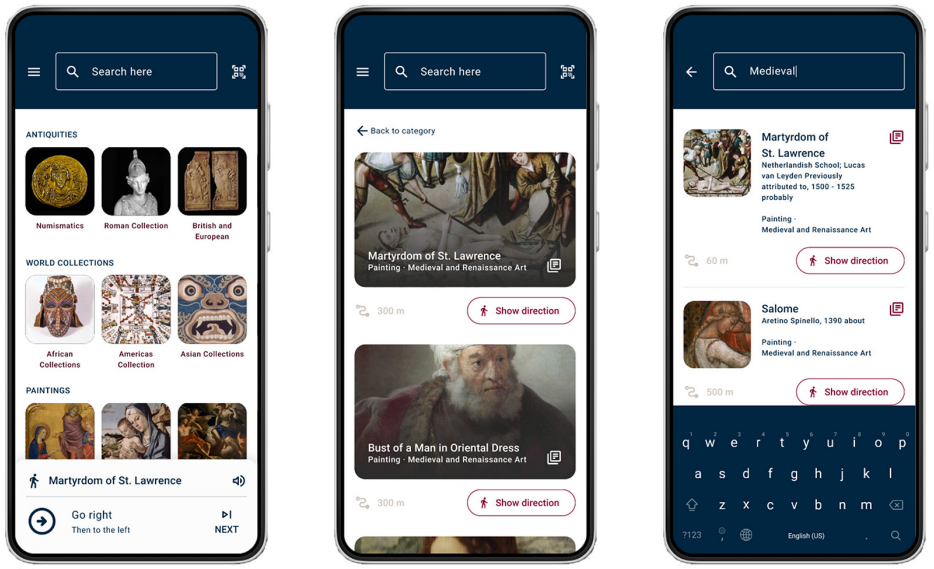

Figure 25. High Fidelity Screen

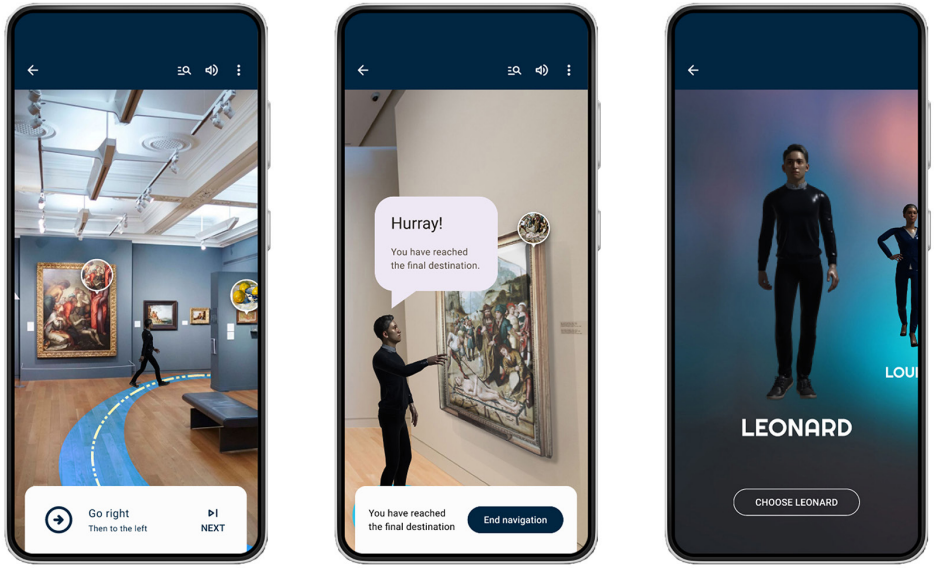

Figure 26. High Fidelity Screen

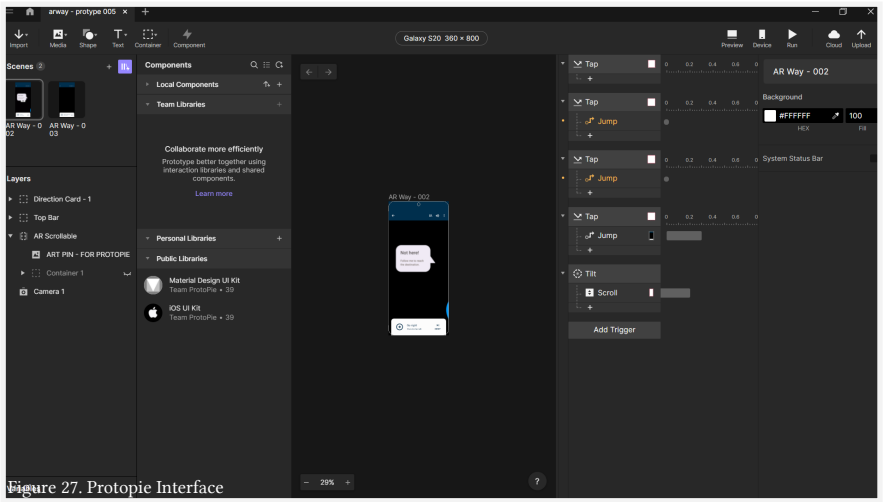

Figure 27. Protopie Interface

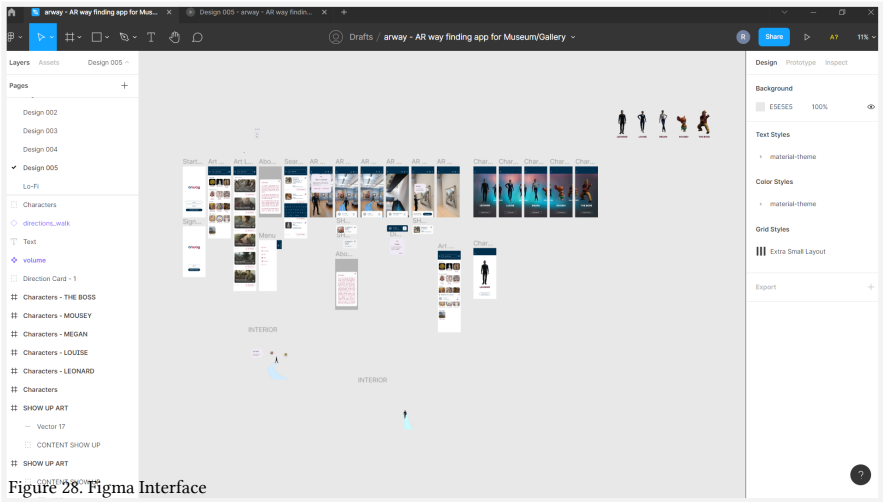

Figure 28. Figma Interface

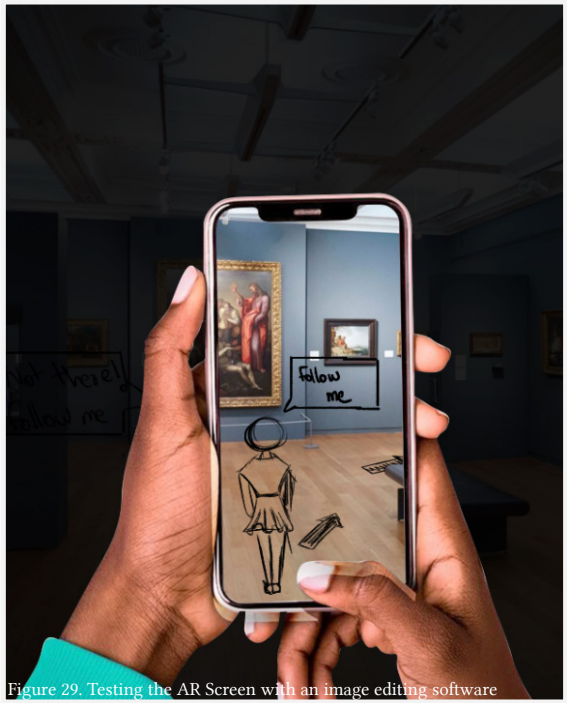

Figure 29. Testing the AR Screen with an image editing software

appearance and feel of using an AR app within a museum or gallery. The high-fidelity design developed in Figma was then used in protopine to visualize how the screen would appear in the actual world when viewed via a camera.

Usability test

The prototype was transformed from a wireframe to a high-fidelity prototype, followed by low-fidelity. Minor changes to the user flow were implemented after the usability study with the users for the wireframe to improve the user experience in the app. Wherever it was necessary, screen layouts were also modified. Potential users who had difficulty finding their way around an art gallery were interviewed one-on-one. While conducting the usability study, their pain points were considered.

Creating AR Prototype

It was not easy to create the AR prototype and demonstrate the results. The AR screen was created digitally at first, and the AR camera was designed using image editing software. A rough character was drawn for the low-fidelity prototype, and the screen was moved about to depict a human moving the phone. Next, the art gallery interior was drawn for the wireframe, and the character was placed on top of it to indicate to the users that the character was directing them. An art gallery interior image was faked on

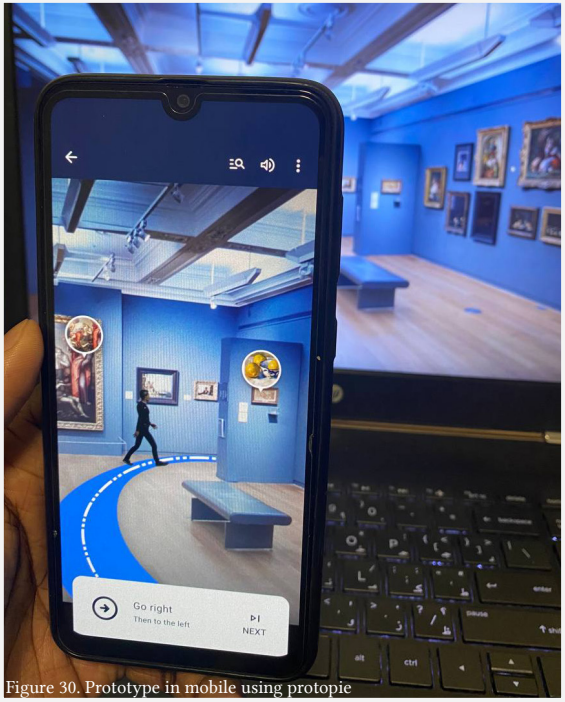

Figure 30. Prototype in mobile using protopie

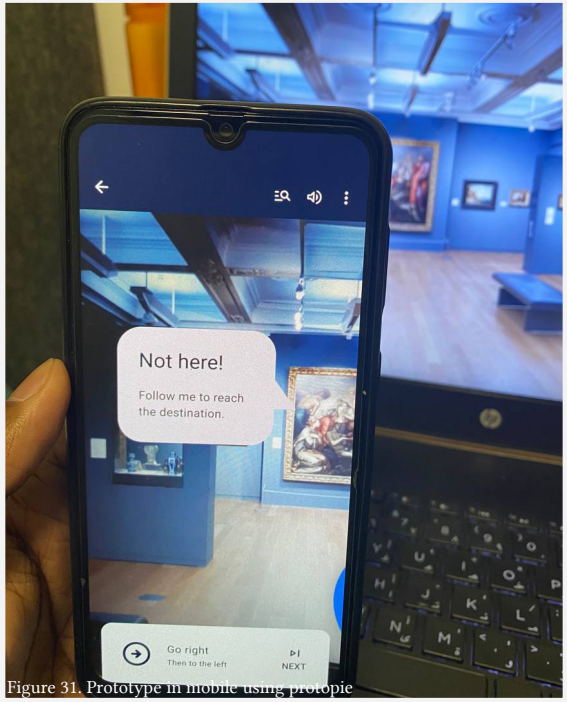

Figure 31. Prototype in mobile using protopie

the laptop screen afterwards for the high-fidelity AR prototype to acquire a sense of using the AR app. Finally, images from an art gallery were used in the Figma prototype to test with users.

For implementing the AR prototype Unity 3D, a 3d based software, was used to develop the AR screen, but it was not possible to learn and develop it within a short time. So protopie was considered to design the AR screen.

DISCUSSION

People have begun to use augmented reality (AR) for various reasons in the rapidly evolving technology environment. In a research study, Wang et al. (2022) addressed AR in the beauty product industry. AR has been used on a small to big scale in various industries, not just the beauty sector. However, in any art gallery, an augmented reality wayfinding mobile application is a must-have because people are struggling to find a way inside the gallery due to distinct reasons.

This project will address users' frustrations who find it difficult to navigate around an art gallery. Currently, galleries and museums utilize a variety of approaches to guide visitors, including kiosk desks, staff, printed maps, and more. Of course, a paper map will be useful, but a character leading and displaying the route through a mobile app would thrill and entice users to utilize the app rather than a static map.

Because there is now no available software or technology in the market, creating an AR prototype is difficult. Several applications and approaches were utilized to fabricate an AR prototype for this project. First, there must be software that can produce AR prototypes, leading to a more effective means of testing with users. It was challenging to explain each element on the AR screen and move each element when testing with users.

FUTURE WORK

Testing the AR prototype with potential users revealed that they are very interested in utilizing an AR application to prevent the pain points they experienced within the art gallery. Therefore, the prototype will be evaluated with potential users inside the gallery rather than in a controlled environment, which will allow for different

aspects of utilizing an app inside the gallery to be discovered.

The user may hear the direction while navigating inside the art gallery, which is still being developed because not everyone will want to hold their phone in front of the gallery. For disabled visitors, certain accessibility measures must be provided.

A usability study for a high-fidelity prototype will be conducted in the next phase. Disabled users will also be considered so that the app will be inclusive. A few more participants will be considered for the next study to get more insight which could provide better results.

AR PROTOTYPE

Link to AR Prototype

Figma: https://bit.ly/ARway-UXAD

Note: Use the prototype on a desktop/laptop for a better view. Using on a smartphone or other devices might avoid some screen space because of the variation in screen resolution.

Figure 32. Mockup of person using arway app inside gallery

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APPENDICES

APPENDIX A

Characters

All of the prototypes' characters were generated with Mixamo, an Adobe product that has a large library of characters and animations. The characters were animated and downloaded from Mixamo in various poses. The characters were then loaded into Blender, a 3D programme, to produce high-quality output files with various poses.

Softwares Used

Figma

Protopie

Adobe Photoshop

Adobe Illustrator

Blender

APPENDIX B

Wireframe Usability Study

Observations	A	B	C	D	E	F
Searching for art through search	0	0	1	0	1	0
Searching for art through browsing	1	1	0	1	0	1
Used 'Continue as guest'	1	1	1	1	1	1
Need a character to guide	1	0	1	1	1	1
Need direction symbols	1	1	1	1	1	1
Finds audio tour app useful	1	1	1	0	1	1
Finds audio tour app not useful	0	0	0	1	0	0
Speaks in positive tone	1	0	1	0	1	0
Speaks in indifferent tone	0	1	0	0	0	0
Speaks in frustrated tone	0	0	0	1	0	0
Speaks in annoyed or impatient tone	0	0	0	0	0	0
Speaks in confident tone	0	0	0	0	0	1