



Revolutionizing Location Based Experiences: Apps for Immersive  
Exploration of Historical Sites and More.

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## **Declaration**

I, Oskar Lenartowicz, herewith declare that I have produced this paper without the prohibited assistance of third parties and without making use of aids other than those specified; notions taken over directly or indirectly from other sources have been identified as such. This paper has not previously been presented in identical or similar form to any other Irish or foreign examination board. The thesis work was conducted from year to year under the supervision of Dr. Mark Marshall at the University of Limerick.

## Chapter 1: About the Project

For this project, my goal was to create a game changing (revolutionizing) way that Virtual and Augmented reality can be put to practice. Whether this be at home by hobbyists who just purchased an Augmented or Virtual reality headset, or at secondary schools in Ireland, where subjects like computer science are just becoming more common (since a pilot scheme in 2018), or even tourists who are trying to find and decide on their next travel location.

In short, my plan to do this, consists of creating an easily accessible application, that can support anyone who would like to visit or experience the thrill of a historical site or landmark through augmented reality. Especially since users like students nowadays may have had the opportunity to learn from home during the COVID 19 pandemic, or others who were unable to travel during that time and after.

It would be classified as easily accessible as there are “6.84 Billion smartphones globally” and “As of 2024, the number of smartphone users is predicted to reach 7.1 billion” people who will own a smartphone. While 70.16% Devices are running the Android operating system (‘How Many People Own Smartphones? (2024-2029)’ 2024).

Out of those users, 5.35 billion people can be classified as internet users worldwide. (Pelchen 2024)

To remind us as well, the world population as of 15<sup>th</sup> November 2022, reached 8 billion people. (Nations 2024)

Devices supported would Android 7.0 or above due to Unity’s / Google AR CORE minimum API Level requirements. These requirements state for “AR Required app, specify Android 7.0 ‘Nougat’ (API Level 24) or higher.” (‘Getting started with AR Foundation | ARCore’ 2024)

This means that roughly, only from android users, ranging from Android 4.4 to 13, 96.3% of those users are on Android 7 API, and above (Rahman, Mishaal 2023). Meaning they would be able to access this application without any issues.

This would allow a wide range of audiences to be exposed to this application.

There are many different use case where this application could be put to use. For example underfunded schools in Ireland, where representatives have been noted stating “We need sufficient funds to educate our children in a warm and safe environment”. With such needs, school trips or resources could be limited. (“Crisis level”: Schools “can no longer rely on bailouts from bank of mum and dad” 2024)

Although when linking back to the user statistics of smartphones usage, under “Less than high-school” Education level, 57% have smartphone only ownership. Giving an opportunity to implement this application as an additional learning tool. (‘How Many People Own Smartphones? (2024-2029)’ 2024)

Another example could be users from home with total household savings in Ireland falling to 16.8bn euro in 2024 from 17.6bn euro in 2023 (Caden 2024), or those time restricted, would be able to simply launch an app on their phone and enhance their learning experience or explore their adventurous side by visiting landmarks and historical sites that they might not be able to visit otherwise.

A project goal is to make the application immersive through interactivity. There will be interactive features implemented in the application which are location dependant.

For example, simply If location A if visited, the experience will be location A involved only, no location B questions will appear. Each selection is specifically made.

Some of the interactive features planned for the users include challenges, short quizzes, fun puzzles, optional narrators for accessibility, or approachable and interactive historical characters.

To give a better understanding of this projects outline, below you will find the reasoning and motivation explained alongside the aims for this project:

#### Goal One:

- To create a better alternative to an exhausting google search (shorten search and information gathering time)
- Why?:
  - The average time spent searching online for information, for example on google, on average takes 2.5 hours per day, “which adds up to 8.8 hours per week or more than one full workday” while another study, found users to “spend up to 1.8 hours per day — or 9.3 hours per week — searching and gathering information.” (‘How much time do people spend searching for information? – Unleash Community’ 2024)
- Solution:
  - An application with Technical, historical information, with additional clearly labelled community feedback found all in one place.

#### Goal Two:

- Providing accurate and trustworthy information (misleading online information)
- Why?:
  - Information found online is not always accurate, honest or can be relied on. “information published may not always be credible or accurate, as anyone could have written it.” (‘Evaluating the quality of online information - University of Wollongong – UOW’ 2024)
- Solution:
  - Technical Writers to create main historical content for application. Assuring users all information is trustworthy and accurate. Alongside this providing a community submitted option, that will be reviewed/fact checked and further labelled as community addition.
  - The community factor will be added as 49% of consumers trust online reviews as much as personal recommendation” (Zhou 2022)

#### Goal Three:

- Engage users with Interactive Content Development:
- Why:
  - Attention span / retention reduction within users, for example TikTok users in recent studies have shown that the “endless stream of 15-to-30-second-long videos slashes attention span like no other type of media” (Sijercic 2023).
- Solution:
  - Quizzes, Challenges, Trivia, Voiced Tour guide.
  - These options would be added to each separate level to create a more interactive experience where you are able to choose your own path in exploring the augmented world around you. “These in-game experiences, challenges and rewards based on individual behaviour, ‘are’ enhancing user satisfaction”. (‘Facing the Top 3 Challenges with Creative Solutions: User Retention, Purchases, and User Acquisition - SLAB’ 2024)

#### Goal Four:

- An Immersive experience:
- Why:
  - To achieve over all goal of “the creation of a digital environment that completely immerses the user in a sensory experience”. Which ultimately will allow the users to create memorable connections with the brand, increase user engagement and generate intense emotions. (‘Discover the Advantages of Immersive Experience | Nivelics’ 2024)
- Solution:

- Augmented reality scenes that offer a free roam experience through out the virtual world. Essentially transporting the user to a different reality. The Camera using its ability to showcase background or fully cover and be in a virtual world. Applicable to both small artifact displays, and large area showcases.

#### Goal Five:

- Digital Preservation of history:
- Why:
  - To help prevent generational data loss of cultural heritage sites and others. It can be stored in multiple formats and or locations, which can make it easier and less likely that all copies of the data will be lost or destroyed. Ultimately making it easier to archive data for the future. ('How Digital Preservation Aims to Keep Data Accessible and Usable Over Time' 2024)
- Solution:
  - Through 3D scanning of objects, and other photogrammetry methods, preserve the objects and heritage sites with ease. Technical writing creating factual compact information appended within / alongside the 3D models / objects. Again, stored in multiple locations and throughout mobile phones with the application downloaded.

#### Goal Six:

- Enhance pre-travel research & sustainable tourism:
- Why:
  - Researching travel destinations can be a very long process with multiple sites providing biased answers. The average users pre planning a trip spend 20-30 hours through this process. All while "deciding a location, activities, and potentially hotel stay." (Jain 2018)
- Solution:
  - All in one application for finding new locations and activities to visit and stay at.

Regardless of who would choose to use this application, the end goal is to create a more immersive, sustainable, sophisticated and captivating experience.

Alongside this, through User Research in this project, I was able to outline key information. The users' needs and wants, experiences and expectations. I was able to

put this data to use to begin developing iterations of my project, starting with low fidelity prototypes to get the functionality idea of the application correct, to the final high-fidelity prototypes. By creating user story boards, I was able to create a user flow for the application and personas allowed me to visualise the appearance of the application. Testing of the Low fidelity prototypes allowed me to understand user feedback and develop a more user-friendly product. All which is later showcased in this report in more detail.

## Chapter 2: Introduction

My inspiration for this project was brought to me by the joy I used to experience when travelling and exploring new places. It brought a world of seemingly endless possibilities and unknowns yet to be discovered. My inspiration was created by various factors.

Before deciding on travelling to any location, I research where to visit, what is available and other details about the locations.

When trying to find any detailed information, I saw a common trend of hotel websites only recommending what's closest and best towards their location. Attempting to encourage those traveling to visit their location specially. As well, they would only recommend the most popular attractions. No less popular sites would be displayed or shown.

Any ratings on their sites, would refer to the stay location, not the landmarks specifically, so knowing what to expect was difficult.

Also, Google would have information spread across their results page with different sources stating different information about travel destinations making my own research results mixed.

When I would finally decide on a travel destination, my plan would be to visit all found landmarks or sights to see.

Although, it was difficult to always admire the locations due to the time it took to push through the cues and congestion, to focus on what was written or being said by a guide, if any.

It always left less time for moments of exploration and admiration, instead it brought ques (this may be okay if it is a tour guide!).

This issue has made me consider; how can we improve our time spent at historical sites using technology?

Through that question, I have realised that it would be beneficial to create an application which using augmented reality (and virtual reality where applies) allows us, the users, to learn more about historical sites, or landmarks prior to visiting them. Making us more informed and giving us time to enjoy them!

## Chapter 3: Literature

### AR VR Hardware

What is Augmented Reality? In short it is a device which allows the user to use a camera, on their phone for example, and display virtual objects on their screen, within that cameras space.

Although, Virtual and augmented reality are not a recent discovery. The first found adaption of a virtual / augmented reality can be found as far back as 1957 with a “Sensorama Simulator” allowing the users to view 3D Images and enhanced by physical feedback such as vibrations, wind, and audio as well as a system for reproducing scents (Arena *et al.* 2022)

But to have a better understanding of how augmented Reality works and what it is, it is best to go in depth about its technology.

Augmented Reality devices and technologies function on two main bases. The hardware and software side. The hardware side being explained below.

Augmented reality hardware relies on its sensors such as cameras to analyse its surroundings and pass them through. The passthrough image is “designed to add digital elements over real-world views with limited interaction” (Corporation 2024) meaning the user will be able to visualize these but not fully interact dependant on the model type.

Sensors that also get used are typically accelerometers to understand where the user is currently moving their head and understand their forwards, backward, left or right positions.

A gyroscope of the device can be used as well to calculate where the device is currently rotated, this could be used for any sort of head tilting to mitigate motion sickness, it “measures and maintains orientation” (Islam 2019)

Depth sensors would also be a feature on certain AR devices, dependant on what the device actually is. To explain a little in-depth, it is a “form of three-dimensional (3D) range finder, which means they acquire multi-point distance information across a wide Field-of-View (FoV)” (Admin, Terabee 2019). To simply put it, these are sensors for calculating the distance between the headset and the user.

Lastly, audio is a key identified sense that is used for augmented and virtual reality, it helps users be more immersed in their newfound world. Each person using such technology, where appropriate “should be able to tell where a sound is coming from in 3D space based on their own position” (Makarov 2024).

The types of headsets available have a wide range. These account for both Virtual reality and Augmented Reality. These devices include smartphones, tablets, Virtual and Augmented reality headsets, such as the oculus quest 3, or smart glasses for augmented reality (StreakByte 2023).

### **An Augmented Reality Museum Guide**

Throughout the years, technology has been evolving with AR being found in the automotive industry with such devices as a Heads up display, a drivers aid for seeing their speed, navigations, or any other crucial information displayed on their windscreen instead of using an instrument cluster making the driver feel more connected and aware of their surroundings by simply keeping their head-up, as per the name (Heikki Harju 2023)

Another popular use-case was Pokémon Go, a mobile app/game were creatures “are created and overlaid into the physical world” and currently has over a billion downloads worldwide. Simply by using a phones camera, the GPS in a smartphone for locating the user to capture the “Pokémon”. (Kerdvibulvech 2021:457)

An example of everyday AR use, includes applications such as Instagram, snapchat, tiktok or other social medias which essentially use augmented reality to create “filters”,

objects displayed over a real world object such as a face filer/mask displayed over a person when they take a photo, with brands using them for their marketing purposes as well. ('How AR Filter Agencies on TikTok, Instagram, and Snapchat Make Brands Spark - Byten21' 2024)

In museums such as the “The national museum of Singapore” or “The national Gallery” (McIntyre 2023) are places that use this kind of technology to display interactive artifacts that are either no longer in good condition or to make a more immersive experience where they can “create 3D models of figures from the past to narrate displays”, potentially even allowing them to reach remote audiences. (Livdeo 2023)

Another good use case of AR is within industrial settings, for Upskilling workers, Product design and assembly, warehouse management and logistics, were devices like AR could be used for “efficient and accurate manufacturing” in their industries. ('5 Ways to Use Augmented Reality in Manufacturing in 2023' 2024)

## **Searching Online**

With 85% of users online worrying about disinformation, it is not uncommon for “fake news” to be appearing on google. (Henley and correspondent 2023) With 5.9million searcher per minute on google alone, there are scams or a bound spread of misinformation across the internet ('34 Eye-Opening Google Search Statistics for 2024' 2024).

To stumble upon such an issue when looking for travel destinations can be demotivating and stressful additionally to the time it may take to find a suitable location.

The application will aim to battle these issues through using historians and technical writers who will be able to moderate content and create precise information's for users to stay reassured. Although it all “depends on the writer's conceptual mastery of the subject and its vocabulary, as well as on his or her ability to analyze and shape data with a minimum of distortion” ('Accuracy' 2024)

## **Future expected for Virtual reality**

VR and AR are constantly evolving fields with new technologies such as new more advanced cameras, sensors or faster processor being available allowing us to have more powerful headsets or eventually allowing our phones to be the main device for

virtual and augmented reality experiences. These technologies make it easier for projects such as this to be more accessible, for example, in the Jerusalem's Visitor's Bureau, users are able to immerse themselves within a Virtual reality environment and witness how developed the city was 5000 years ago. ('What is the Future of Virtual and Augmented Reality Technology? | Jabil' 2024)

## **Chapter 4: Methodology**

### **Competitor Benchmark:**

- AR History – 3D Monuments: by Boyan Penev, available on the apple store  
Features: IOS Only. 3 Locations, Scale options for models. Stated High resolution models.
- Google Arts and Culture  
Features: Images and videos of artwork/ artefacts. Direct digital preservation from all available sources, interactive games (Puzzles, crosswords...)
- Google Street View  
Features: See locations in 360 degree panoramic view. Directly relates to a map. No other information except addresses provided.
- Google Cardboard  
Features: Discontinued budget headset. For mobile phones. Virtual reality at cheap cost.
- Riftcat AR / VR  
Features: Augmented Reality / Virtual Reality at a low cost. Any game to become and augmented or virtual reality app displayed at your phone screen.
- Pokémon Go  
Features: Augmented reality app, catch virtual creatures by travelling in real time, in the real world. All location based. Map integrated. Requires phone.
- Time Travel VR Tour  
Features: In person tour with virtual reality headset. Only online website showcasing information.

### **Overall Project Objectives (Extra's to previously mentioned Aims):**

- Develop intuitive and user-friendly interface.

- Create a database of historical sites, popular and lesser known or culturally significant.
- Implement interactive features for app. Quizzes, Virtual tours, trivia, time traveling (envisioning items as in their original state, reconstructed).
- Have Technical writers, with historians, and other cultural experts create content and approve accuracy of information that will be provided in the application.

### **Project Scope:**

#### In-scope

- Develop an Augmented reality application for mobile phones, focusing on the element of providing historical and current information.
- Visualizing the locations through augmented reality, allowing for users to see current state, and original state if available.
- Creating a database of historical landmarks, cultural sites, or any heritage from around the world. Allowing for a large digital preservation of significant history.
- Adding in interactive elements into the application, quizzes, tour guides, information, specific item visualization or voiced guides for accessibility for better engagement.
- Design easy user interface for users to easily find their way around the application.
- Enable friend / follower features for easier sharing of recommended locations.
- Account mode for personalized content, based on activity. Guest mode for non personalized content.
- Rating system for community popularity rankings.
- Location features for users to see what is nearby them (within category section)
- Community added information / locations. Only after validation of authenticity.
- Testing for bugs and quality assurance for user friendly experience.
- User feedback to ensure positive experience.

#### Out of scope:

- Booking travel accommodation or transportation through application
- Providing real time information regarding weather at locations, or crowd levels in area
- Ticket purchasing through application for location entry / local fees.
- Creation and the sale of physical items related to the application. For example, merchandise or souvenirs.
- Offer trip Plan's, allowing the user to plan through the application all points of their trip within the application.

- Guaranteeing the same availability and freedom of exploring at the historical sites or locations in comparison to the application which allows complete freedom of exploration.

### **Project Justification:**

This project is aiming to develop an augmented reality application, for mobile devices, focused on improving both the pre-travelling experience and learning experience for those who are interested in traveling or historical information.

The reason this project is important currently is due to several reasons:

Research shows that users pre planning their travels need around 20-30 hours for their googling and choosing a location to visit, their available activities and tourist attractions. This application would be able to shorten that research time through having available locations and their attractions right in one place. (Jain 2018)

It is encouraging those traveling to learn about the historical sites available before visiting them. Promoting sustainable tourism practices by providing information about certain sites fragility, or where we can visit within, or other helpful tips. Additionally, it will allow the users to make an informed decision whether they would like to travel to that location by seeing it in augmented reality first. Which means it can also support the tourism industry by promoting historical sites and attracting users to locations they may not have been interested in visiting before.

By utilizing Augmented reality for this application, users will be able to interact with digital content, taken from the real world like never before. Taking traditional ways of learning and searching for educational or fun information, presented in one application.

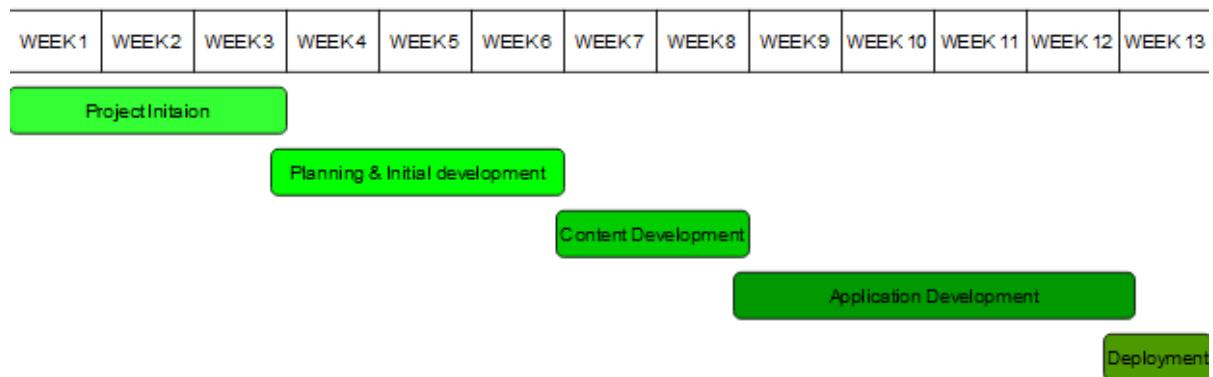
The digitization of all historical elements will create a large database of historical items, meaning the digital preservation of all significant items can be held for the foreseeable future.

### **Project Timeline:**

- Project Initiation (Week 1-3)
  - Scope and requirements Definition
  - Initial research of technologies and competitors
- Planning & Initial Development Phase (Week 3-6)
  - Plan timelines.

- Create wireframes.
- User Surveying
- Storyboarding, User Flows.
- Create data for locations to be included in prototype.
- Create assets (Images, buttons, colour palette)
- Low fidelity prototype development
- User testing of low fidelity prototype
- Content Development (Week 6-8)
  - Applying found research to improvement of prototype.
  - Location information sourcing
  - 3D model sourcing and creation
- Application Development (Week 8-12)
  - Unity development of high fidelity prototype
    - Implement features in scope.
    - Populate app with content.
    - Application Usability and functionality testing
  - User testing
  - Final Adjustments
- Deployment of application (Week 12-13)
  - Final Testing of functionality and usability.

#### Basic Visualization / Gantt chart of project timeline



For the User testing aspect, I have interviewed 12 Users. This would ensure that I have a diverse enough demographic presented, and enough to capture a good range of feedback for the application. Ultimately to improve the overall user experience. The main goal of the user research and testing was to get an in-depth understanding of individual perspectives and allow for a better understanding of their needs and wants and overall app improvement over time.

Specifically the process was firstly user Survey, User Interviews followed with User testing.

## **Chapter 5: User Research**

All user interviews are attached below in appendices.

Participants were fond of history exploration regardless their position. On multiple occasions what was mentioned were time restraints, difficulties of deciding on travel locations and the longevity of the research process.

9 out of 12 users surveyed were keen on exploration and interested in technology use.

2 users were familiar with the use of augmented reality or have not used it for historical purposes.

In general, the majority of participants felt that technology was the way to go for digital preservation and that preservation is a key factor in history.

Participants were aware of sustainability measures and happy to learn more.

Educational books were of support, but online results were found to be untrustworthy.

Art, museums, and architecture were all liked by participants.

Local heritage is counted as important and worth exploring.

Lack of time and overcrowding were biggest issues during travels occurring 3 and 4 times, with unsuitable whether only occurring twice and none 3 times.

## **Chapter 6: Design**

What was considered for this design?

Law of proximity, all elements that are close to each other can be perceived as related.

Law of continuity, elements arranged in a line to be perceived as related.

Colour contrast for improved readability.

Fitts law in menus for search bars and buttons. Efficient movement.

The colour palette created was to resemble a vintage look for historical value, and green for a natural colour while brown colours for an aging look.

To begin my Design, I have created User Personas from my key research findings. These have allowed me to make more realistic predictions of what kind of users may use this application, what key needs they have identified for their own lifestyles or wants and or frustrations to further better the product development cycle.

The personas are created using Canva.

## User Personas:

### Persona One:

#### Jim Bracken



Persona 1  
Age : 18  
Location : Cork, Ireland

##### Hobbies

- Photography
- Gaming
- YouTube
- Exploring
- Traveling

##### Short Description

- A 18 year old who just graduated from Secondary school.
- Enjoys exploring and traveling where possible.
- Spends most of his time on the computer talking to his friends.
- Looking for a job.

##### Needs

Jamie needs to keep himself occupied where possible, is not able to sit and do nothing  
Jamie needs to explore once in a while to have the sense of adventure

##### Wants

Jamie wants new ways of entertaining himself  
Jamie would like to be more involved when he plays games, not just using a keyboard and mouse all the time.

##### Frustrations

Jamie currently does not have a job after graduating from secondary school and is not sure what he would like to do now.  
He does not have enough money to travel around the world although it would be his dream  
The weather does not always allow him to explore outside  
There are not more new attractions in his area.

### Persona Two:

#### Joe Griffin



Persona 2  
Age : 32  
Location : Limerick

##### Hobbies

- Photography
- Sports
- Music
- Art (Painting)
- Hiking

##### Short Description

A 32-year-old male who in his spare time enjoys hiking. His trips always inspire him to be more adventurous, take photos and create art to share with the world. Music is a way of relaxation and experiencing different cultures to him.

##### Needs

Joe needs time to hike or relax to stay sane, otherwise he gets frustrated due to lack of adventures  
Joe needs to plan everything before going on a trip, otherwise he will not proceed with it.

##### Wants

Joe wants an easier way of exploring new areas before going to them.  
Joe wants to interact with anything on this trips, whether it be with another person or a wall that holds a story.

##### Frustrations

Joe gets frustrated when he cannot travel or go on an adventure, it is his way of relaxing and getting inspired.  
Spontaneuos is not his middle name, planning is key and he cannot always find a good place with concise information about his traveling destinations online.

## Persona Three:

### Bob Kennedy



Persona 3  
Age : 46  
Location : Wicklow

#### Hobbies

- DIY Projects
- Fitness
- Podcasts
- Exploring different cultures

#### Short Description

A 46-year-old man who is a work addict and perfectionist. Whether it be work at home in his garage or work itself. Sitting down is not an option. Fitness is key for keeping active and a great way to get some energy out. Podcasts allow him to meditate, learn new fun facts or just listen in to interesting topics. Exploring different cultures is great for someone like Bob who enjoys learning new things each day.

#### Needs

Bob needs things to do each day, he cannot sit for longer than a few minutes without doing something. Bob also needs to keep his passion for work active, it is what keeps him motivated each day.

#### Wants

Bob wants to learn more about different cultures and their area, but find that free time is hard to come by in his schedule. Bob wants better ways of finding new attractions, podcasts give him good ideas but they can be hard to come by.

#### Frustrations

Bob gets frustrated when something lacks detail in its execution. Everything has to be described perfectly and show the detail. Ads are not Bob's favorite, he does not mind them being subtle, but if they distract from any experience he finds them frustrating.

## Persona Four:

### Mary Fitz



Persona 4  
Age : 42  
Location : Galway

#### Hobbies

- Gardening
- Meditation and Yoga
- Teacher
- Knitting
- Watching Movies

#### Short Description

Mary is a secondary school geography teacher who values a nice and up-kept garden. Knitting is her hobby when cold weather comes about. Meditation helps her keep on top of everything and plan for her lessons to be more interesting for pupils. When there's a chance a good movie can make the day better too.

#### Needs

Needs time to plan lessons for her class to fully engage students

#### Wants

Wants to keep a healthy work - life balance and enjoy her hobbies

#### Frustrations

Students who do not participate in class or ignore the content taught

## Persona Five:

### Jane Hadaway



Persona 5  
Age : 28  
Location : Dublin

#### Hobbies

- Graphic Design
- Fitness
- Movies
- Going out with Friends
- Observing different cultures architectures.

#### Short Description

A joyful lady who is passionate about graphic design, likes to stay healthy through exercising. Enticing movies are always great regardless of genre. Going out with friends is always fun as they get to learn something new while having fun. A interest for her has always been exploring architectures of different cultures.

#### Needs

Needs to stay socialized or will feel lonely after time  
Needs to stay on top as graphic designer through her inspirations at work

#### Wants

Wants to always stay motivated to design  
Explore new architectures without the stress of travelling  
Have fun and learn more about her friends

#### Frustrations

Can't find the time to do everything she enjoys, has to sacrifice some things for others

## Persona Six:

### Hillary Orange



Persona 6  
Age : 19  
Location : Cork

#### Hobbies

- Social Media - TikTok Content Creator
- DIY Crafts
- Makeup
- Reviews on trips, hotels and places visited

#### Short Description

Creates variety of content for her peers, makeup tutorials, DIY crafts and any travels documented. Always looking for new ways to entertain her followers.

#### Needs

Needs to create content to upkeep followers satisfaction

#### Wants

To stay entertaining and fresh with her content

#### Frustrations

Struggles finding new ways of being creative or where to travel. Worries too much.

These, alongside my user Interviews really helped me in understanding what my users require, what they may be looking for in such an application and what realistically I would be able to supply in alignment with my scope.

Alongside user personas, to better understand the user journey, I have created user storyboards which allow further improvement and understanding of user's needs, wants and constraints.

## User Story Boards:

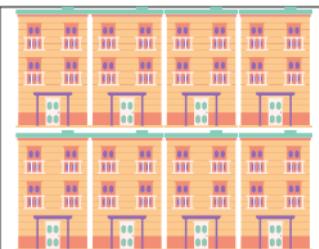
### Storyboard One:

#### STORYBOARD : JIM'S ADVENTURE



##### JIM IS ALWAYS TRAVELING

he loves exploring wherever the road takes him! Endless trips make him happiest.



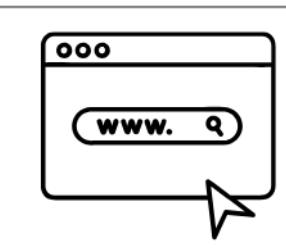
##### BUT

To Jim it all was too well known, nothing he saw took his breath anymore as it all became familiar.



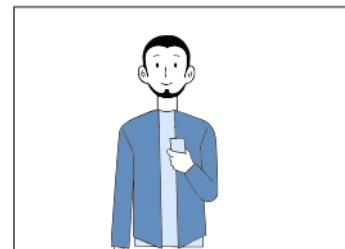
##### SOON

Jim started to wonder what new areas could he launch to explore



##### SO

Without thinking about it twice, Jim went to the internet for help. Where he found out he can explore the world right though his phone!



##### THEN

Jim started exploring landmarks around him that he never new existed. He learned more about them and got even more excited before seeing them in person! New plans have been made.

### Storyboard Two:

#### STORYBOARD : JIM & BOB'S ADVENTURE



##### JIM

Was sitting looking for things to do on the weekend with Bob



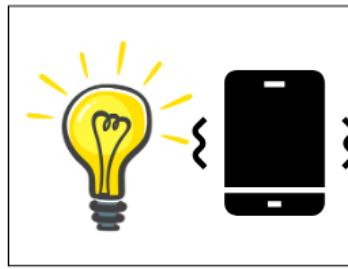
##### BOB

Wanted to be help and look for the closest option to suit both of their tight schedules.



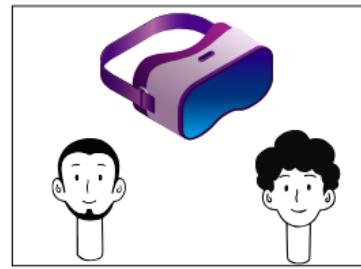
##### BUT

Both Jim and Bob struggled to find anything that wouldn't take hours to travel to, or take too much time to complete.



##### SO

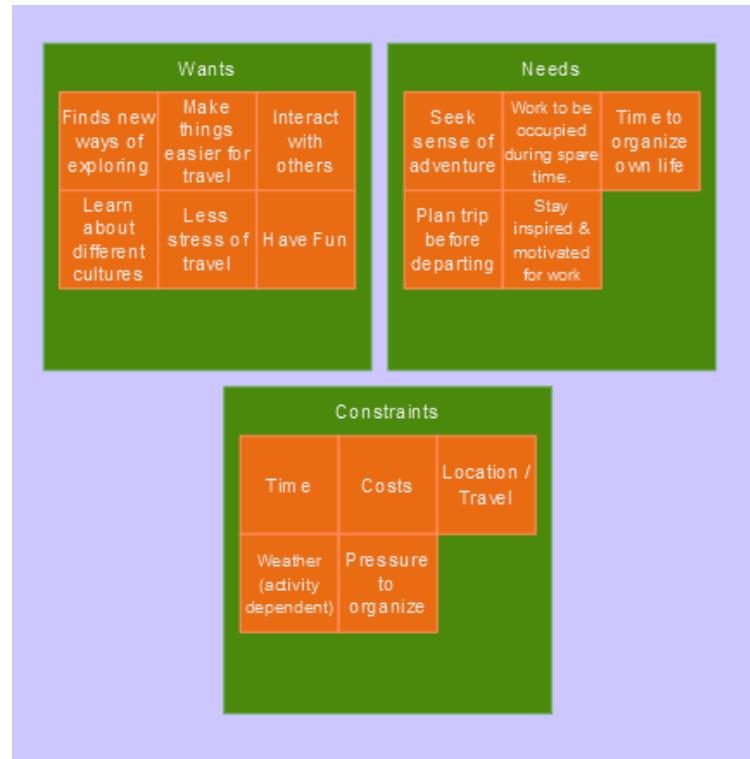
both decided on trying a different way of doing things, this time by using technology



##### THEN

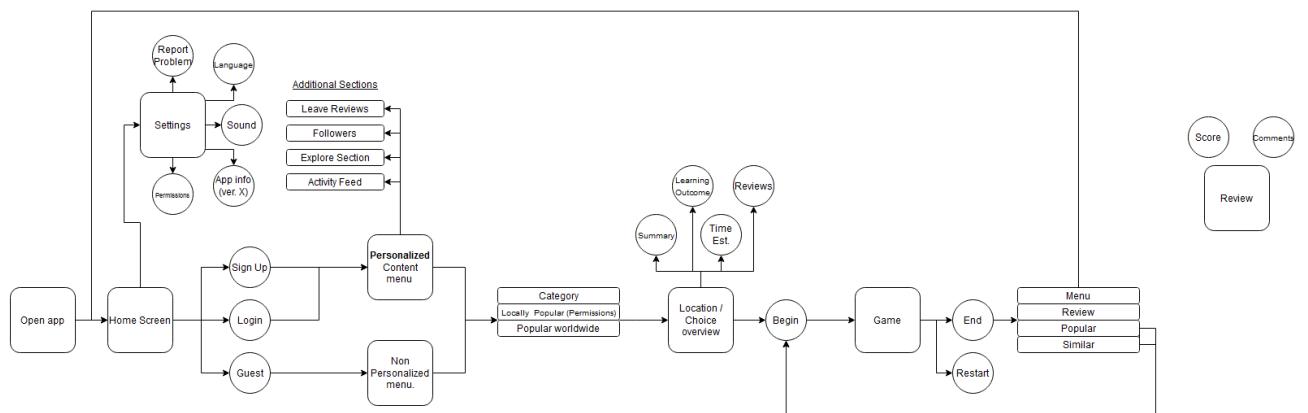
Jim and Bob settled on using their phones for Augmented reality and have fun in the real world with their phones. They now could explore limitless!

After completing the storyboards, I created a basic Affinity Map to outline some of wants, needs and constraints on their own:



From this process I began creating a mock app flow:

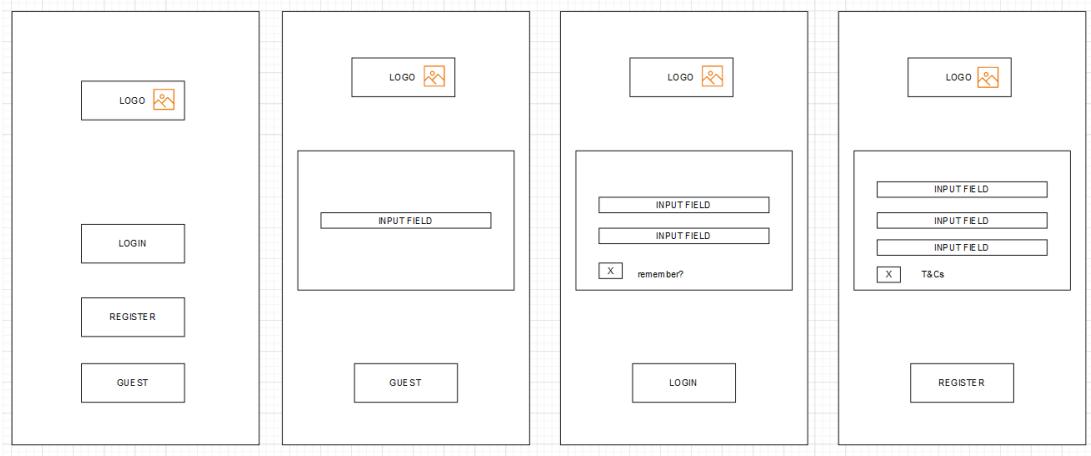
A Basic application layout, showcasing the architecture planned.



## Wireframes:

I began the development of the application through wireframing, essentially creating a basic sketch of the application which allows me to place all items in the best location possible.

Below are the first 3 starting screens, after selecting whether the user would like to register, login, or continue as a guest they will be presented with each screen with different input fields.



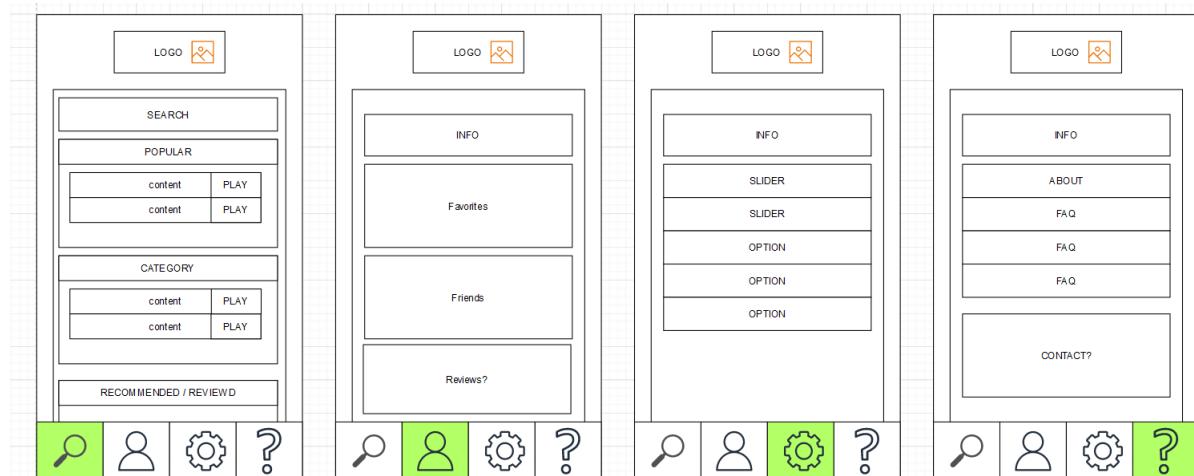
After the said screens, and filling out their name, potentially with email and password, they will be brought to a front screen that displays three main sections. Popular, Recommended / reviewed (based on login and engagement, own or peers) and categories. Most importantly, for ease of use there will be a search bar implemented at top. All of the sections will be in cascading style to mitigate endless scrolling.

Each section will showcase options where users can visit/play, with the play button next to them.

The account section could allow users to save favourite places for future plans, see their friends activities and finally all reviews, theirs or their friends on the app.

Settings is meant to include all relative options, e.g. Volume and optimization.

The "?" Would allow users to get in touch and tell them more about the application.



When pressing play, the user would be brought to an extensive preview of the application, allowing the user to ensure they would like to visit the area, and educate them further about their choice. An image would stay to visualize and large play button for ease of finding at the bottom of the screen.

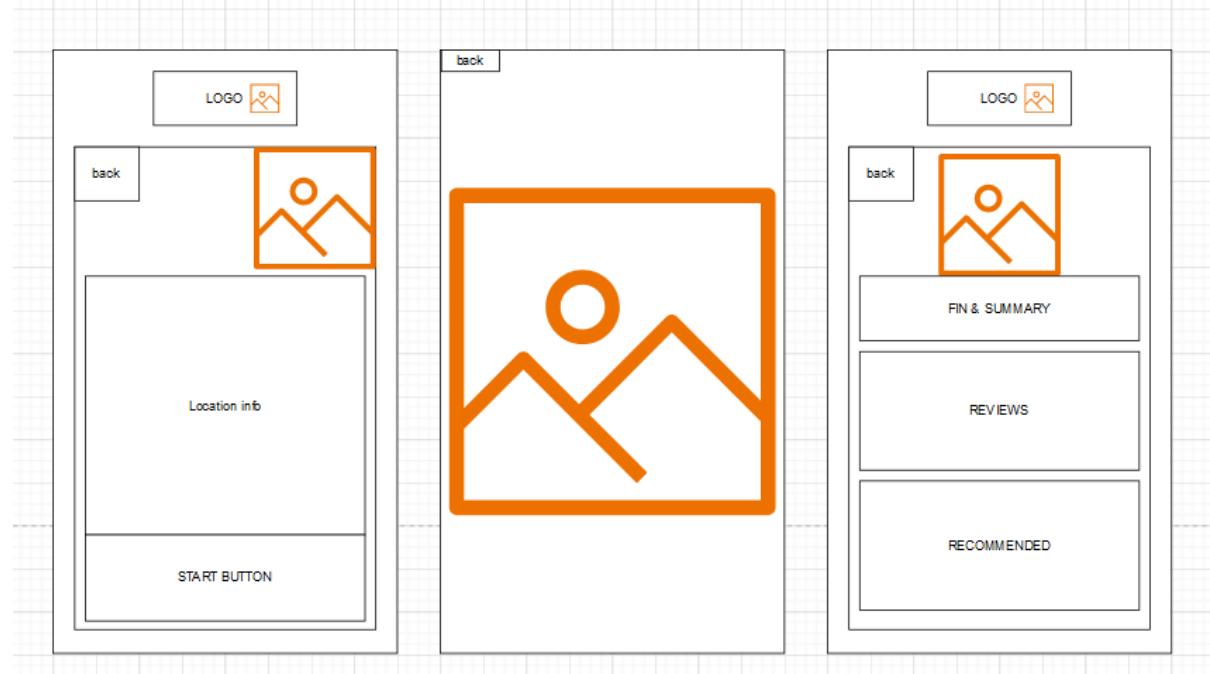
Mid Game, there should be a back button present, assuming that the game mode is using the in build phone gyroscope and not an onscreen joystick.

If no joystick is present options such as automated movement could exist in settings.

After end of game, the user would be presented with a summary of time spent, information learned from interactions, reviews existing and potentially an option to leave a review if logged in. If logged out, an option to create an account should be presented when pressing a button to review.

Recommended section lastly to encourage the user to further use the application and explore the virtual world.

If the back button should be pressed, the user would return to the main section with the three sections.



## Low Fidelity Prototype:

For a basic, low fidelity prototype I decided to use Figma.

In which I was able to create a basic functional design to give the users an idea of what the final application is capable of achieving, how it would be interactive, and just the general purpose. The colours, layouts and design are all open to user input.

The name Tech-lens was decided as this application is intending to put a simple lens to great use through technology.

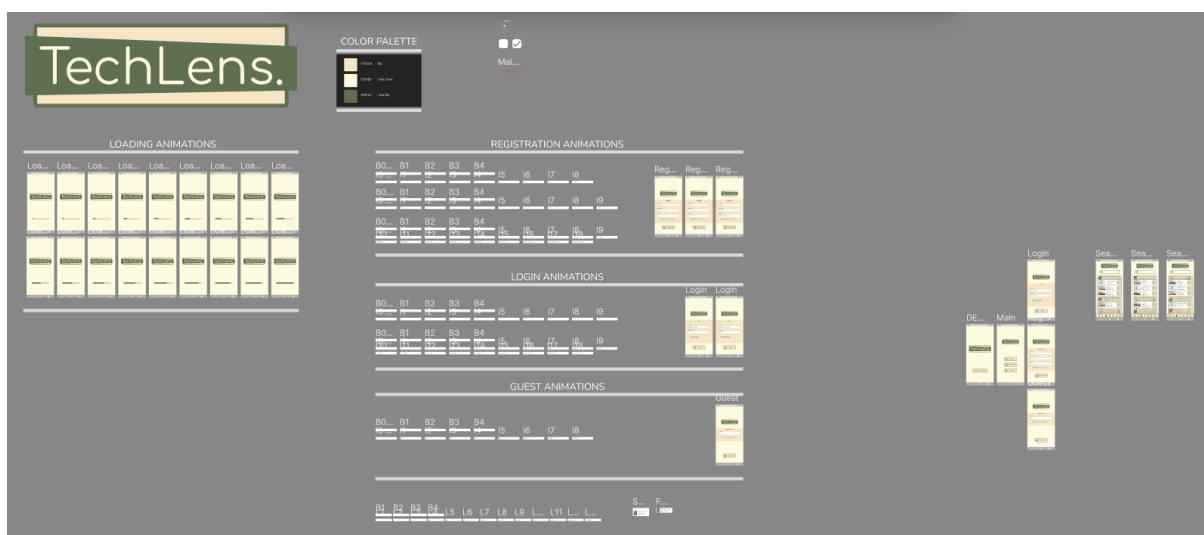
The logo and other assets are made through Figma as a basic input and colour palette idea, hinting towards a more vintage and green look. (references to be included of why this decision has been made...)

There is a common use of icons throughout the application, allowing the users to use “recognition rather than recall” (Nielsen Norman laws...) and easily recognise any menus or options presented.

A dedicated Help section is to be created in the prototype. Settings for volume, power modes and any other found optimization options in a standardized gear icon for settings.

All of the searches, typing and other animations are short presets to make the demo feel more realistic, like an actual android application, while not overloading the user by making them decide on searching for a location or stressing over what to do. Instead anywhere they press or attempt to go, a preset is ready for them to explore and see how the application will function further in testing, once a high fidelity prototype is developed, and final the end product.

Figma Screenshot of First Iteration Progress:





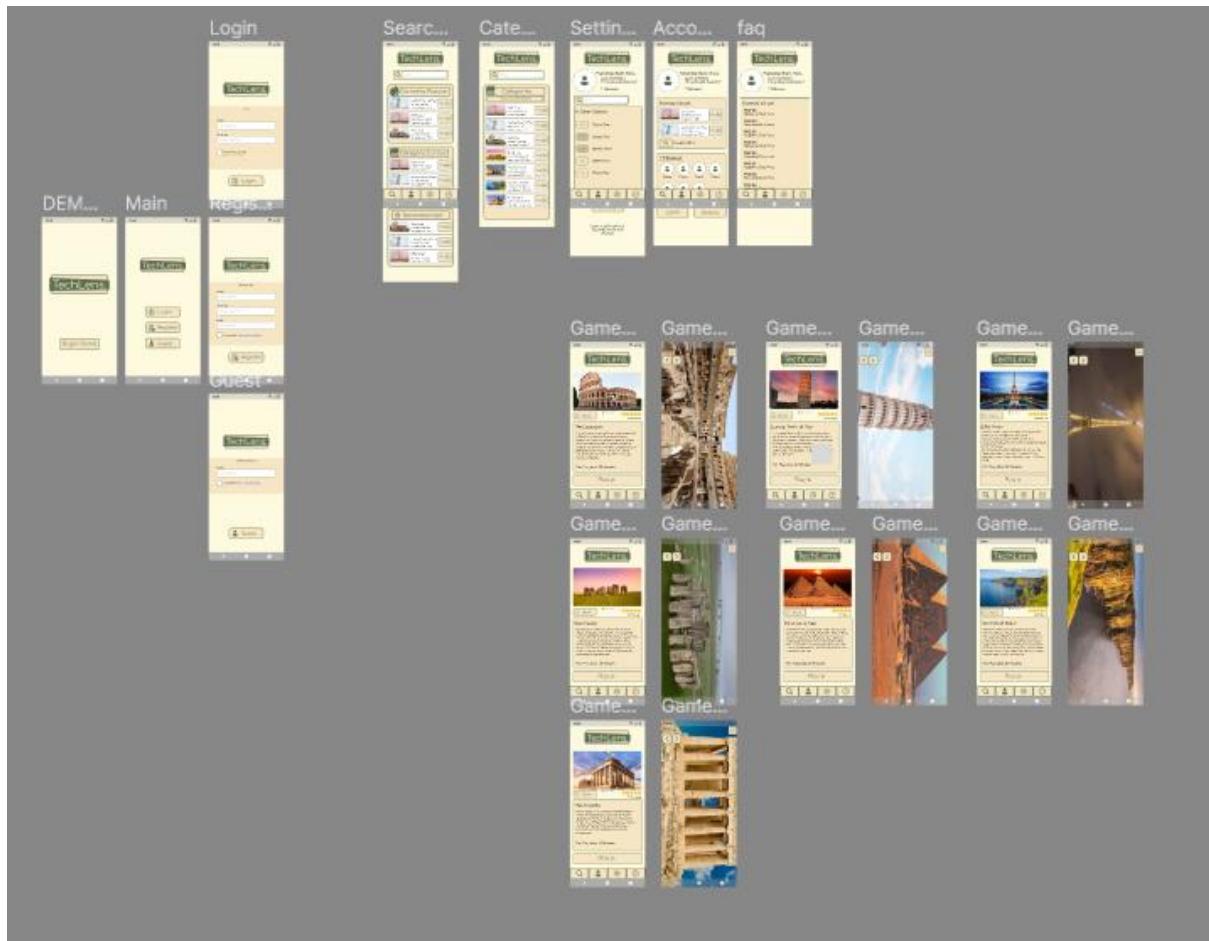
Link to board: <https://www.figma.com/file/DissWQYpdqubgplkdHWTWC/TechLens---AR-travelling?type=design&node-id=0-1&mode=design>

Prototype preview:

<https://www.figma.com/proto/DissWQYpdqubgplkdHWTWC/TechLens---AR-travelling?type=design&node-id=52-156&t=LaQ33mfK1iFJAZNc-1&scaling=scale-down&page-id=0%3A1&starting-point-node-id=10%3A561&mode=design>

## Chapter 7: User Testing

In early testing of the prototype, some feedback received revealed that the application currently is found to be slightly clustered in the categories section, the background could be a different colour and potentially more contrast to make certain aspects of the application stand out more clearly to the average user. The logo was perceived positively and general design concept okay. The flow of the application was commented to be as expected with any application. Another mention included that the guest feature is a nice touch for users who would like to try out the application or others who prefer not using accounts on new apps.



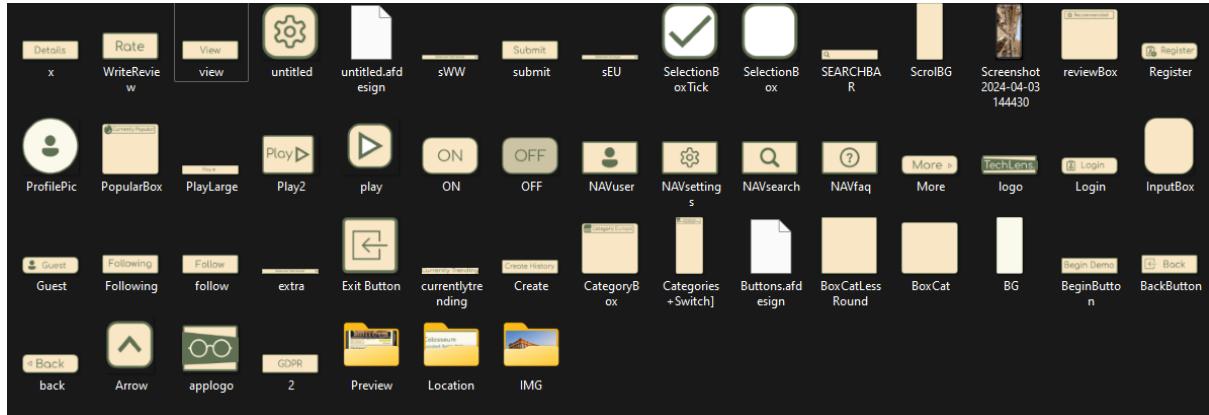
For this I have slightly adjusted the content in the current Figma prototype and decided to proceed on the development of my high-fidelity prototype within Unity.

Specifically, I have decluttered the main search section, created more spacing throughout the pages and implemented the exampled levels. The colour scheme was later changed within the unity design,

## Chapter 8: Final Prototyping

The unity application has been coded specifically for android, for the wide compatibility and large market.

All assets created were using the Affinity suite. These are included in the previously submitted Game files unity folder.



Scripts created in C# are all alongside with comments to explain their functionality within the code rather than copy and pasting within the report.

The development of the unity prototype consisted of constant building and running to a connected android device with USB debugging enabled. Ensuring all build and player settings were set correctly for the android version too.

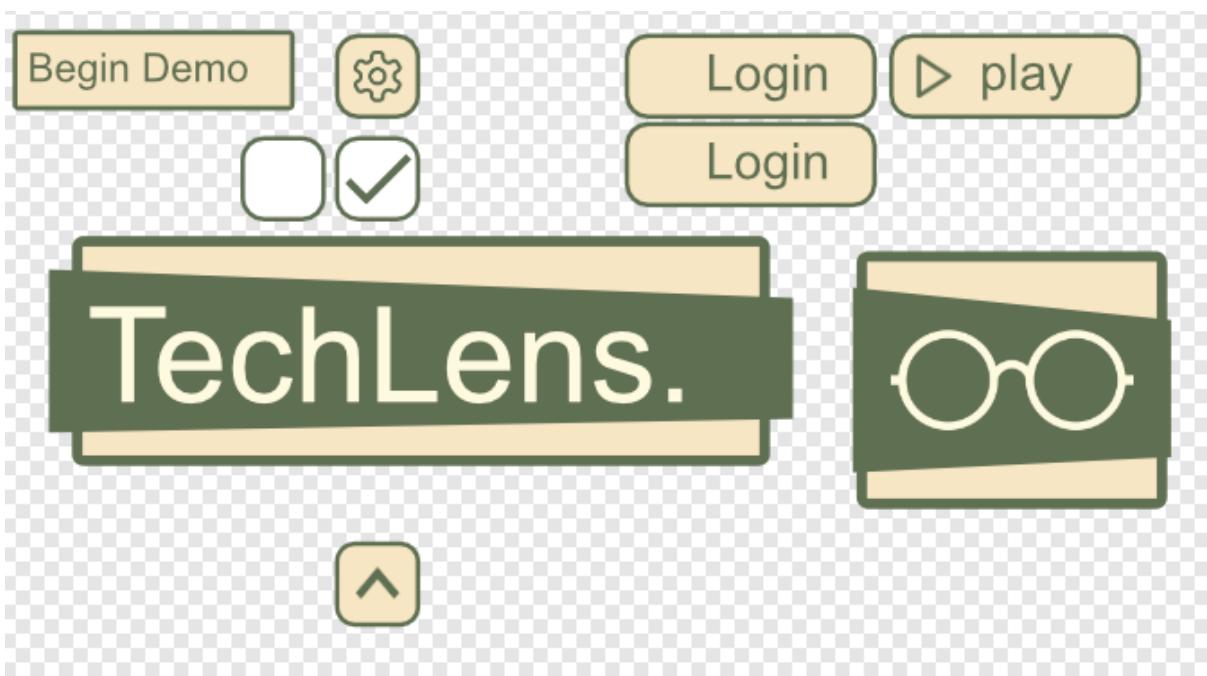
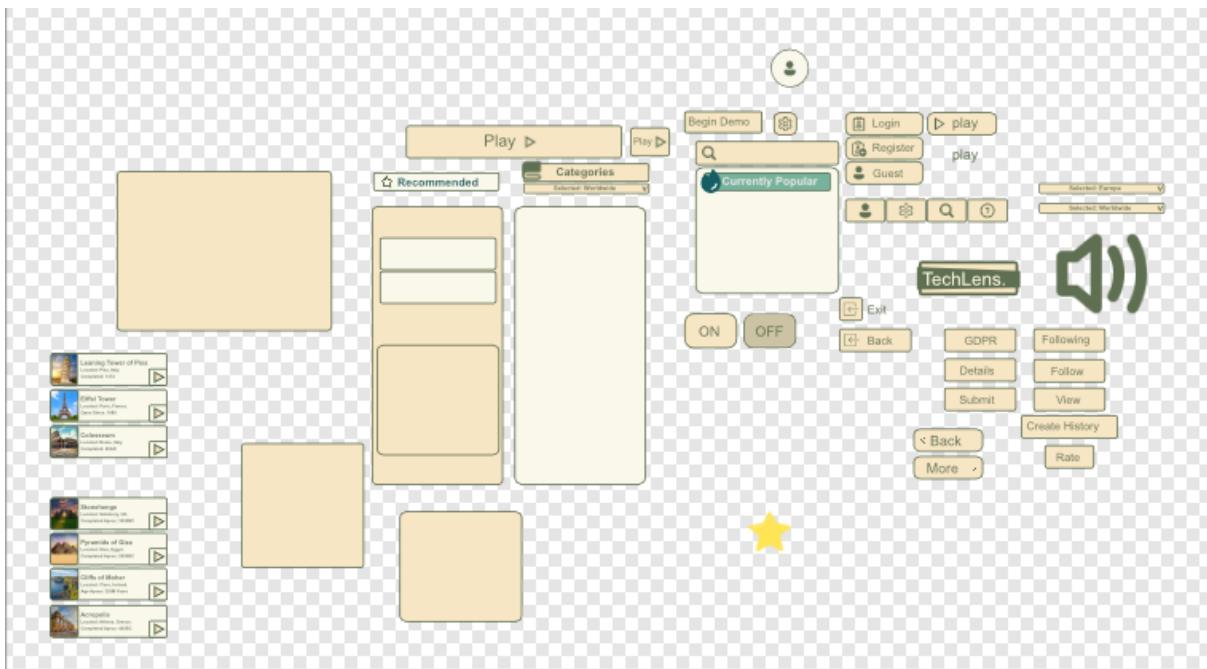
There was no major error experienced during creation of scripting and assets creation as I have previously created a mobile game.

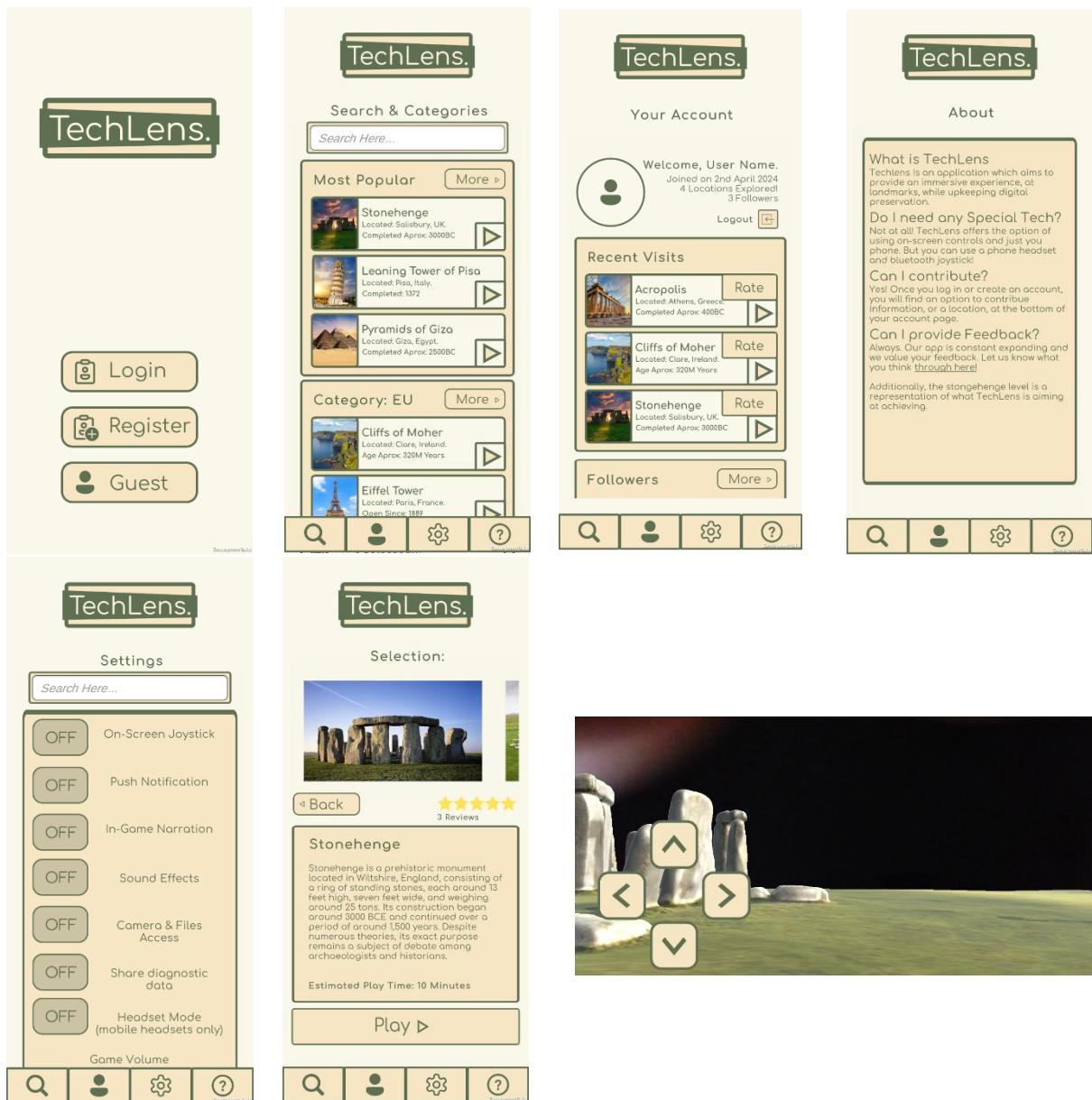
The unity ARCORE template was used for easier setup of camera movement within the application.

A major level that was created within the application was the Stonehenge level. Its aim was to showcase that the application can allow for users to move along the game freely, explore freely and visualize both places as they are and were. As well as have some mini games included.

Not all features included in the game were functional. This was informed to the user. For example, I did not include the voicing over yet due to not having a suitable voice actor. These features would be available in the final deployment/game future.

Screenshots of design board affinity:





Above are snippets from the in-game, updated visualization of the unity app. Decluttered screens with lighter backgrounds for contrast included.

## Chapter 9: User Evaluation

Final user evaluation preformed is reflected in the appendices fully regarding the applications features.

The users seemed to find the UI easy to navigate, colours appropriate and the game functionality to be ultimately more engaging due to its nature of quizzing, free roam experiences and visualizations.

There were no major complaints found and expectations for a deployment of this application have been set.

## **Chapter 10: Reflections**

I believe that this project has thought me a lot regarding the longevity and research needed for such a project.

It is clearly, and maybe too obviously stated that this is a long-term project that requires a lot of dedication to be completed to a high standard.

I am currently satisfied enough to submit my project as I know I have given it what I could, due to my own time constraints.

Although If I would have the opportunity to do a similar project in the future, I would be happy to learn how I can become a better writer and enjoy spending more time to get more technical into my report.

My app / game development has been a true pleasure, as well as researching all the facts available about augmented reality, and even getting all the user input. It was all extremely valuable and exciting information.

This project has given me inspiration and hope to in the near future, create some sort of technology and actually deploy an application that will be able to support those pre-traveling, or attempting to help with digital preservation / all of my previously mentioned goals. I do see this being a useful

I am grateful that I had could complete this project against all obstacles.

Thank you for taking the time to read through my report, and the time to review my application.

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## **Appendices:**

### **Image Links:**

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### **3D Models:**

"Low poly emergency exit sign" (<https://skfb.ly/6Wqtv>) by Mckai is licensed under Creative Commons Attribution (<http://creativecommons.org/licenses/by/4.0/>).

"Quest mark \_ Anil" (<https://skfb.ly/onVSp>) by aniljaco is licensed under Creative Commons Attribution (<http://creativecommons.org/licenses/by/4.0/>).

"Stonehenge England - VR" (<https://skfb.ly/6QXqU>) by GSXNet is licensed under Creative Commons Attribution (<http://creativecommons.org/licenses/by/4.0/>).

"Stonehenge Replica - Historical Series Britannia" (<https://skfb.ly/6rlYZ>) by GSXNet is licensed under Creative Commons Attribution-NonCommercial (<http://creativecommons.org/licenses/by-nc/4.0/>).

### Figma Board:

<https://www.figma.com/file/DissWQYpdqubgplkdHWTWC/TechLens---AR-travelling?type=design&node-id=0-1&mode=design&t=nwyJ0jAgp9uKxMS4-0>

## **User Survey (Phase 1)**

### **Participants: 12 Total**

(Question Numbering Directly from form questionnaire Q4 is the same as Q1):

**Link:** <https://forms.office.com/e/EuBzHcMwdU>

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### **Question Four: Have you recently explored any travel destination?**

Participant 1: "Yes, I recently explored Rome in Italy for 3 days. It was an incredible experience exploring it and soaking in the culture."

Participant 2: "Absolutely, I actually just came back from a trip to Paris. The charming streets, and delicious food made it incredible for me."

Participant 3: "I had the chance to visit Barcelona recently. The stunning architecture, and beautiful beaches are not forgettable."

Participant 4: " I recently travelled to Amsterdam. Exploring the canals, visiting museums was great."

Participant 5: "No not recently, a few years back I travelled with my family but since I didn't have much time."

Participant 6: "I visited Prague recently. Beautiful medieval architecture, rich history, and the lively atmosphere made it wonderful."

Participant 7: "Yes, I decided to be a bit more local recently and visit the cliffs of Moher. Windy but it was a pleasant visit."

Participant 8: "No sadly there is not enough time between work and college, maybe next year I will."

Participant 9: "No, only locally around Ireland."

Participant 10: "Yes, I have visited Berlin recently. A lot of history to be seen in such a well-built, innovative looking city."

Participant 11: "I went to Barcelona recently. Great weather and lovely buildings. Different than home."

Participant 12: "Yes specifically Athens, Greece. Exploring the ancient ruins was so interesting and new to me."

**Question Five: When traveling to a new area, how important do you consider immersing yourself in the local history and cultural heritage to be?**

Participant 1: "Very Important, immersing yourself into the culture and within the local history plays a huge part in my visits. It makes me feel like I have lived there my whole life yet I am just finding out about it."

Participant 2: "For me, immersing myself in the local history, while traveling in Europe, or anywhere is a priority. It's like stepping back in time and understanding the context of the places I visit."

Participant 3: "Absolutely a key factor to any traveling. You do not want to be the odd tourist in public."

Participant 4: "I consider immersing myself in the local history and cultural heritage to be paramount when traveling in Europe. It's not just about sightseeing; it's about understanding the people, traditions, and stories behind each historical site."

Participant 5: "It for sure can be important, but I do not do it myself. When I am anywhere, I like to learn about new things, but I would not immerse myself completely."

Participant 6: "Immersing myself in the local history and cultural heritage is a non-negotiable aspect of my trip. It gives me a deeper appreciation for the places I visit."

Participant 7: "Important, it is always fascinating to uncover the layers of history that are hidden under layers."

Participant 8: "Not too much, all places seem to have their story, but I wouldn't try to read too much into it. I enjoy the moment rather."

Participant 9: "I would not mind immersing myself if overseas but in general I just try to learn on the spot."

Participant 10: "Personally, immersing myself in the local history and cultural heritage is one of the most fun aspects of traveling. It's a chance to dive into their cultures and habits."

Participant 11: "It's like diving into a completely new world, it is extremely important."

Participant 12: "I would like to say that immersing myself, adds a personal level to the experience. It is a crucial part of my travels."

**Question Six: If you have had the opportunity to visit cultural heritage sites or historical landmarks, what was your experience?**

Participant 1: "Oh, visiting cultural heritage sites in Ireland was like stepping into a time machine. From the ancient ruins to the stunning castles it felt like a journey through Ireland's history."

Participant 2: "My experience exploring always feels magical. It is always full of surprises no matter where I look. Information filled but slightly crowded"

Participant 3: "Visiting cultural heritage sites in Ireland was an unforgettable experience. Living close, yet far from the cliffs of Moher and experiencing them for the first time was my first unforgettable experience."

Participant 4: "Exploring historical landmarks yearly in Europe for means a journey through time and tradition. Each site offered a glimpse into our worlds secrets and stories of the past."

Participant 5: "My experience visiting cultural heritage sites in Ireland was simply great. Not a lot of people yet history rich"

Participant 6: "Exploring the Landmarks and diving into the incredible history is always a treat regardless of where I go. Not too crowded ever but weather has to be right."

Participant 7: "Crowded. Plent of people, sun beating down but the history really made me feel like I am in a different age."

Participant 8: "I did, all went well when there is not too many tourists around. I enjoy a peaceful journey where I can explore at my own pace."

Participant 9: "Last time I went on a trip to Europe I did a lot of exploration. It was a good experience but exhaustive it was exhaustive to plan such a long trip."

Participant 10: "A delightful experience I had was perhaps within my trip to Greece. The culture, it's people, the weather and the architecture were incredible."

Participant 11: "it became a yearly occurrence for me before Covid to travel, since then I did not travel as much as I would like to and when I would, it would be only for a couple of days for a quick visit. Otherwise, it was great."

Participant 12: "More often then not, I stay at home and rather do some reading. But when I do travel I find it quiet stuffed in most places, which I don't like. I prefer to go on times where I can actually spend my time admiring instead of feeling rushed to get through the experience."

**Question Seven: What experience, if any, do you have using augmented reality technology?**

Participant 1: "I've used augmented reality a few times before, mostly for fun little games on my smartphone. Haven't really explored any historical or educational apps though."

Participant 2: "I've dabbled with augmented reality here and there, mostly through filters on social media apps like Snapchat and Instagram. It's always been more for entertainment than anything else."

Participant 3: "I haven't had much experience with augmented reality, to be honest. I've seen it mentioned and used by friends, but I personally haven't explored it much myself."

Participant 4: "I've used augmented reality a bit, particularly for trying out virtual furniture placement apps when redecorating my home through amazon. It's been interesting."

Participant 5: "I've used augmented reality a handful of times, mainly for trying out those virtual try-on features in clothing shopping apps. It's been helpful for visualizing how clothes might look before buying."

Participant 6: "I'm somewhat familiar with augmented reality from using it in mobile games like Pokémon GO. It's been a fun experience, but I haven't really explored its educational or historical applications."

Participant 7: "I've used augmented reality a bit, mostly for trying out those virtual makeup try-on features on Snapchat or TikTok. It's been a fun way to change the way I look."

Participant 8: "I've had limited experience with augmented reality, mostly through trying out filters and effects on social media platforms. It's been entertaining, but I haven't used it for anything else really."

Participant 9: "I can't think really of many instances where I used augmented reality. Maybe those filters on apps but not much more."

Participant 10: "I've played virtual reality games before on my computer, I can imagine its mainly the same with augmented reality"

Participant 11: "I've had some experience with augmented reality, mainly through trying out virtual furniture placement apps when decorating my home. It's been interesting to see how furniture looks in my space before buying."

Participant 12: "I haven't used augmented reality much, to be honest. I've seen it mentioned and used by friends, but I haven't really explored it myself. It seems like it could be an interesting technology though."

**Question Eight: On a scale of 1 to 5, 1 being the lowest and 5 the highest rating. Relating to the previous Question, If you have used this sort of technology before, how would you rate the usage experience?**

Participant 1: 3

Participant 2: 4

Participant 3: 2

Participant 4: 3

Participant 5: 4

Participant 6: 3

Participant 7: 4

Participant 8: 2

Participant 9: 3

Participant 10: 3

Participant 11: 4

Participant 12: 2

**Question Nine: Have you ever utilized augmented or virtual reality, or other technologies for exploring cultural or historical sites? What was your experience like?**

Participant 1: "I haven't had the chance to use augmented reality for exploring really anything yet. It sounds like it could be an interesting way to learn more about Ireland's rich history though."

Participant 2: "Yes, I actually had the opportunity to use augmented reality during museum visit. It was fascinating! The AR app gave additional information about items history. It definitely made my overall experience more fun."

Participant 3: "No, I don't think so. For exploring historical sites. I usually rely on guidebooks and audio tours when visiting historical landmarks."

Participant 4: "I haven't personally used augmented reality or other technologies for exploring historical sites. I tend to prefer more traditional methods of learning about history, like reading books or even reading the signs."

Participant 5: "No not really, I have not used any technology, I think, when exploring. I've always been more drawn to experiencing history firsthand by visiting museums and landmarks in person."

Participant 6: "I haven't had the chance to use it for exploring, yet. My experiences with exploring historical sites have mostly been through guided tours and reading about them beforehand."

Participant 7: "No, I haven't. I'm more of a traditionalist when it comes to exploring historical landmarks, preferring to immerse myself in the surroundings without the aid of technology. Just my surroundings and I."

Participant 8: "I haven't personally used augmented reality in that way. But if it was easy to use I could try it"

Participant 9: "No, I've always found it more engaging to learn about history through personal exploration and hands-on experiences at historical landmarks."

Participant 10: "My experiences with visiting historical landmarks have been more about appreciating their architecture and cultural significance in person. So no."

Participant 11: "No, not to my knowledge. I prefer to take my time exploring historical landmarks at my own pace, without distractions. If it can provide that then I would try it."

Participant 12: "The most I would have used is roller coaster rides in Virtual reality, if that counts as historical. But not much more."

#### **Question Ten: Do you believe it is essential for modern technology to be integrated into experiences related to tourism?**

Participant 1: "Integrating technology into tourism experiences can make it more engaging and informative I think."

Participant 2: "I think it's becoming increasingly important. In today's digital age, travellers expect access to information and some immersive experiences, and technology can help, in some ways, meet those expectations."

Participant 3: "Yes, I mean it might open up new possibilities for storytelling and engagement with cultural heritage."

Participant 4: "Absolutely, whether it's using virtual reality to visit destinations or mobile apps for guided tours, it could really make travelling easier and more informative."

Participant 5: "In my opinion, integrating technology could make any experience way more engaging. So why not?"

Participant 6: "Potentially, it could introduce some innovative ways of exploring."

Participant 7: "Sure, it seems like it would make travelling and exploring way more convenient."

Participant 8: "I think integrating modern technology into tourism is important. It can provide us with valuable information, and tools to make exploration easier."

Participant 9: "It's essential for modern technology to be integrated into tourism experiences. The endless possibilities with technology built in, it is really incredible."

Participant 10: "There are high changes it could improve the flow of people through museums or other areas. Just with a device like their smartphone, with location on could help a tourist tour the area. Absolutely yes."

Participant 11: "Technology seems to be bringing us many improvements in this age. Maybe it is not essential yet but it for sure it could improve the tourism sector."

Participant 12: "It is essential, the accessibility benefits it can bring through hearing aids, or visualizations. It really is a game changer."

### **Question Eleven: How critical do you believe it is to conserve and protect cultural and or historical sites?**

Participant 1: "History is history for a reason, it disappears within time unless preserved. Yes it is critical to conserve history while it still exists"

Participant 2: "Very critical, otherwise history might repeat itself but the monuments it left might not."

Participant 3: "It is very important, conserving what's ours to stay with us. Keeps up a rich heritage building up over the centuries."

Participant 4: "For me, I do not mind if something is conserved drastically. As long as it's there".

Participant 5: "Preserving any and all cultural and historical sites is very critical. They're tangible links to our past, preserving our traditions."

Participant 6: "Conservation and preservation are key to anything. We build on our mistakes like we build on our history. We can't allow to forget it."

Participant 7: "Protecting our landmarks is really, really important I believe."

Participant 8: "Preserving cultural and historical sites is indispensable. They're not just monuments. They're repositories of our stories and traditions."

Participant 9: "Why would it not be a critical factor in this. It's history for a reason. Generations preserved it and so must we."

Participant 10: "Not extremely. New history is found each day and if we get stuck on one, how can we make history like it again?"

Participant 11: "Critical indeed."

Participant 12: "Conservation is critical. Look at the leaning tower of Pisa. Years back they were attempting to stop it from leaning over more and collapsing. Instead levelling it to a safe level to preserve it."

**Question Twelve: Which cultural or historical aspects typically influence your decision to travel to a new area?**

Participant 1: "For me, it's definitely the cultural heritage that draws me to new areas. For example, I'm fascinated by Ireland's ancient history, from its Celtic roots to its medieval castles and archaeological sites."

Participant 2: "The vibrant cultural scene is a huge draw for me. From traditional music to lively festivals. Everything from literature to food, there's always something unique to experience."

Participant 3: "All the attractions, landmarks and anything I can visit. The more popular the better."

Participant 4: "As an art enthusiast, I enjoy visiting museums, art galleries or sightseeing beautiful architecture. Those usually influence my choices."

Participant 5: "Visiting ancient ruins like or exploring the stories behind iconic landmarks usually influences my decision. With anything I'm always eager to learn more."

Participant 6: "Literature within history has always fascinated me, potentially it could be my motivating factor if I know what to expect."

Participant 7: "Nothing much cultural is an influence, maybe prices for tickets to where I can go."

Participant 8: "Recommendations from friends is usually where I get inspiration for my travels."

Participant 9: "Typically I research online the history and culture of the area's I want to travel to. Then I choose the most appealing options."

Participant 10: "The people there, the culture I find, the areas I can visit. Some things you can't replicate until you see them but I try my best to find out online before I travel."

Participant 11: "As a lover of architecture and design, it is the blend of ancient landmarks and architecture that is a huge draw for me. There's so much to admire."

Participant 12: "Events in other countries usually inspire me to go to them. St. Patricks day I spend in Ireland. The Carnival? Brazil it is. There is just some must see events and places. The people, their traditions, and the way they live. Everywhere is same yet different."

**Question Thirteen: To what extend does the integration of technology impact your decisions when choosing destinations?**

Participant 1: "Highly Influential, researching the location and creating travel paths is huge help in apps."

Participant 2: "From browsing travel blogs, to searching for attractions myself. I'd say it has a significant impact on my choices. Without it I might be lost, literally."

Participant 3: " Being able to access virtual tours, historical information, and user reviews through apps and websites helps me narrow down my options and plan my itinerary. So, I'd say technology integration has a considerable impact on my decision making process."

Participant 4: "As someone who loves to immerse myself in history and culture when traveling, technology greatly influences my decisions when choosing destinations. Having access to it allows me to explore historical sites in depth and gain a deeper appreciation for the destination."

Participant 5: "Large Extent, gives me a sense of reassurance when I find information existing online, that I am actually traveling to a real location."

Participant 6: " When researching historical landmarks to finding the best places to eat and stay, technology really helps me plan my trips. How could it not be useful."

Participant 7: "Significantly supports my decision making. Any answer I might need or question I might have, I can just go online and search. Not everything seems to be true, so I do take it with a grain of salt."

Participant 8: "A considerable amount of impact, technology is everywhere nowadays. It is quite hard to not use it to be honest. It does help to find new destinations, but God does it take time."

Participant 9: "Travel websites, social media platforms, and mobile apps help me easily discover and explore historical sites, cultural events, and local attractions. It has a good effect for me anyway."

Participant 10: "The integration of technology definitely affects my decisions when selecting destinations. From researching destinations online to using navigation apps to get around, it simplifies the travel planning process, and it allows me to discover hidden gems I couldn't otherwise find myself."

Participant 11: "It has a great impact on my decision making process, the options it shows me when I look for any travel destination is incredible. Always a hard choice but I'll try to visit them all one day."

Participant 12: "I typically do not use technology for travelling, I try to go off recommendations or books I read to decide on where I go. I do not trust what is on the internet. Rather, I would prefer to see it through my own eyes when I get the time."

#### **Question Fourteen: Have you ever visited a historical site locally?**

Participant 1: "Yes, I've been to the Rock of Cashel, it's a stunning historical site here in Ireland."

Participant 2: "Absolutely, I visited Kilmainham Gaol in Dublin, it's quite a memorable experience."

Participant 3: "Not too local, although I explored the ancient ruins of Glendalough in County Wicklow recently."

Participant 4: "I've visited the Cliffs of Moher, it's a must see especially in good weather."

Participant 5: "Yes, I've had the opportunity to visit the Newgrange passage tomb, it's truly fascinating."

Participant 6: "Years back I went to the Ring of Kerry, there's so much history and beauty along that route."

Participant 7: "I have gone to the Giant's Causeway a little while back. It is history packed and I can't wait to go again. Really a gorgeous sight and trip."

Participant 8: "I have been to the Cliffs of Moher again not too long ago, breath taking as always."

Participant 9: "Absolutely, I've been to the Blarney Castle and kissed the famous Blarney Stone."

Participant 10: "Indeed I have, the historic city of Kilkenny, there's so much medieval charm there."

Participant 11: "Yes, I've been to the ancient site of Tara, it's steeped in Irish mythology and history."

Participant 12: "Yes, I've explored the ruins of the Rock of Dunamase, there is some incredible views of the surrounding countryside there."

**Question Fifteen: On a scale of 1 to 5, 1 being the lowest and 5 the highest rating. How would you rate your experience on the previously mentioned site?**

Participant 1: 4

Participant 2: 5

Participant 3: 3

Participant 4: 2

Participant 5: 4

Participant 6: 5

Participant 7: 3

Participant 8: 2

Participant 9: 4

Participant 10: 3

Participant 11: 5

Participant 12: 4

**Question Sixteen: How likely would you recommend someone to visit a local site and explore its heritage?**

Participant 1: Very likely, Ireland's local sites are rich in heritage and offer a unique glimpse into our history.

Participant 2: Likely, exploring Ireland's is beautiful to explore.

Participant 3: Extremely likely, visiting local sites allows you to discover hidden gems and uncover fascinating stories from the past that you might not find online.

Participant 4: Probably, there is a lot of history everywhere or every county. Depends on where you look.

Participant 5: Likely, exploring local sites can really be fun and a memorable experience that I can recommend.

Participant 6: Very likely, the best gems are the ones hidden in plain sight.

Participant 7: Quite likely, it is good to know what is around locally and support our locals.

Participant 8: Not too likely, I feel there is always more to explore everywhere and could not recommend only locally.

Participant 9: Indifferent, potentially I could depend on what site it is and have I visited it.

Participant 10: Definitely, I would highly recommend visiting local sites to anyone interested in learning the country's rich heritage.

Participant 11: Very likely, exploring Ireland's local heritage sites is a fantastic way to learn about the country's history and traditions firsthand.

Participant 12: Extremely likely, Ireland's local sites are filled with fascinating stories and that make for an unforgettable exploration of the country's heritage. A lot of people from abroad come to Ireland regardless of the weather to see what we offer.

**Question Seventeen: While traveling, did you experience any of the following?**

**Unsuitable Weather, Overcrowding, Lack of time, None, Other**

Participant 1: Lack of time

Participant 2: Overcrowding

Participant 3: None

Participant 4: Unsuitable Weather

Participant 5: Lack of time

Participant 6: Overcrowding

Participant 7: None

Participant 8: None

Participant 9: Lack of time

Participant 10: Overcrowding

Participant 11: Unsuitable Weather

Participant 12: Lack of time

## **User Interview Questions (Phase 2)**

### **Participants: 6 Total**

(Question Numbering Directly from form questionnaire Q4 is the same as Q1):

**Link:** <https://forms.office.com/e/c5VMTkKJg1>

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### **Question Four: What would motivate you to visit new, diverse places?**

Participant 1: I'd be motivated to visit new, diverse places for the opportunity to immerse myself in different cultures and learn about their history and traditions.

Participant 2: Exploring new places excites me because it allows me to broaden my perspective, meet new people, and experience new landscapes and attractions.

Participant 3: I'm motivated to explore to satisfy my curiosity and sense of adventure. There's always something new to discover, whether it's a hidden gem or something in the open.

Participant 4: The prospect of trying new foods and experiencing different lifestyles motivates me to visit new places. I love exploring local markets and tasting authentic dishes.

Participant 5: I find inspiration in the diversity of landscapes and natural beauty that different places offer. From green hills to rugged coastlines, each place has its own unique charm.

Participant 6: Meeting locals and hearing their stories motivates me to visit new places. I enjoy chatting with people from different backgrounds and learning about their way of life.

### **Question Five: Could you share an instance where you explored a historical site or cultural heritage?**

Participant 1: Last summer, I visited the Colosseum in Rome, Italy. It was breath taking to walk through the ancient amphitheater and imagining the gladiatorial contests and spectacles that took place there in its glory time.

Participant 2: During a trip to Athens, Greece, I explored the Acropolis. Standing atop the hill, surrounded by ancient ruins and overlooking the city below, I felt a profound sense of history and admiration for Greek civilization.

Participant 3: In Paris, I visited the Louvre Museum and had the chance to see iconic works of art such as the Mona Lisa and the Venus de Milo. It was fascinating to experience firsthand the cultural heritage preserved within the museum's walls.

Participant 4: While traveling through Barcelona, I explored the Sagrada Família, Antoni Gaudí's masterpiece of modernist architecture. The intricate details and symbolism woven into the design left an impression on me. I admire its detail.

Participant 5: In Florence, Italy, I wandered through the Uffizi Gallery and admired Renaissance masterpieces by artists like Botticelli, Michelangelo, and Leonardo da Vinci. It was a surreal experience to see these works of art up close.

Participant 6: During my London stay, I visited the Tower of London and learned about its rich history as a royal palace, fortress, and prison. Walking along the walls and seeing the Crown Jewels was a memorable experience.

**Question Six: When travelling, are there any historical or cultural practices that you have observed and found interesting?**

Participant 1: "Absolutely! In Greece, I was fascinated by the tradition of breaking plates during celebrations. It's a unique way to express joy and release negative energy."

Participant 2: "Yes, when I visited Italy, I was intrigued by the concept of 'aperitivo,' where locals gather for pre-dinner drinks and snacks. It's a great way to socialize and unwind after a day of exploring."

Participant 3: "Definitely! While in Spain, I enjoyed witnessing the flamenco dance performances. The passion and intensity of the dancers, combined with the vibrant music, create a captivating cultural experience."

Participant 4: "Oh, for sure! When I traveled to France, I was impressed by the dedication to preserving local heritage. From historic villages to traditional festivals, there's a strong emphasis on maintaining cultural traditions."

Participant 5: "Yes, during my trip around Ireland, I was struck by the importance of storytelling in preserving history and folklore. The Irish have a rich tradition of oral storytelling, which adds a unique dimension to their culture."

Participant 6: "Absolutely! In Germany, I found the Oktoberfest celebrations, and drinking, to be quite intriguing. But it's not just about beer. It's a cultural event filled with music, food, and traditional Bavarian attire."

**Question Seven: How does your understanding of local areas impact you're travelling experience?**

Participant 1: Knowing local areas helps me discover hidden gems and have authentic experiences that aren't always found in tourist guides.

Participant 2: Understanding local areas allows me to immerse myself in the culture that extra bit. Connect with locals and uncover unique dining spots and attractions off the beaten path.

Participant 3: It makes my navigation throughout local areas easier. It makes me feel as if I am a local myself.

Participant 4: Being aware of local areas helps me avoid tourist traps, save money, and find accommodations that offer a more budget-friendly experience, so it does pay off well.

Participant 5: My understanding of local areas is beneficial in ways of having a deeper appreciation for them.

Participant 6: Not significantly, It makes a mental difference in some way but I do not feel as though it would change my overall visit.

**Question Eight: Can you share any challenges you faced when travelling through unfamiliar areas?**

Participant 1: "Navigating public transportation systems in unfamiliar cities was challenging, especially with language barriers."

Participant 2: "Finding affordable accommodation in popular tourist destinations proved to be quite difficult, as prices tend to fluctuate based on demand and what is around."

Participant 3: "Locating authentic local dining experiences away from tourist areas was a bit of a challenge, but it led to discovering hidden culinary gems. More time would be beneficial to find them."

Participant 4: "Managing my budget effectively while traveling through Europe was a constant challenge, as unexpected expenses often arose whenever I would reach a destination."

Participant 5: "Understanding the cultural norms and etiquette in each place I visited presented some initial hurdles, but locals were usually helpful in offering guidance to not stand out too much."

Participant 6: "Dealing with unexpected weather changes, especially during outdoor activities, required some flexibility and preparation."

**Question Nine: Does tourism in your eyes support the preservation of cultural sites?**

Participant 1: Absolutely, tourism plays a vital role in preserving cultural sites by generating revenue for conservation efforts and raising awareness about their significance.

Participant 2: Yes, tourism can support the preservation of cultural sites through funding from entrance fees and donations, as well as encouraging local communities to value their heritage.

Participant 3: Definitely, tourism provides the necessary funds for the maintenance and restoration of cultural sites, ensuring their longevity for future generations to enjoy.

Participant 4: Indeed, tourism fosters appreciation and respect for cultural sites, prompting governments and organizations to invest in their preservation and protection.

Participant 5: Without a doubt yes, tourism incentivizes authorities to implement regulations and measures to safeguard cultural sites, preserving them for both visitors and locals alike.

Participant 6: Absolutely, tourism drives economic growth in regions with cultural sites, creating opportunities for sustainable development and ensuring their continued existence for years to come. If managed well.

**Question Ten: How do you manage adapting and respecting new cultural norms when travelling?**

Participant 1: I always research cultural norms and customs of the countries I'm visiting beforehand. Once there, I observe locals and follow their lead to adapt respectfully.

Participant 2: I make an effort to learn basic phrases in the local language and use them when interacting with locals. It shows respect for their culture and helps bridge any communication gaps.

Participant 3: In the moment, when I am there I try my best to learn from the locals and my surroundings.

Participant 4: I'm mindful of my behaviour and dress appropriately for the culture I'm visiting. It's important to respect local customs, especially when visiting religious sites or conservative areas.

Participant 5: I engage in conversations with locals and ask questions about their customs and traditions. Although I try to find information online prior.

Participant 6: I always carry a guidebook with tips for regions I'm visiting. It helps me navigate unfamiliar situations with sensitivity and respect.

**Question Eleven: Which cultural differences had the most significant difference or impact on your travel experience**

Participant 1: The emphasis on punctuality in Germany really impacted my travel experience. It was quite different from the more relaxed attitude towards time in Spain.

Participant 2: The dining customs in Italy stood out to me. The tradition of eating meals slowly and enjoying each course made for a unique culinary experience compared to the faster-paced meals in the UK.

Participant 3: The sense of personal space in Scandinavia was noticeable. People there seemed to value their personal space more than in Southern Europe, which influenced my interactions with locals.

Participant 4: The concept of "fika" in Sweden was a pleasant surprise. Taking breaks throughout the day for coffee and especially socializing created a relaxed atmosphere that was different from the hustle and bustle of other European cities.

Participant 5: The social etiquette in France, particularly the importance of formal greetings and politeness, had a significant impact on my interactions with locals compared to the more casual approach in the Netherlands.

Participant 6: The emphasis on sustainability and eco-consciousness in the Nordic countries was evident. From eco-friendly transportation options to recycling practices, it shaped my perception of responsible tourism in Europe.

**Question Twelve: From your perspective, how does responsible tourism contribute to preservation of local areas?**

Participant 1: From my perspective, responsible tourism supports the preservation of local areas in Europe by promoting these sustainable practices that minimize environmental impact and respect cultural heritage. It is here to improve the way we explore.

Participant 2: Responsible tourism helps safeguard natural landscapes and historical sites for future generations. Through simply educating those traveling it makes it better.

Participant 3: It links sustainability and travelling. Contributing a clean and respected area with reduced tourist impact on its environment.

Participant 4: I believe it helps in preservation of local areas and potentially their traditions.

Participant 5: By reducing waste and supporting locals. Subconsciously supporting the preservation of local areas.

Participant 6: Well, responsible tourism can encourage visitors to explore off-the-beaten-path destinations and engage with authentic cultural experiences.

**Question Thirteen: Did you have an opportunity to experience augmented reality previously?**

Participant 1: Yes, I had the chance to try augmented reality once before.

Participant 2: No, I haven't encountered augmented reality yet, but it sounds interesting.

Participant 3: Absolutely, scanning QR codes and bringing things to life,

Participant 4: Yes but only through face filters on applications, or furniture/items through apps.

Participant 5: Yes, it was a fun experience. Felt a little bit surreal.

Participant 6: No, not in a historical context yet although I might have seen it prior to this.

**Question Fifteen: Do you believe that augmented reality could improve your knowledge of an area before travelling?**

Participant 1: Absolutely, I think augmented reality would make me feel like I have a virtual tour guide right in my pocket.

Participant 2: Definitely! Augmented reality has the potential to provide immersive experiences and detailed insights into landmarks. Could make pre-traveling easier.

Participant 3: Yes, I believe augmented reality allows me to better appreciate the significance of landmarks before visiting them in person. More time to learn prior to going.

Participant 4: Absolutely! It could offer a unique way to explore destinations from afar, helping me grasp them before visiting.

Participant 5: For sure! It has the potential to provide engaging experiences prior to my travels and help me decide on where I should visit.

Participant 6: Yes, the visualizations, information, and endless possibilities seem exciting for pre-traveling.

**Question Sixteen: Do you believe that augmented reality, through experiencing a historical site, could influence your choice or where to visit?**

Participant 1: Absolutely, it adds an extra layer of excitement and engagement to the planning process.

Participant 2: For sure, it could sway where I visit depending on how it is displayed.

Participant 3: Definitely, experiencing historical sites in augmented reality would definitely impact my decision on where to travel. It's like getting a sneak peek into the past before deciding on my next destination.

Participant 4: Absolutely, augmented reality can definitely influence my choice of where to visit. It makes historical sites more accessible and engaging, which could influence my decision when planning a trip.

Participant 5: Why not, it is a unique way of exploring that may have a lot of potential to offer.

Participant 6: Definitely, it seems like an exciting way to explore places prior. A way to know what I may enjoy and what I would not.

**User Interview Questions (Phase 3)**

**Participants: 5 Total**

(Question Numbering Directly from form questionnaire Q4 is the same as Q1):

**Link:** <https://forms.office.com/e/yXKtSy5HCm>

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**Question One: While using the app, how was your experience navigating and exploring information?**

Participant 1: Navigating and exploring information within the app was seamless and intuitive. The user interface was well-designed, making it easy to find relevant information about historical sites and navigate between different tabs. The interactive elements, such as historical visualizations and quizzes, kept me engaged throughout. I am happy I was able to stay at my own pace.

Participant 2: My experience navigating and exploring information within the app was excellent. The interface was simple to follow, allowing me to easily access detailed information about historical sites, view images, and explore in the visualization.

Participant 3: Easy to follow, simple tab system with nice features to it. Menu was okay, just took me a second to realize upon clicking there is more to be found. I enjoyed the colour scheme. Not too difficult to read on yet pleasant colour wise.

Participant 4: My experience navigating and exploring information within the app was smooth. Nice and clear labelling of features. I particularly appreciated the interactive elements, such as quizzes and challenges, while optional made it that bit more fun.

Participant 5: Navigating and exploring information within the app was a breeze. Engaging to look for information, something about its choice was pleasant.

**Question Two: How would you describe the use and effect of Augmented reality for this app?**

Participant 1: A positive effect, nice blend to imagine Stonehenge in my living room. Artifacts to size would be nice too but it gives me room to travel. Good use overall.

Participant 2: Noticeable use for the chosen app. Wouldn't like it to be completely in virtual reality as I do not have a headset but it was nice to visualize everything in front of me while on my couch.

Participant 3: Brilliant! With more location I will be able to easily choose where I'm going next!

Participant 4: Great! It brings historical sites to life in a way that is both educational and entertaining, allowing me to learn more at my pace and enjoy what I am playing.

Participant 5: The reconstruction was a great idea for augmented reality, just to see what it was really like. Nothing else could do that.

**Question Three: Do you believe that the app was immersive and accurate in portraying historical events and sites?**

Participant 1: Yes, it really brought history to life in my eyes.

Participant 2: Good mix of quizzes and facts even the reconstruction. Interesting and fact filled.

Participant 3: Unique approach of teaching information, entertaining to say the least.

Participant 4: Yes, it was like stepping back in time and exploring these places in a whole new way.

Participant 5: Absolutely, I felt as if I was really exploring each location and it was all only me.

**Question four: How do you feel regarding the applications way of providing information and context of sites?**

Participant 1: Helpful, informative and easy to find. Just search for the location and it is there.

Participant 2: A lot of ways to section and find locations or even submit your own. Ratings and the factual information. Feels great.

Participant 3: It does a fantastic job of providing information and context of sites. It's informative yet concise, allowing me to quickly grasp the key highlights of each historical site.

Participant 4: I think the app's approach to providing information and context of sites is spot on. It seamlessly integrates multimedia elements like images, giving me a better understanding before even entering augmented reality.

Participant 5: I really appreciate how the app delivers information and context of sites. It's interactive and offers various features like quizzes and sound help, keeping me engaged and eager to learn more about the historical sites I plan to visit.