**Task 8**

1. What was your starting understanding of the problem area?

The first starting understanding of the problem area was that an Augmented Reality (AR) application needs to be developed to visualise interactive data of Maltese Parish History and Historical Analysis.

A location-based AR application will allow the users to visualize data about the parish that the user is currently located in. It will allow information such as history, mass times and parish contact information to allow the user to have details on how they can contact.

The prototype needs to get information from an online database. A Content Management System (CMS) needs to be developed to make administrative changes and updates to the data that is found in the database. The CMS will allow the admin user to add, remove, change data found in the parish database. Data found in the database are the location of the parish, and some basic information.

The prototype needs to have access to the location and camera of the user’s smartphone. The location if the smartphone will be used to display information of the nearest parish as an augmented visualized interactive data on the screen using the smartphones camera sensor.

This will be done so that users can have a modern interactivity with Maltese Parishes, and to see if parish data can be accessible using an Augmented reality application on a smartphone.

1. What was the initial choice of method with respect to methodology?

The initial choice of method with respect to the methodology was to make the use of surveys or questionnaires to have a qualitative and quantitative data that will show me information’s and details based on the experience of the prototype and Augmented Reality in general. The data and results gathered from a survey will allow to further enhance the usability of the prototype. The quantitative data was going to be used to have a quantitative idea on how the participants interaction with the prototype helped them to get parish data and information. Questions like “On a scale from 1 to 10 do you find these sentences to be accurate (1 being least accurate)” and will proceed to ask questions like “The data shown was clear to read”. The qualitative data would be gathered from questions asked to the user from the survey to further explain in their words.

The questionnaire has several advantages over interviews, such as being more reliable and encouraging greater honesty because it is anonymous. (Cohen et al. 2009)

(Of course, dishonesty and falsification may be impossible to detect in a questionnaire)

Cohen et al. (2009) also have mentioned that a questionnaire disadvantages, on the other hand, include: the interviewer is unable to respond to questions about both the purpose of the interview and any misunderstandings experienced by the interviewee, because the same questions can have different meanings for different people; if only closed items are used, the questionnaire may lack coverage or authenticity; if only open items are used, respondents may be unwilling to write; and if only open items are used, respondents may be unwilling to write.

The prototype application initially was going to be developed as an android application, which will need to be downloaded and installed on the user’s phone.

The application was going to be developed using Unity Game Engine with the help of AR Foundation which is a cross-platform framework.

1. How did the methodology change based on the literature review?

Whilst researching about the technological advantages and uses of Augmented Reality, I researched about Web-based AR. Which uses an online based site which allows the augmented reality to be visualized. This will be a good technology to use for the prototype as the participant and users do not need to download any application to use the AR App. People may enjoy the immersive and unique experience of AR on-demand on most operating systems, mobile devices, and web browsers because there is no need to download any applications.

According to Qiao et al. (2019) Web-based AR (Web AR) provides a pervasive Mobile AR experience to the users, this is because of the many successful deployments of the Web as a lightweight and cross-platform service provisioning platform compared to App-based AR.

When catering to a huge audience which may be using iPhone, Android, and  
others, there’s a need to design for multiple platforms. That is why cross-platform  
and interactivity are important for the prototype development, because it will allow  
users to use various platform selection.

Roy & Kanjilal (2021) and Qiao et al. (2019) reported that Web AR apps  
typically use a method to off-load computation (e.g., cloud computing) to speed the process in order to obtain better performance. However, compute offloading  
may create an additional transmission delay, affecting the user experience and  
limiting its application in existing mobile networks.

The methodological approach was changed because a mixed approach to obtain qualitative data was needed with the use of two semi-structed interviews and observation of participants using the prototype.

Denzin (1970b) and Silverman (1993), cited in Cohen et al. (2009) revealed that  
the qualitative interview is moving away from a prescriptive, standardized format  
and toward an open-ended or semi-structured format, which allows respondents to  
project their own perspectives on the world. It allows participants to raise and  
pursue ideas and topics that might not have been included in a pre-determined  
schedule, rather than sticking to a rigid discussion sequence.

Bailey (1994: 243–4), cited in cited in Cohen et al. (2009) pointed out that when  
it comes to collecting data on nonverbal behaviour, observational studies outperform  
experiments and surveys. Observation studies allow researchers to observe ongoing  
behaviour and take relevant notes about its key characteristics. Because case study  
observations take place over a longer length of time, researchers can create more  
intimate and informal relationships with the people they’re watching, and they’re  
usually conducted in more natural settings than experiments and surveys.

1. How did the chosen methodology affect the presentation of results?

The chosen methodology allows the results to be conducted from a technical interview beforehand the testing of the prototype to get information about how the participant uses technology and a general overview about AR usage and knowledge.

After the prototype was finished, the usability heuristics was tested. This was mainly done to observe participants using the prototype to gather results for efficiency of use and to check error prevention. After this testing, the data gathered was used to fix bugs in the prototype to improve the user control and efficiency.

This was necessary to finalize the prototype, as the results and observations from the findings will be more accurate as the prototype will be finalized without any errors.

During the usage of the prototype, observations are conducted to observe behaviour and note key characteristics.

After the testing of the prototype, the second semi-structures interview will be done to have feedback, opinions and other questions related to the experience and general discussion about the prototype and AR in general.

The results have shown that in fact having a Web-Based Augmented Reality website improves the accessibility and usability of the AR Application. This is because the user can easily access the website via a QR Code instead of downloading and installing an application.

The methods that I used in the methodology where ideal for this situation as semi-structured questions will allow the participant to freely express themselves about topics that might not have been included in the planning of the interview.

The result shows the opinions of the participants about AR and the usage of the prototype to be used in the real world.

They also include improvements, and other features that may be introduced in a future version to keep improving on the prototype.

From the observation I can also point out how the user experience can be improved from analysing facial expressions and how they used the prototype. Which corresponds with the second interview were the participants express themselves by giving opinions on how to improve the UX.

1. What are the limitations highlighted in your or other dissertations?

The prototypes’ loading time was a big limitation as the prototype is Web-Based. This means that the internet network connection impacts drastically the downloading of the assets and loading of the website in general.

However, G. Andrews et al., (2014, cited in Qiao, X. et al. 2019) proposed that the  
impending 5G networks will open up new prospects for Mobile AR, particularly  
Web AR. They offer increased bandwidth (0.11 Gb/s) and lower network latency  
(110 ms), which increases data transmission on mobile networks.

Web AR is intended to be a lightweight and cross-platform Mobile AR implementation enabling the widespread promotion of AR applications. However, compatibility is also one of the most critical issues at the present.

Roy & Kanjilal (2021) conducted quantitative research to find the performance of the web-based AR applications on mobile devices with low-end hardware configuration supporting WebGL and WebRTC. Which showed that hardware is insignificant regarding performance. Moreover, it was found that performance is highly dependent on the entity object.

Roy & Kanjilal (2021) examined the performance of the web-based AR by using framerate rendering metrics on different devices and reported that the smartphone memory is a critical part of performance evaluation.

Yovcheva et al. (2014), cited by Javornik et al. (2018), underlined two key design issues. To begin, they underlined that AR content should highlight the important aspects of the actual destination - things such as a building’s name, for example, should be displayed in some form in the AR perspective. Second, they emphasize that AR apps should meet users’ information demands. For example, if a user is interested in a certain landmark, she expects the app to give such location-based information. Despite the novelty of AR, consumers have certain expectations about it that must be met if an application is to provide a positive experience.

(Olsson et al. 2013; Yovcheva et al. 2014, cited by Javornik, A., et al. 2018)

1. What possible areas of related study do you believe are feasible, based on the presented results?

Having the network connection be a big limitation as the prototype is Web-Based means that the internet network connection impacts drastically the downloading of the assets and loading of the website in general.

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Unlike virtual reality, augmented reality is not restricted to a wearable device and is being tested and deployed on a variety of devices, including phones, projectors, and computers, in addition to AR glasses or headsets. Companies such as Google and Meta (rebranded from Facebook).

In Google I/O 2022, Google released its latest AR glasses and its ability to see languages translated immediately in front of your eyes was demonstrated, which appears to be a highly useful application for AR glasses. The company gave no indication of when they will be available and only showed in a recorded video that didn't show the display or how you would interact with it. However, the film depicted a highly promising future for augmented reality. Before showing the video during Wednesday's I/O speech, Google CEO Sundar Pichai provided some perspective on how the business perceives AR. According to what he said, the company believes that AR can exist in a variety of places other than a smartphone.

“These AR capabilities are already useful on phones and the magic will really come alive when you can use them in the real world without the technology getting in the way. That potential is what gets us most excited about AR: the ability to spend time focusing on what matters in the real world, in our real lives. Because the real world is pretty amazing!” (Sundar Pichai. 2022)

Mark Zuckerberg has a grandiose vision for the metaverse, and he believes that you, too, will one day be able to view it – although through augmented reality glasses. Zuckerberg may have high ambitions for smart glasses, but the technology's near-term reality is far less so. The demo during Zuckerberg's Meta talk were not based on any working gear or software. Meta also doesn't have a working, wearable prototype of its intended AR glasses, instead opting for a tabletop display. Nonetheless, Zuckerberg has lofty ambitions for when his high-tech spectacles become a reality. Employees are working feverishly to complete the first generation by 2024, and are already planning a lighter, more advanced design for 2026, followed by a third iteration in 2028. ​​

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