Enhancing the Museum Experience using Augmented Reality

Axel Scicluna, Frankie Inguanez
Institute of Information & Communication Technology
University College
MCAST, Paola PLA 9032
{axel.scicluna.a100322, frankie.inguanez}@mcast.edu.mt

***Abstract*—this paper is about how using technology specifically a mobile app to improve popularity and increase interest in young people to visit the museum more. To increase the interest Augmented Reality was used so that the 3d models might catch the interest of the young people. Unity was used as the main platform for the proof of concept along with Easy AR for the AR technology along with c as the coding languages for both Unity scripts and Easy AR SDK. Making the museum more apealing with technology might not be for everyone hence this paper will go into the logistics of it.**

***Index Terms*—Keywords- Mobile, Museum, Augmented Reality, Unity**

I. Introduction

the aim for this paper is to shed some light on museums, some people take them for granted but if no one comes to visit them they will get no revenue and will shut down. Thank fully Malta has a good foothold on tourism and tourist visit a lot of museums which in turn keep the lights on for us Maltese residents to enjoy them. Malta is a tourism country when summer comes our businesses boom along with that is several different sectors of the market, if we can improve the museum sector and attract more people, it will also help other sectors because the more people are happy the more likely they are to suggest their friends to go to that place. Research Questions:

1) **C**an the entire museum experience be enhanced using an augmented reality application?
2) **W**ill the mobile app make the museum more popular, Especially with young people?
3) **I**s it feasible enough to for a businesses to invest in Augmented Reality?

II. Literature Review

Augmented Reality is most commonly used on mobile platforms, while the hardware needed to run augmented reality is widely available the software is not, as of late Augmented reality is gaining traction as more years go by company start using in more creative ways to innovate. The main AR(Augmented Reality) libraries are ARToolKit and EasyAR, both are free to use for developers however paying will increase the capabilities of the library. AR is very versatile and it has been used for games, medicine, marketing, transportation and the list goes on and on. For games it was used in

Fig. 1. Example of a Museum

the popular game Pokemon GO, AR was used to make the pokemon feel like they were in the real world and that you are capturing it. The point of augmented reality is to make the real world blend into the virtual world, AR can revolutionize the marketing industry by making your product pop out of your device.

The virtual object needs to be placed somewhere on the screen and how does the software know where to put it? Markers, these markers are unique images/patterns which are made specifically for the software to recognize them. There might be the need for different objects to show at different times, markers are the spawn point of the virtual object, marker-less AR exists also for example in hospitals a doctor can put a 3d model of a skull of the patient using his/her head as a marker to have a better understanding of the bone structure.(Furht, B.)

while it is good to have a guided tour with a device,

compared to an interactive experience it is much better to have the person interact with the environment. Museums are meant to evoke someones curiosity and make them learn, its in the museums best interest to have the visitors learn as much as possible.(Shigeki Yokoi)

when talking about attendance according to heritage malta annual report in 2015 the total admission fees is 1,197,921 while 2016 was 1,287,585 which is a 7.48

While there are rising numbers in visitors, the admission fees have only seen a 7.48

AR is not always good for every place, art museums for example would not really be benefiting from AR since the actual experience of it is to look at the art with your naked eye and appreciate it. It is always better to see something in person rather then a digitized version of it. The best museum that would gain from an Augmented Reality system is a historic type of a museum. One which people normally would read from a plaque and move on, now they interact with the object and some information may be retained.

The placement of markers may bring out a problem in it self, some museums might not allow for permanent placements. Temporary placing markers might lead to them not being straight from people touching them, falling down or getting damaged. Markers are easy to replace since you can print a marker from any printer, but keeping the marker without any scratches or marks is important so that to keep the software working without any mishaps.(Mixed Reality,[1])

in the medical field AR is being used in surgeries to give surgeons a practice round. Soft tissue surgery's like liver cancer patients are one of the few sick patients which are benefiting from this collaboration, when surgeons needs to cut out certain parts of the liver they need to have the upmost care and confidence that they are cutting where it needs to be cut using a model of the patient's organ.(Augmented Reality for minimally invasive Surgery,2010)

some problems with AR are the system delays. Since it takes part of the real world and integrates the 3d models or software into it and then puts it on screen, any delays or lag will negatively impact the user experience. There can also be Apps which make the virtual object overlap over the object to hide it, if the software does not align its self well with the object the illusion will be shattered. Some pointers which need to be taken in consideration are limit the amount of objects to load as possible, less objects the more processing power for the rest of the application. While augmented reality can be accessed from most modern mobile phones, if a private company wants its own devices for the use it can become quite expensive.

III. Research Methodology

While visiting Valletta visiting some museums I felt that everything around us is moving so fast and getting better while museums didn't change much apart from being more accessible to people with disabilities such as sight. In today's time its rare to see someone to not have a mobile phone, using the mobile phone as a familiar element it can change the

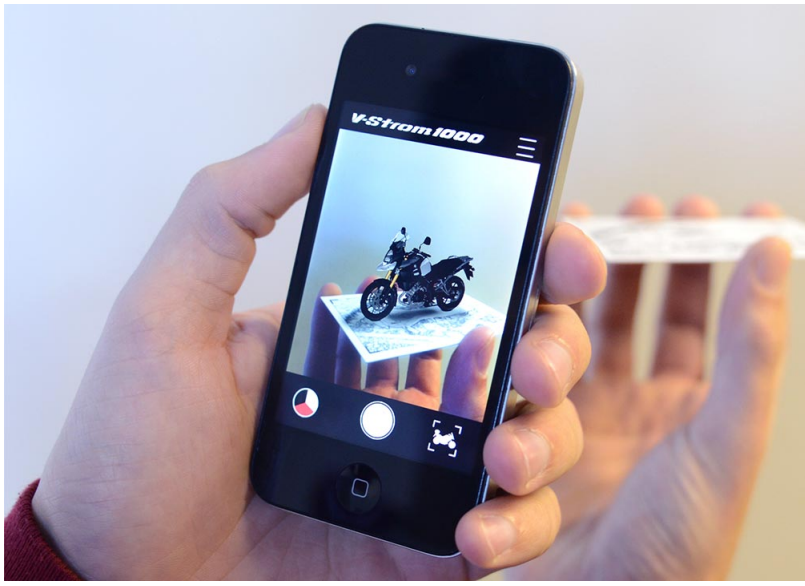

Fig. 2. Augmented Reality being used

experience of the visit from a forgettable one to a memorable. The prototype was first intended to be created using android studio however the limitations on the free libraries and the limitations of the program itself ruled it self out. After some research I found that you can create an app using. The difference between Unity and android studio is that Unity has more assets and tutorials on how to create a game then android studio, android studio can be extremely buggy on occasions. Unity uses c as its language of choice which I am accustomed to code, also speed is really important while using augmented reality so that we can keep a stable image and keep track of the marker. For the Augmented Reality SDK the first choice was ARToolKit because if its simplicity and large community forum it had. However when the search for the program started the company that owns the IP deleted every download link available and discontinued it. The second choice was EasyAR which was second choice only because it does not have a large community and tutorials as the other one. EasyAR is used to integrate AR without having to code the basics of it, makes development of the software run much quicker also unlike other SDK's there are no watermark on screen and EasyAR lets you sell the product. As for the Assets Photoshop and Blender were used, Blender is an excellent free tool that makes the modeling process possible for people without a lot of experience and its free. The App does not use a database only local storage is used to reduce the space that is used by the App, making the app work offline with no need to have a WiFi connection. The App can work on most phones as long as they have the space to install the app and a normal camera. Unfortunately without a camera the App doesn't work, since the root of the program is getting the tracker recognized by the mobile using the camera. The prototype will give many types of different data that can then be analyzed, the most important data that can be gathered is how much people enjoy using

the application in the museum compared to people who will go trough the same museum but without the application. The Second most important data gathered is how much the person who used the app has retained after the visit, in theory the more one enjoys the activity the more they would remember of the visit. This paper has to do with mobile phones so data that is collected can be correlated to the relationships that people have between them and mobiles phones although it will not be the main focus it might shed some light on the social aspect on how people view technology advances such as the application.

A group of 10 people were given the app and a quick run down of the app concept and usage. After 5 minutes of playing with the app, a survey was given to collect their insight. Quantitative data and Qualitative data are really important with each of them having their own strengths and weaknesses. Quantitative data usually use surveys to get the data, these usually would need a big amount of people to take the survey however what we are getting is not all of the data that we need. The survey only tells us about the state of mind of the population in general, it does not tell us about their individual likes and dislikes about the topic. That is where Qualitative data comes in, Qualitative data is much more personal and it is more focused on the human behavior. Instead using surveys interviews are set up with the questions shifting from yes or no questions to what do you think about this?,getting qualitative data will give us a better insight in the users minds.

IV. Project Evaluation

The prototype can be described as a proof of concept, but not a finished product. The program has been made to work with a json string which can in theory be used alongside a website to customize the quest and edit them. Visuals like particles and sound effects can be added to create a more finished product.

Would you use this app if presented?

Yes	Maybe	No
5	4	2

Do you think the app will help you enjoy and learn more about the museum?

Yes	Maybe	No
7	1	2

Would you revisit a museum because of this app?

Yes	Maybe	No
3	3	4

Are you against technology being incorporated in museums?

Yes	Maybe	No
3	5	2

V. Conclusion

While simple the application was still received in positive light, however the app was not up to par to professional level graphics and models. If the app was given new graphics and models , more people would find it more frendly and easy to use it. The more complex the app is the worst it will perform, the User will use it for an average time of 5-15 minutes hence making it hard to use and learn will discourage people from trying it. As the data suggests most people are on the fence about the implementation, the likely culprit of this is the unusual placement of this technology. People have been going to museums and getting the same experience, walking around ,reading and maybe watch the occasional video that until they are accustomed to it they might not try it. Not a large amount of data was collected making it hard to determine if young people specifically would visit more because of the technology. A test involving a real museum would have to take place since getting the museum more popular demands a more stable source of people then 1 day only. However the prototype can be made to appeal more to them using different themes and making the game more competitive. Considering the total progress of the paper, more data is required to have a more definitive answer however considering the data that was collected it can still be proven as accepted.

Fig. 3. MCAST Logo

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