Digital Design Methodologies CS5604

Augmented Physical Space

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Topic: Augmented Physical Space

Physical technology (smart displays, sensors, cameras and smartphones) fill our modern day cities. A government agency wants a new generation of digital services that work together and make movement through the physical space a more enjoyable experience. Designs can target specific user communities or provide a more general experience. The design must also include a capacity to measure the effectiveness of the services or service elements.

Online portfolio:

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Introduction

This essay is divided into 4 sections. **(1) Systematic Literature Review** is the first section where we conducted research based on following question: "What are the current design processes for augmented reality in museums and exhibitions?". **(2) Domain analysis** illustrates an overview of AR Colosseum 1.0. **(3) Design artefacts** present personas, wireframes, prototype, customer journey map, sketches, video, reflective report and critical analysis. **(4) References** summarize literature used for this project.

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Systematic Literature Review

Abstract

Background

Augmented reality creates a good opportunity to improve user experience in various museums and exhibitions around the world.

Objective

The purpose of this systematic review was to gather information about current design processes of augmented reality used in museums and exhibitions, presents some of the successful examples and help designers to make their future work of AR more effective.

Methods

We conducted a review of literature in January 2019 using Boolean data search in two scientific databases related to the main topic. Only English journals and articles focused on augmented reality related to museums and exhibitions were included to this study.

Results

The 17 studies were identified, precisely read and studied for this systematic literature review. Results show that users were in the vast majority satisfied with AR implementations. Study also gives a number of advices on how to design AR for museums and exhibitions.

Conclusion

Augmented reality related to museums and exhibitions was by users from many studies rated very high. It was proven that AR improve user experience in visitor attractions, although, there are still several technical and non-technical constraints which designers need to be aware of when designing augmented realities.

Keywords: museum, exhibition, augmented reality, design, innovation, user experience.

Introduction

In a lot of cases, gallery and museum visitors may appreciate artwork by just looking at it not needing any other kind of entertainment. Antoniou (2015) even says that some of museums do not wish to use technology because of "aesthetical contradictions". By Keil (2013) even when certain museums wish to have AR, in some cases it is not technically possible. There are indisputably museums where would be augmented reality not helpful at all. However, research shows that a good use of AR in museums and exhibitions can lead to improvement of user experience (Chan 2013, Madsen 2015, Lu 2014, Brancati 2016).

Methods

The search was accomplished in January 2019 for articles which were focused on the use of augmented reality in museums and exhibitions to improve user experience. Used key words for the search are defined below (see Figure 1). For the purpose of this study only 2 databases were searched. ACM, which provides articles published by the Association for Computing Machinery, and IEEE, providing access to Computing and Engineering Collection. Only articles and journals published after 2013 were considered for 2 reasons: (1) older articles

could not be relevant, (2) this year Google came up with its Google Glasses which showed a huge potential of what augmented reality could be and how it can be helpful.

Search Lines	Search terms
Line 1	("augmented reality" OR AR)
AND	
Line 2	(monument OR museum OR exhibition)

Figure 1 Search terms for systematic review

Our query returned 282 articles. When duplicates were removed, the total number of articles decreased to 267. Titles of remaining articles were screened which excluded another 162 articles (they were focused only on VR, not museum or exhibition related or focused on game industry) which went down to number of 105 articles. After abstract screening, another 63 of them were excluded (too theoretical, with too specific audience, not user experience related). From 42 of remaining articles, another 25 were excluded after the full-text review (too technical, not design related) which resulted in the final number of 17 documents selected for systematic literature review.

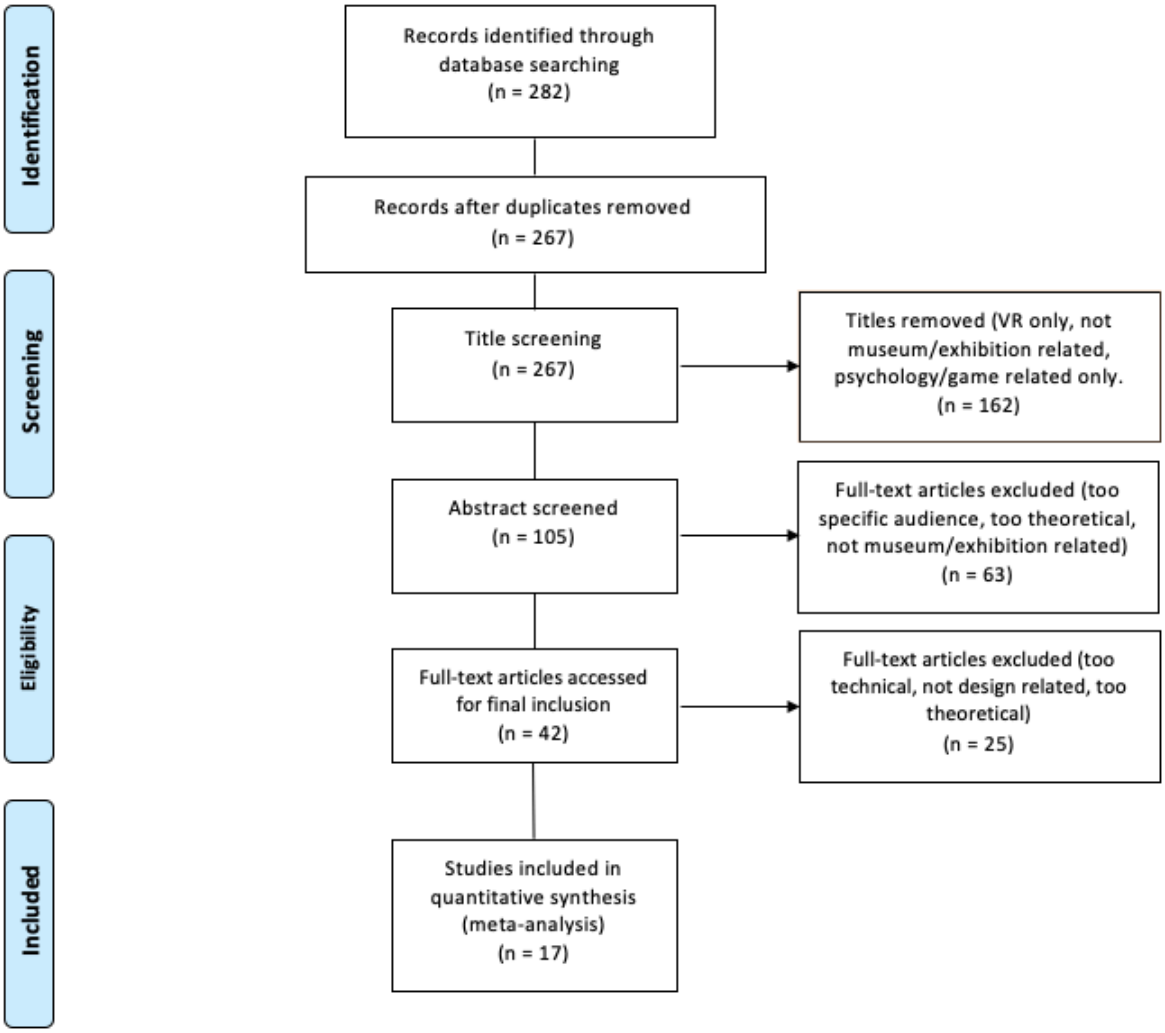


Figure 2 Systematic review of the literature flowchart

Results

Overview

By Keil (2013) sometimes it is difficult to incorporate augmented reality to museum for three main reasons. Firstly, blending pre-existed exhibition design aimed to specific purpose with technological infrastructure. Secondly tracking objects where there is no physical marking possible and also making visitors to understand context of the museum interacting with AR.

When designing augmented reality for museums and exhibitions, due to the Antoniou (2015) there are also several non-technical constrains which may occur. A lot of museums such as British Museum, Museum of Athens, Vatican Museum or National Archaeological museum do not wish to use technology because of "aesthetical contradictions". Author also says that based on reports, some of the installations can be distractive and could socially isolate users.

Hunsucker's (2018) study explore design parts of AR. By author, designing AR for museums and exhibitions has to be very user centric. The biggest problem is to overcome users disconfortabillity with technology. That is why he advices to use for example smart phones for AR as one of the familiar platform to visitors. Another constrain in his study occurred when users were not interested of downloading the AR app which is also something to count with. He also mentions that usability testing has to be run in its environment (to see if there is a space for technology, if the people will not be too crowded around it etc.).

Fugo (2017) describes various types of augmented reality. Museum related ones are for example marker-based ones (used in museums to display visual objects through marks which camera captures) and feature-based ones which are independent on any markers (e.g. used for face masks/filters software).

One of the feature-based augmented reality technologies was studied by Javornik (2017) who created a "magic mirror" in a theatre play. Visitors could interact with it before the play started and see how would their faces look with Ancient Egypt Make-Up. Feedback for this kind of AR was very pleasant *"Wow!", "This is amazing"*, *"That's so cool"* and *"I haven't experienced something like this before."*

Wearable augmented reality

Pollalis (2018) focus on wearable AR in exhibitions. He says that hand-held devices like tables and phones can lead to distraction since visitors can focus more on the device rather than displayed artefacts. Therefore, author prefers head-worn AR and presents ARtLens using HoloLens device. In this study, customers used HoloLens for 15 minutes. All of them agreed that they enjoyed their tour and learned more about the artefacts.

Another successful study on wearable AR was also made by Brancati (2016). 35 unskilled volunteers participated his study where they worn the AR glasses in open-air area. Users were analysing four dimensions: usefulness, ease of use, ease of learning and satisfaction. From 0 (very bad) to 5 (extremely good) users' choices were in the area between 3.5 and 4.5.

Vainstein (2016) was focusing on user experience and user expectations from wearable AR. 17 people of his study were testing the technology through AR glasses. When testers were asked what they expect from this kind of augmented reality, their answers were following: text (6), Audio (14), video (11), and images (11). This demonstrates the need for a variety of media options. Having information registered to the real-world position of the museum objects (i.e., see-through AR), was also important (13). The users also wanted a light weight device (17), and the ability to adjust/remove the display (11). Most users want to be able to choose from multiple content items (13), yet they still expect personalization (10), and acknowledge that the system should monitor them for that (12).

Successful projects for inspiration

Coulton (2014) Shows how can be AR effective on paintings in museums. In this case users, firstly "scan" certain painting through the camera of their mobile devices. Thanks to images matching technology, device will recognize certain art and return a text to users describing history of the painting.

Lu (2014) comes up with another example of AR use for paintings. Through tablets borrowed by the entrance of exhibitions, visitors could see how paintings "come alive" through short videos. Study of this kind brought a lot of positive feedbacks. 80% of the subjects felt curious and some of them tried to understand how the technology worked. Several of the subjects mentioned the visualizations created a situation of "paintings within paintings".

Successful augmented reality was also made in Koldinghus Museum in Denmark. Madsen (2015) used Ipads and tools for orientation tracking (gyroscope and compass within the Ipad) so users were able to see how the chapel looked in the past through these devices. The main attraction there was a large movable TV connected also to Ipad via HDMI wire giving visitors larger screen. Author admire, that future steps for this innovation would be to add a story telling aspect to it to keep visitors interested for longer time, however, feedback was very positive.

Breuss (2016) presents AR in Keltenmuseum Hallein which is based on the marks placed the ground. Users download and use an app through which they "scan" mentioned marks on the ground to see a huge talking Celt. By author, visitors loved it because of its real-time authentic storytelling where the Celt himself tells the story throughout the museum. Surprisingly, at the beginning of exhibition there were not many people familiar with this kind of AR.

Chan (2013) uses AR technology to show visitors ancient caves and paintings in it through tablets. He uses only iPads due to its "long battery and elegant design". The whole device is in glass so users could not break the device and they easier realised that there is nothing to touch on the screen. More than 100 000 users tired this technology and most of them were due to the study amazed. There were 2 tablets given to groups of 3-10 people which by the author wasn't problem. *"Most fun is to hold it, but entertaining is also to look at it",* users said. By author it is suitable for everyone from 2 – 80 years old. Feedback from users was positive, although some of them wished to add more text or videos to it.

Augmented Reality can also serve a good purpose. Kim (2013) shows for example of an augmented reality on white rhino sculpture which tells a story about their past, present and futuristic extermination evoking people to care more about this problem.

Discussion

Several studies reported improvements in user experience when interacting with augmented reality in museums and exhibitions (Chan 2013, Madsen 2015, Lu 2014, Brancati 2016). From this data, we can see that AR has a huge potential for future use in touristic attractions, although, there are still some things to be improved.

By Madsen (2015), some people interacting with AR stood in a way of another customers' view which made them feel little uncomfortable. In this case the device could be designed in a way where everyone can see what's happening on the screen. In this study, but also in Vainstein's study (2016) users were expecting more features from augmented reality devices. On the other hand, adding more features could lead to lack of interest especially from seniors or non-technical users. Therefore, designers have to find a healthy balance which would fit most users. Hunsucker (2018) mentions a case when certain number of customers refused to download the app for AR. This is another risk when designer expect visitors to use their own

devices. Antoniou (2015) also mentions that some AR used in museums could lead to social isolation.

On the other hand, great success was recorded from for example Lu (2014) when AR technology was focused on real paintings, which made them through iPads cameras "come alive" using short interactions. This use of augmented reality has potential to be aslo applied on e.g. sculptures which will come alive and tells a story. This kind of storytelling from an authentic non-alive character was recorded for example in a study of Breuss (2016) which resulted in very good feedback as well.

Overall, due to a huge diversity in a use of AR it is obvious that this kind of entertainment is still forming its way to find its real and effective use. Even when there is a big satisfaction with the use of AR in museums and exhibitions, more studies on the same topic should be made and compared to each other for better analysis. Results could help designers to improve user experience, fulfil users' needs and avoid mistakes using non-effective implementations.

Conclusion

The purpose of this systematic review was to explore current design process for augmented reality in museums and exhibitions and help readers designing effective AR based on previous studies. Even though it was proven that AR improve user experience in visitor attractions, there are still several technical and non-technical constraints which designers need to be aware of when designing technologies like this for entertainment. Some of them are mentioned in this study.

Domain Analysis

Statement

More and more museums and exhibitions try to enhance their user experience via augmented reality. This essay focus on one of them in Colosseum, Rome.
Visitors will be able to interact with AR devices within the Colosseum and have a look on how the monument looked like in the past, giving them also information about its history and another interactions and videos.

Domain Analysis

A. Introduction – AR Colosseum 1.0 is a name of new AR presented in
- Colosseum, Rome with a purpose of education, study and enjoyment. Its aim is also to improve user experience.

B. Glossary
- **Augmented reality:** (AR) is the integration of digital information with the user's environment in real time.
- **User experience:** covers all elements of user's interaction with the company, its services, and its products.
- **Museum:** non-profit institution which is open to public exhibiting heritage of humanity and its environment for education, study and enjoyment purposes.
- **Exhibition:** an event which objects (e.g. paintings) are shown to the public.
- **Colosseum:** the largest amphitheatre built during the Roman Empire located in Rome, Italy. Colosseum is open to public.

C. General knowledge about the domain
- The price of AR is included in the price of the ticket
- AR will be available for every visitor during opening time of Colosseum.
- 3x 2018 Apple iPad Pro 12,9'' will be used as AR devices due to their big size, long battery and elegant design. The front side of iPads will be covered in glass which will protect the device and to help customers to realize that the display is not touchable.
- Users will interact with the device moving it around its axis.
- The app installed in devices will entertain visitors with text, videos and animations showing them how the colosseum looked in the past.

D. Clients and users
- Regular visitors of Colosseum.
- A system administrator
- Duty manager (who is in charge of turning them on and off).

E. The environment

3 iPads will be installed in 3 different places within the Colosseum. Each iPad will give visitors distinct information of Colosseum's history:

- **1. iPad**: 72 CE - construction of Colosseum.
- **2. iPad**: 80 CE - official opening by Titus with a 100-day gladiator spectacular.
- **3. iPad**: 422 CE - Colosseum is damaged by earthquake.

F. Tasks and procedures currently performed

- The main aim of this technology is to entertain and educate visitors.
- Visitors will interact with the device moving it around its axis (horizontally and vertically).
- The display of the device will not be touchable.
- Visitors will try to find buttons "pinched" in the Colosseum which will provide them by information or short videos.
- The view of past can be either stable (showing only past), changing continuously with a view from present after certain amount of time or there will be a button allowing visitors to swap these two views (need to be tested).

G. Competing software

- In the Colosseum, there is no competing software installed. Visitors do not go to places like Colosseum with the main aim to explore AR devices. Therefore, no completing software was chosen.

H. Similarities to other domains

- There are several domains similar to the presented one. Each museum using this type of technology varies due to the different types and themes. Overall, our technology tries to provide customers with more information and entertainment than other museums.
- Inspiration for AR Colosseum 1.0 came from e.g. Chan (2013), Madsen (2015) and other authors covered in systematic literature review further in this essay.

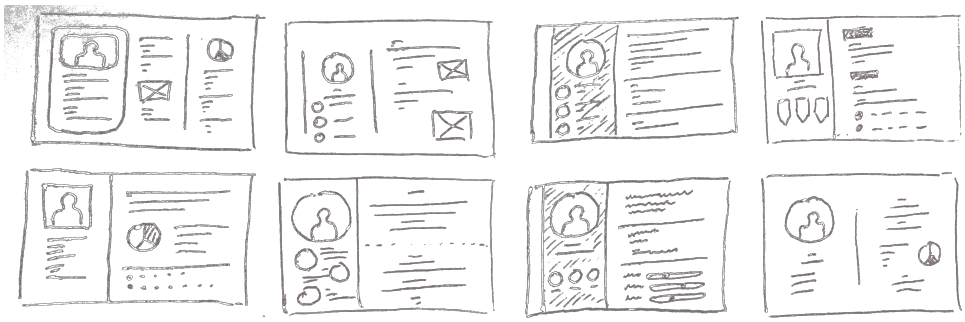
Design artefacts

Personas

Definition

By Unger and Chandler (2012), personas are documents describing typical target users. These documents can later be presented to project team, stakeholders and clients and their aim is to paint a clear picture of who is using the product.

Sketches



Reflective report

Before we came up with the final product, 5 personas were created to help with our designing part. Each persona is based on typical real visitor of unnamed museum we worked for where besides working we also observed visitors' characteristics and personalities for this essay.

Figure 3 Card design

When creating personas, we tried to pay attention on simplicity, clarity and most importantly practicality. Therefore, left part of each persona document serves as an immediate overview of each character. These overviews can be printed on cards (size of French playing card) which can designers keep anywhere as a quick helper in any designing part (see Figure 3).

Right side of persona document describes personas with more details (see figure 4). This part introduces bio of individual characters and explains why they are visiting Colosseum in Rome. This section also describes individual goals, frustrations, focuses on their personality and show their skills including history knowledge. That one should help on deciding how specific should history information in AR Colosseum 1.0 be.

We decided not to differentiate individual personas by colours hence they can just by observing lead to undesirable feelings which these personas might not even own. Grey colour was chosen as an "neutral feeling" colour.

Rather than using colours as a quick hint we chose to use family names as a quick introduction to personas' personalities.

Illustration

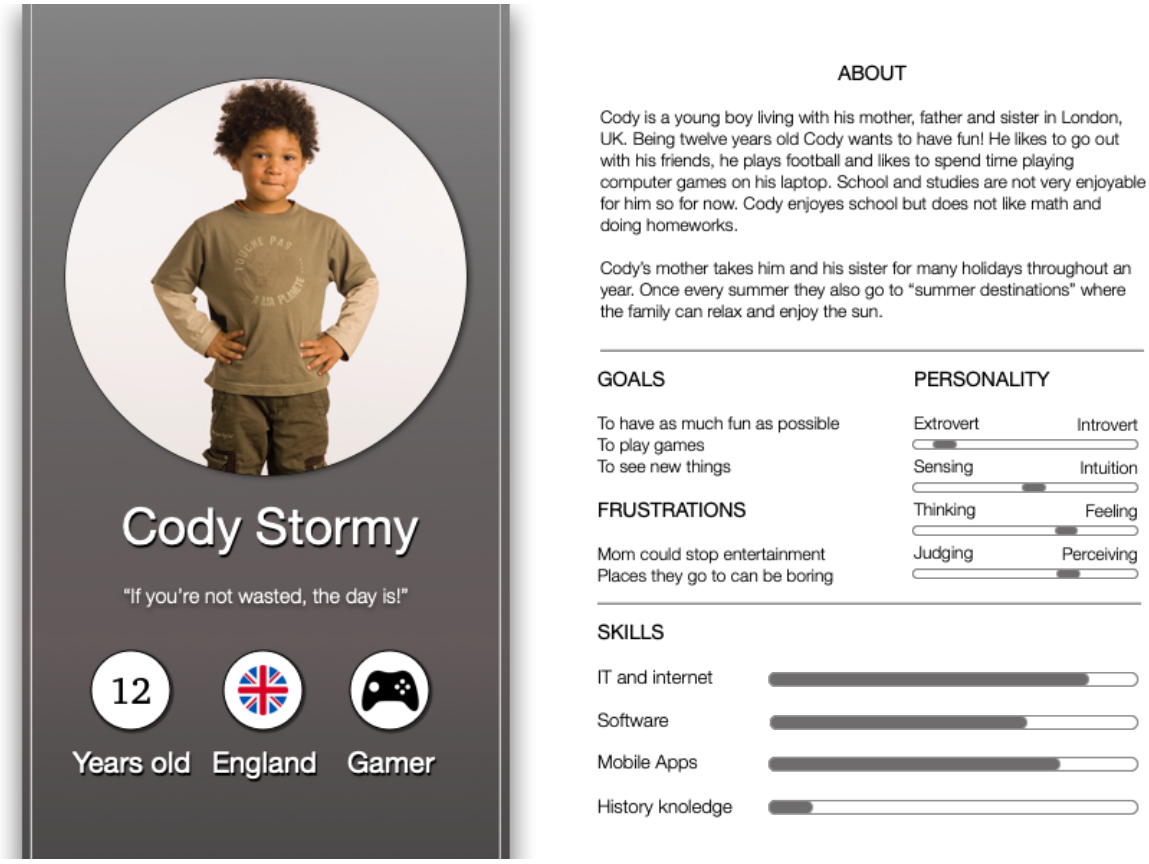


Figure 4 Cody Stormy Persona

Figure 5 Margaret Rainy Persona

Figure 6 Robert Cloudy Persona

Figure 7 Nicol Sunny Persona

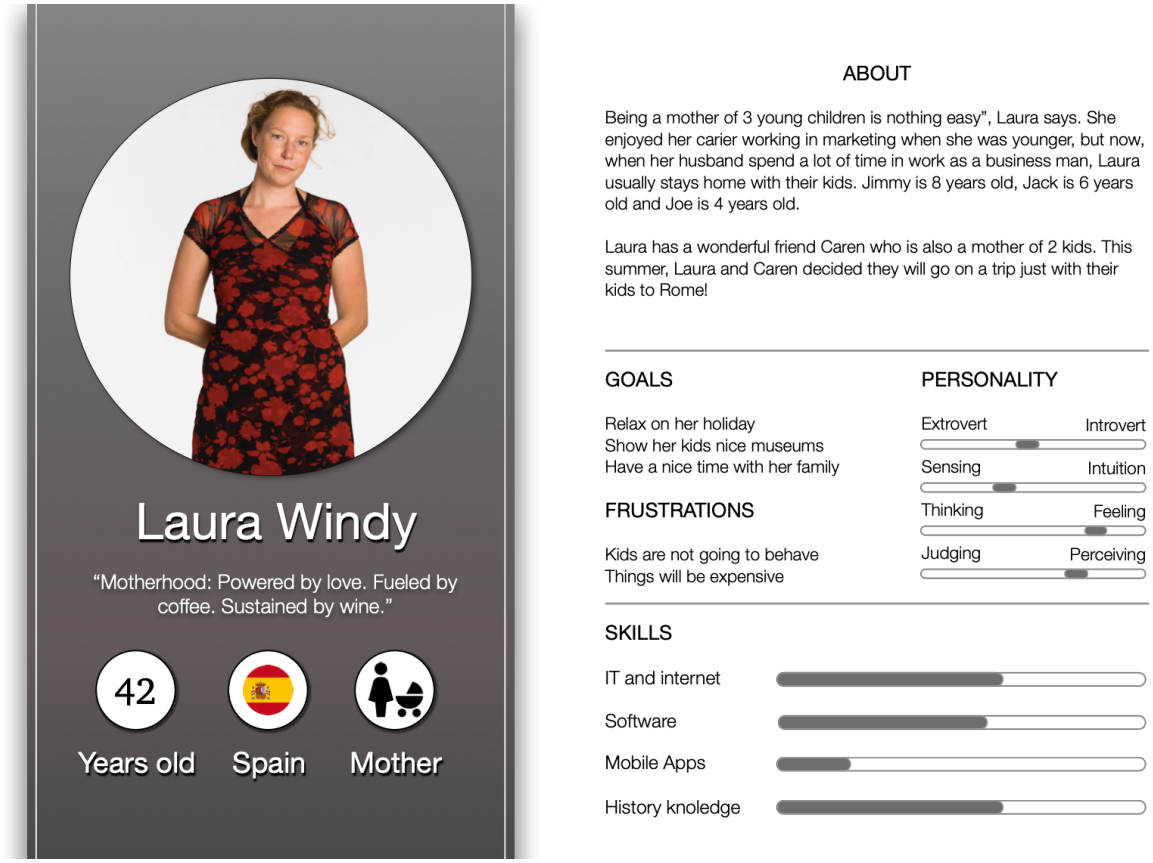
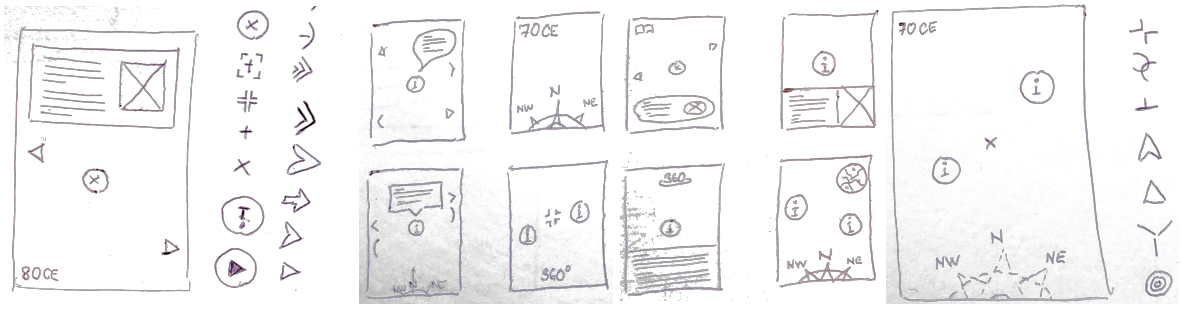


Figure 8 Laura Windy Persona

Definition

By ExperienceUX (2018), wireframing is a process of designing a digital service at the structural level. It is used to lay out functionality and content of websites or apps and they are used early in the development process to establish structure before visual design is added.

Sketches



Reflective report

Figure 9 and 10 illustrates app behaviour when device is moved from the left side to the right side. From very beginning, we wanted to build our AR on individual circle buttons with **"i"** symbols in its centre which would unravel information or play short videos when user clicks on them (see figure 10). However, looking at our personas with various technical skills, we knew we need to come up with something intuitive and easy to use. Therefore, we decided not to give an option of touching the screen.

All interaction with the device will happen when the whole device is moved (horizontally and vertically). Device will be later on covered in a glass case which should help customers realizing that the device will not interact with human's touch. Another reason why we used a glass case was protection of iPads.

Thinking about another hint for customers to help them with rotation of device, we added **360°** icon (see figure 9) which lightly "pulses" when no one interacts with the device. When we decided that device will not be touchable, we had to think about another option on how to "click" on individual info buttons pinched in certain places. That's why we came up with a **focus** symbol which is constantly placed in the middle of the screen. Information and short videos are unrevealed when **focus** meets the information button moving device vertically and horizontally (see picture 10).

When placing text area, we didn't want to cover the whole screen with the text to confuse or disorient customer. That's why we chose the text area to appear in the bottom of the screen where it takes approximately 10 – 20 % of the screen which should not disorient the customer. Amount of text was chosen for approximately 30 seconds of reading so users can enjoy the device but also give chance to other visitors by not using it for too long.

To help users with orientation, we came up with an idea of **arrow** icons (see figure 9 and 10). These icons will show up when **"I"** symbol gets away from displayed area when device is moved. Now, users can easily find all the information. Another hint was added to the top left corner. When user is in "exploring mode", no text is shown and **360°** icon is visible advising customer to rotate the device. When information button is found, customer enters "reading mode" and icon is changed for a **book** icon which advices customer to read an article which just showed up.

Illustration

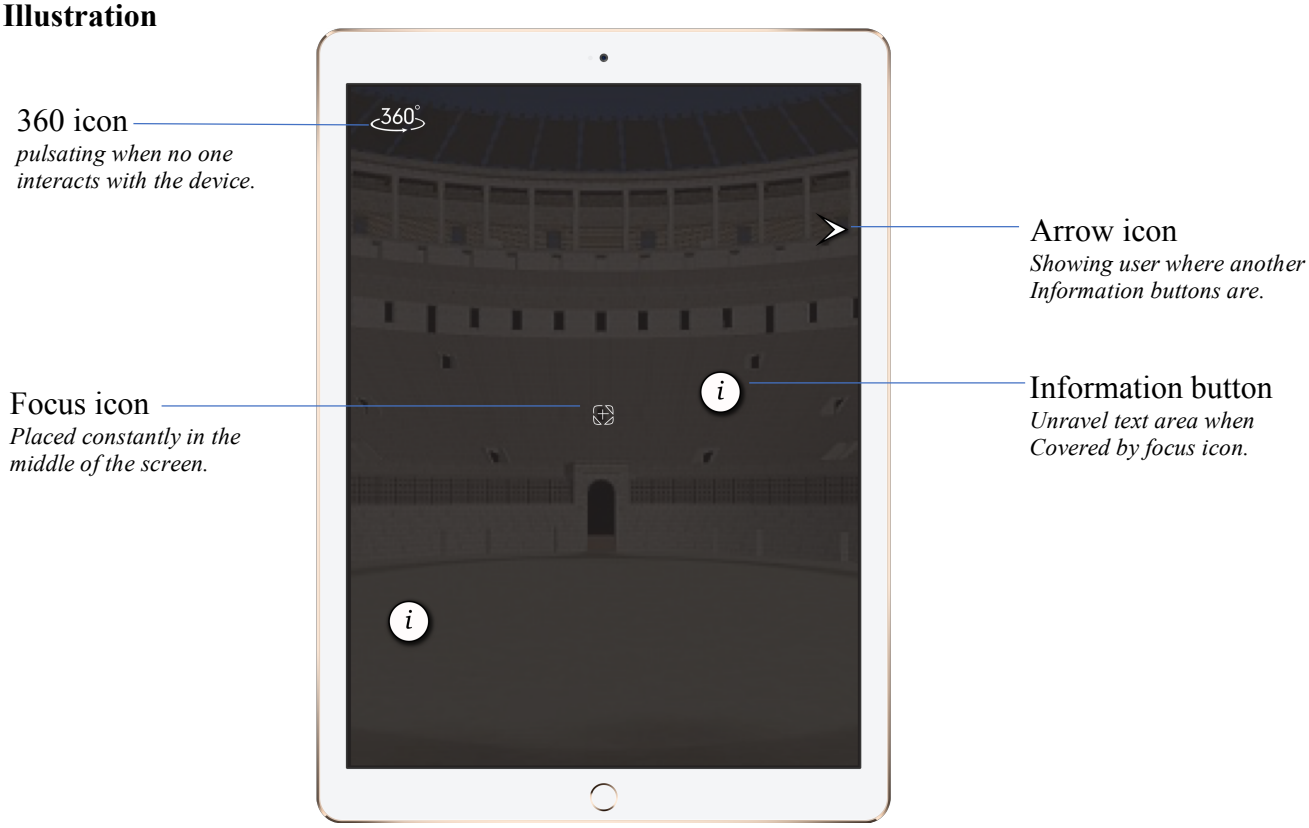


Figure 9 Wireframe 1

Figure 10 Wireframe 2

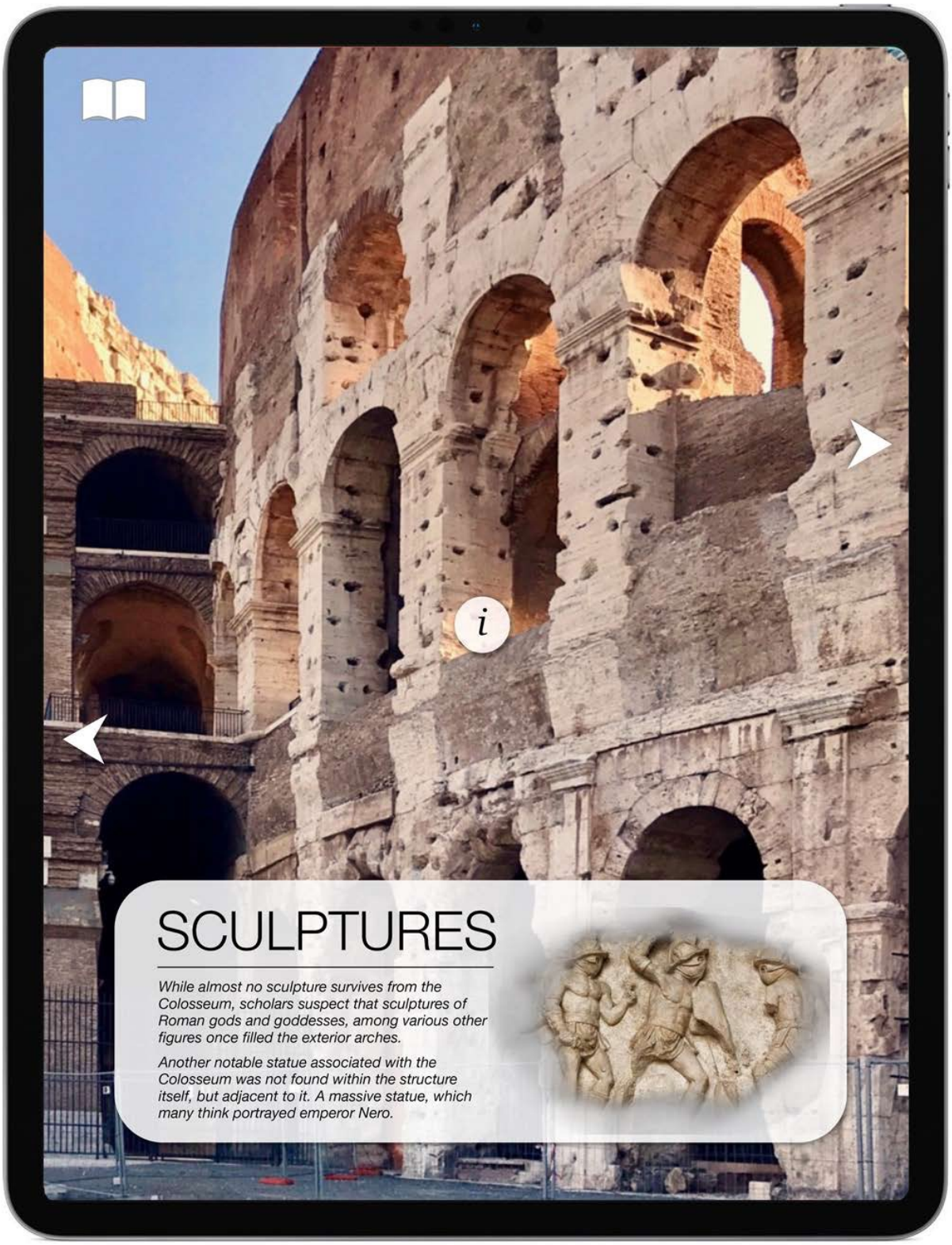


Figure 11 Prototype

Definition

By SalesForce (2016), customer journey map (CJM) is visual representation of every experience customer have with certain product or company. It helps businesses to get into customer and see their business from customer's point of view.

Sketches

Reflective report

As with personas also here we tried to represent customer journey map as simple as possible so everyone can understand it. Since document like this can be presented to many other stakeholders, we didn't want to create CJM on several papers and burden them with all the documents. That's why, in our CJM, we tried to experiment a little when putting all personas to one list. If stakeholders or designers don't have immediate access to personas, they can again use cards summarizing personas we mentioned before. We also tried to keep this section in the similar theme of previous work hence usage of grey colour.

We chose to place personas at the top of our CJM so there is more space for touchpoints description in horizontal line. With layout like this we could not use graphical representation of personas' interests. Therefore, we chose illustration in a form of percentage (see figure 12) followed by their short expression on a form of short sentence.

When thinking about touchpoints, due to the already existing attraction, we wanted to focus only on those which has something to do with our product directly. First touchpoint is when customer hear about AR Colosseum 1.0 for the first time. Second one is when visitors see the device for the first time. Third touchpoint focus on users' interaction with the device for the first time, trying to find out if everything is clear and easy to understand. Last touchpoint is when users are already comfortable with the device and enjoy its usage.

We also added the last line to our CJM where customers evaluate their experience in one sentence. These thoughts could also lead to ideas of improvement for designers.

Illustration

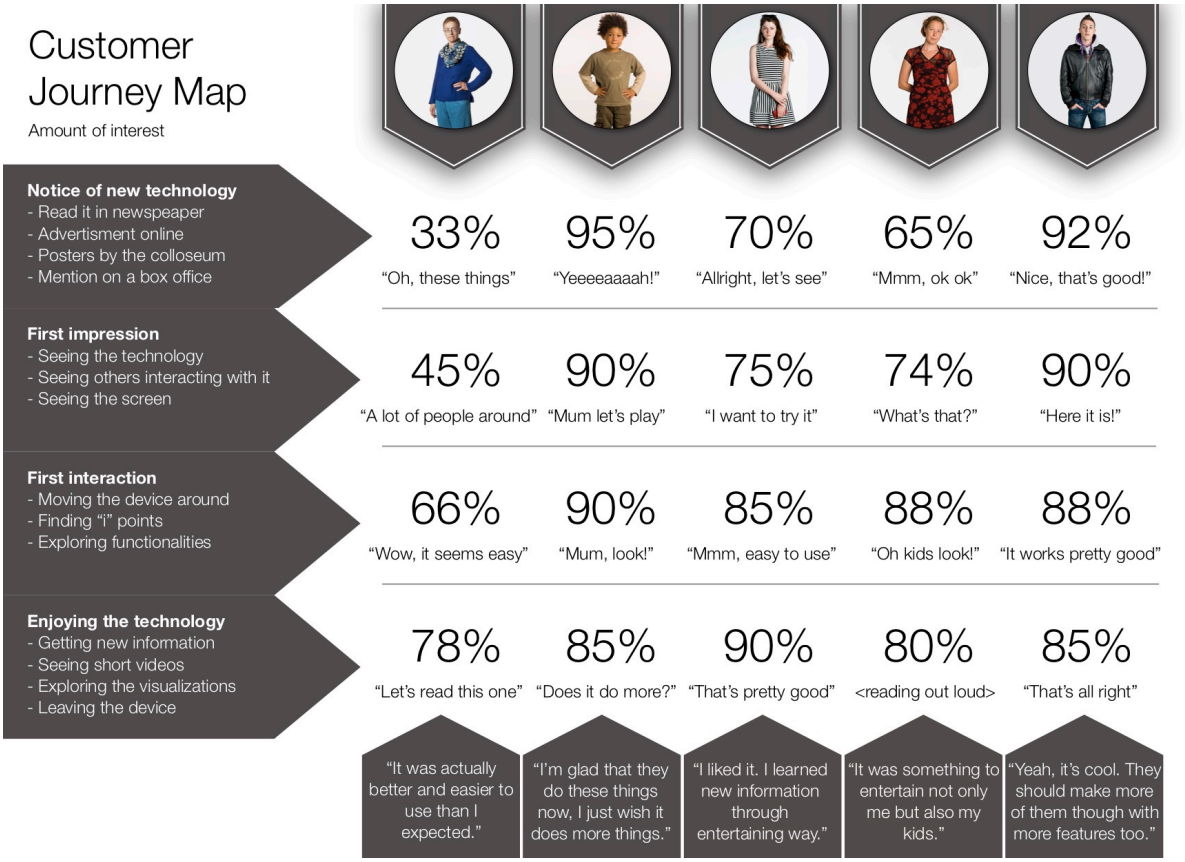


Figure 12 Customer Journey Map

Video

Click on following link to play a video. https://www.youtube.com/watch?v=plc2C2NLP18

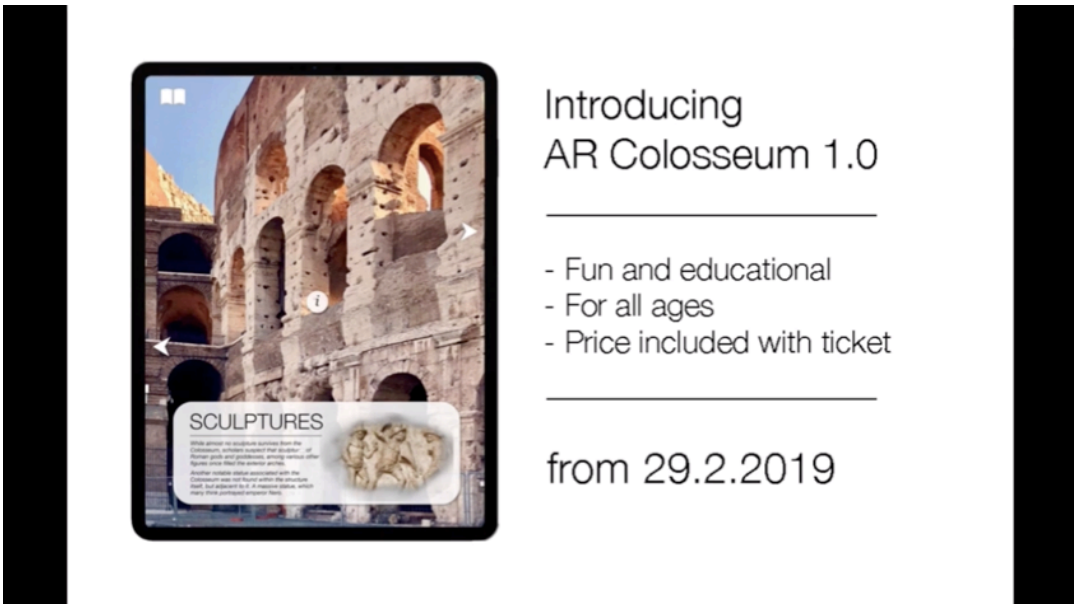


Figure 13 Video

Critical analysis

Systematic Literature Review.

If deeper and larger analysis was conducted, more keywords and their combination would be used.

Domain Analysis.

Domain analysis gives a background of AR Colosseum 1.0 which we created for this essay. All sections were done well, however, more similarities to other domains could be found.

Personas

Personas were created in a practical and useful way to help designers and to be presented to stakeholders. Doing larger essay, more personas might be included.

Wireframes

This part was designed with the main focus on simplicity and usability. App designed like this could in some cases lead to lack of features (need to be tested).

Customer Journey Map

CJM were also designed with the main aim to be simple yet useful. In some cases, this effort might lead to lack of information.

Video

This video is supposed to excite potential visitors of Colosseum and let them know that AR is available. For more curious visitors, more explanation of how this augmented reality works could be shown.

References:

Antoniou, A., O'Brien, J., Bardon, T., Barnes, A., & Virk, D. (2015). Micro-augmentations: Situated calibration of a novel nontactile, peripheral museum technology. *Proceedings of the 19th Panhellenic Conference on Informatics - PCI '15*, *01–03–Octo*, 229–234. http://doi.org/10.1145/2801948.2801959

Brancati, N., Caggianese, G., Pietro, G. De, Frucci, M., Gallo, L., & Neroni, P. (2016). Usability Evaluation of a Wearable Augmented Reality System for the Enjoyment of the Cultural Heritage. *Proceedings - 11th International Conference on Signal-Image Technology and Internet-Based Systems, SITIS 2015*, 768–774. http://doi.org/10.1109/SITIS.2015.98

Breuss-Schneeweis, P. (2016). "The speaking celt" – Augmented Reality Avatars Guide Through a Museum – Case Study. *Proceedings of the 2016 ACM International Joint Conference on Pervasive and Ubiquitous Computing Adjunct - UbiComp '16*, 1484–1491. http://doi.org/10.1145/2968219.2974044

Chan, L. K. Y., Kenderdine, S., & Shaw, J. (2013). Spatial user interface for experiencing Mogao caves. *Proceedings of the 1st Symposium on Spatial User Interaction - SUI '13*, 21. http://doi.org/10.1145/2491367.2491372

Cortes-Davalos, A., & Mendoza, S. (2016). Layout planning for academic exhibits using Augmented Reality. *2016 13th International Conference on Electrical Engineering,Computing Science and Automatic Control, CCE 2016*, 3–8. http://doi.org/10.1109/ICEEE.2016.7751241

Coulton, P., Smith, R., Murphy, E., Pucihar, K. Č., & Lochrie, M. (2014). Designing Mobile Augmented Reality Art Applications: Addressing the Views of the Galleries and the Artists. *Proceedings of the 18th International Academic MindTrek Conference: Media Business, Management, Content & Services*, 177–182. http://doi.org/10.1145/2676467.2676490

Fuguo, P., & Zhai, J. (2017). A mobile augmented reality system for exhibition hall based on Vuforia. *2017 2nd International Conference on Image, Vision and Computing, ICIVC 2017*, 1049–1052. http://doi.org/10.1109/ICIVC.2017.7984714

Hunsucker, A., Baumgartner, E., & McClinton, K. (2018). Evaluating -an-AR-based-museum-experience. *Interactions*, 66–68. http://doi.org/10.1145/3215844

Javornik, A., Rogers, Y., Gander, D., & Moutinho, A. (2017). MagicFace. *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems - CHI '17*, 4838–4849. http://doi.org/10.1145/3025453.3025722

Keil, J., Pujol, L., Roussou, M., Engelke, T., Schmitt, M., Bockholt, U., & Eleftheratou, S. (2013). A digital look at physical museum exhibits. *Digital Heritage International Congress (DigitalHeritage)*, *2*, 685–688. http://doi.org/10.1109/DigitalHeritage.2013.6744836

Kim, T., Jang, J., Park, J., & Park, J. (2013). The journey of a White Rhinoceros: Sculpture augmentation for gallery exhibition. *2013 IEEE International Symposium on Mixed and Augmented Reality - Arts, Media, and Humanities, ISMAR-AMH 2013*, 39–43. http://doi.org/10.1109/ISMAR-AMH.2013.6671265

Kostin, V. E., & Ovchinnikova, V. A. (2005). Elaboration of automatic control system of production engineering process at the central station of oil accumulation. *11th International Scientific and Practical Conference of Students, Postgraduates and Young Scientists; "Modem Techniques and Technologies", MTT 2005 - Proceedings*, 155–156. http://doi.org/10.1109/SPCMTT.2005.4493235

Lu, W., Nguyen, L. C., Chuah, T. L., & Do, E. Y. L. (2014). Effects of mobile AR-enabled interactions on retention and transfer for learning in art museum contexts. *ISMAR 2014 - IEEE International Symposium on Mixed and Augmented Reality - Media, Arts, Social Science, Humanities and Design 2014, Proceedings*, 3–11. http://doi.org/10.1109/ISMAR-AMH.2014.6935432

Madsen, J. B., & Madsen, C. B. (2015). Handheld Visual Representation of a Castle Chapel Ruin. *Journal on Computing and Cultural Heritage*, *9*(1), 1–18. http://doi.org/10.1145/2822899

Mason, M. (2016). The MIT Museum Glassware Prototype. *Journal on Computing and Cultural Heritage*, *9*(3), 1–28. http://doi.org/10.1145/2872278

Pollalis, C., Gilvin, A., Westendorf, L., Futami, L., Virgilio, B., Hsiao, D., & Shaer, O. (2018). ARtLens: Enhancing Museum Visitors' Engagement with African Art. *Proceedings of the 19th International ACM SIGACCESS Conference on Computers and Accessibility - DIS '18*, 195–200. http://doi.org/10.1145/3197391.3205435

Vainstein, N., Kuflik, T., & Lanir, J. (2016). Towards Using Mobile, Head-Worn Displays in Cultural Heritage: User Requirements and a Research Agenda. *Proceedings of the 21st International Conference on Intelligent User Interfaces*, 327–331. http://doi.org/10.1145/2856767.2856802

Unger, R. and Chandler, C. (2012). *A project guide to UX design*. Berkeley, Calif.: New Riders.

Salesforce.com. (2019). *Customer Journey Maps: How to Guide Your Leads to Customers*. [online] Available at: https://www.salesforce.com/products/marketing-cloud/best-practices/customer-journey-maps/ [Accessed 13 Jan. 2019].

Experience UX. (2019). *What is wireframing | Experience UX*. [online] Available at: https://www.experienceux.co.uk/faqs/what-is-wireframing/ [Accessed 13 Jan. 2019].