Project Management Case Study
Project: *Recycling History*

Client: Burwood National Museum

The client, Burwood National Museum, has an existing archive of material using traditional media (such as papers, books, photographs, videos and physical objects). The Museum wish to support new uses of the materials through the use of an enhanced reality application. They have indicated that it is important that this not just be a direct translation of the existing artefacts into an electronic or 3D medium. The outcome is to either enhance existing ways of working with the materials, or offer opportunities for extracting value that have not been possible previously.

Context: The client's museum is where this application will be utilised. The areas within the museum that this project will focus on are the prehistoric gallery, the history of warfare gallery, and the historical artefacts display. Each of these areas have their own designated rooms within the Museum and are physically isolated from one another.

The client has provided the provided minimum requirements for the VR/AR experience:

• Interaction with this content has a number of well-defined affordances (watching a video in a linear sequence, picking up and touching museum artefacts). Different uses of the material require imagining other ways in which the material can be utilized.
• The material described all tends to be passive. These elements can be brought to life once included in a virtual world and given responsibilities to ensure that they detect when they are needed, and then to provide best value to autonomous action.
• Traditionally the shape and appearance of an object defines expectations on how it is used. Consider revising how the function of something like a book would be achieved once it adopts the form that best suits its role, rather than a form based on the materials available to physically manufacture it.
• The reimagined version of these materials needs to be part of the working environment of its users. This might occur in a virtual reality but more likely involves an augmented environment where virtual materials can have a presence in the physical world.

Project manager:

Andrew Suttor

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Requirements Analysis

Project details:

Team and roles

Client: Burwood National Museum

Company/Organisation: Burwood National Museum.

Point of contact: Museum Exhibition Manager, Rahul Ram, email: ramr@deakin.edu.au

Project manager: Andrew Suttor

Designer: Andrew Suttor

Developer: TBC

QA/Testing: TBC

Goals of the project

The goal of the project is to provide an interactive experience of the three selected genres to better enhance the user's understanding of these topics.

Background:

The museum has noticed an increase in uptake of its mobile learning and information guide application. Noting the increasing levels on engagement with this medium, the museum is interested in enhancing the user experience as they attend the museum. The museum wants to utilize emerging technology to better promote their lesser known displays and galleries.

List of requirements

Playing audio archival materials when looking at static displays.

Playing video archival materials when looking at static displays.

To display preserved texts and historical documents and allow virtual interaction. Cued visually or location based.

Interaction with virtual and physical objects concurrently.

Interaction with virtual and physical objects across multiple devices.

Autonomous interactions and/or demonstrations to better explain larger scale concepts. Eg table top battle fields, roaming dinosaurs etc.

Use of continuous background audio to enhance realism and create more engaging experience.

Shared virtual experiences.

The application must be readily available to museum visitors so they can run it on their own devices.

Terminology

Gallery: A designated physical space allocated to a particular time period. Eg the prehistoric gallery, the history of warfare gallery.

Display: A limited physical space within a gallery focusing on a specific event/item within the genre of the gallery.

Assumptions

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- Physical dimensions of the displays are variable and can be changed if needed to enhance AR experience. Physical dimensions of the galleries cannot be changed to enhance AR experiences.

- An AR solution is required to enable interactions with rare artefacts without physically touching or damaging them.
- Mixed reality concepts will need to be applied to make up for the absence of particular artefacts within the physical interactive displays.
- The AR solution will utilize all digital media that the museum has on a particular display. The transfer of information, audio and/or video into a digital variant is the responsibility of the client.
- The generation of any application specific digital assets is the responsibility of the project team.
- Both a head mounted display version and a mobile device version will be required.
- Single user experiences are preferable for most displays whilst select activities will require multiple participants.
- No previous AR experience is required by the user.
- All AR experiences will occur in physically separated displays and galleries. There is no requirement to link one digital experience to the next.
- Users will physically pass through a door, archway or corridor to transition from one gallery to the next.
- The design will be completed in the designated time frame, providing the developer clear and explicit instructions that can result in a system implemented and tested in the time allowed.

User stories

Bob goes to the museum. He walks into the History of Warfare Gallery. He can hear explosions, gun fire both in the distance and close by. He can hear other environmental noises associated with warfare that are often accompanied with various degrees of haptic feedback that makes Bob's senses feel heightened. If Bob looks at the ceiling, he can see historical aircraft in the distance engaging in a dog fight. Through his device he looks at a painting of a battle in a medieval warfare display. He is shown a digital map indicating where this battle took place. His attention is turned to a flat surface below the painting where he will see a virtual table top representation of the battle. Bob is able to watch the table top battle from start to finish, or adjust/move key organizations within the battle to change the outcome. Bob can have a shared experience in which Jane can control the opposing force and together they can create an "alternate history" by changing the outcome of a battle depending on their own decisions/actions. Alternatively, Bob can have "alternate history" experience by himself.

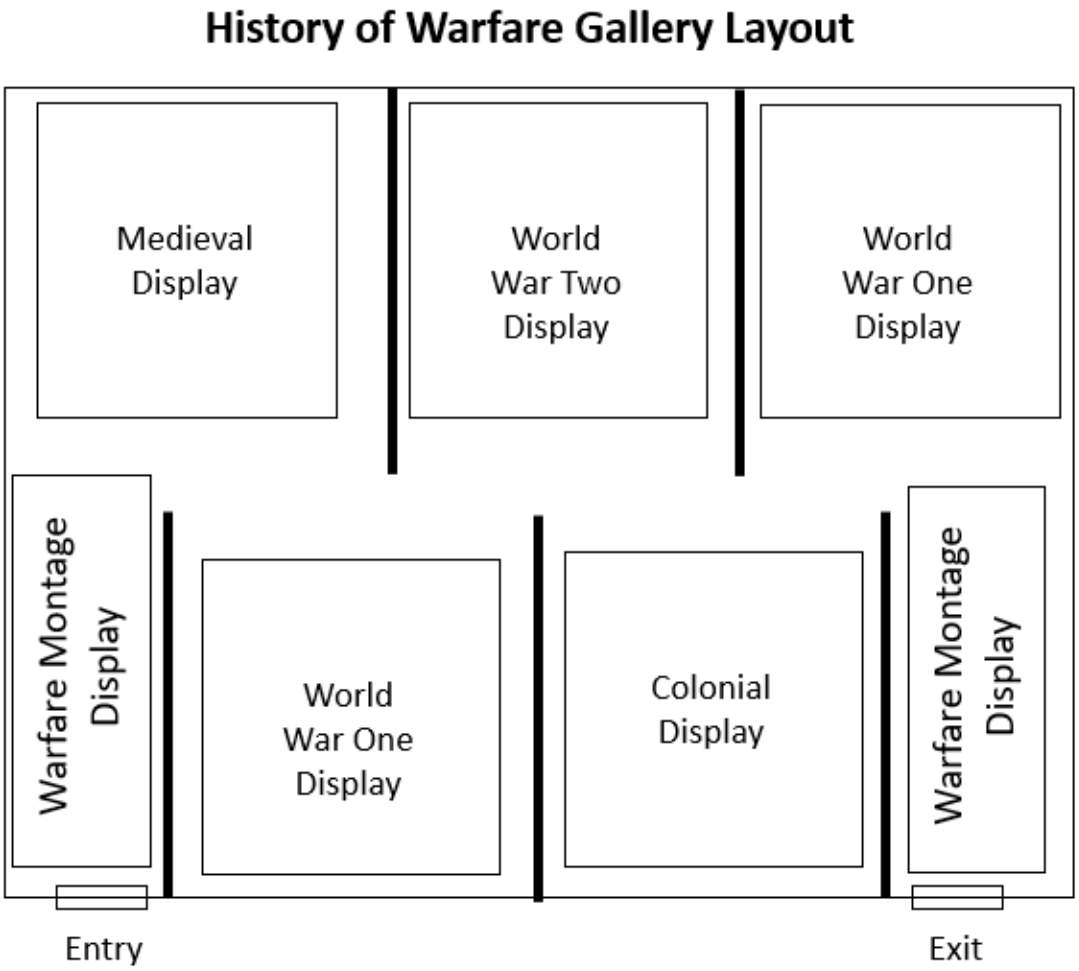
Bob goes to the Dinosaur Gallery at the museum. He can hear dinosaurs roaring in the distance and other environmental noises expected within dense tropical jungles (breaking branches, wildlife noises, rustling bushes, birds being startled etc). He watches virtual dinosaurs interacting autonomously within the gallery that is decorated with virtual foliage. Bob puts his opened hand, palm up, out in front of him and looks up a Pterodactyl display (winged dinosaur) using his device. The Pterodactyl digitally comes to life and swoops down to take virtual food from Bob's held out hand. As Bob watches the Pterodactyl fly away another Pterodactyl swoops in from the side and takes the food from its mouth. Both disappear in the distance.

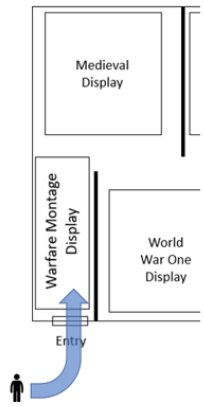
Bob goes to the museum. He sees an ancient roman house partially built in the historical artefacts' gallery. On his device he can hear the sounds of the house getting made including voices and construction noises. He can see a digital map that shows where these dwellings were made and the time period that is accompanied by an audio cue of its brief history. Bob is encouraged to pick up

virtual stone bricks to finish construction of the house and windows. Bob can be helped by Jane who can see the same bricks laying on the ground along with other virtual tools and building materials. Jane and Bob interact with the virtual tools and building materials to complete the building task. Virtual tools include a hammer to push bricks into place, nail in windows etc. Bob and Jane are guided by audio and visual clues on how to complete the construction of the roman house using the virtual artefacts.

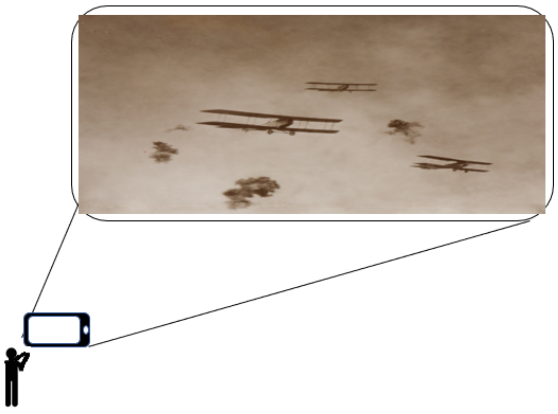
User interaction and design

Story board of history of warfare experience:

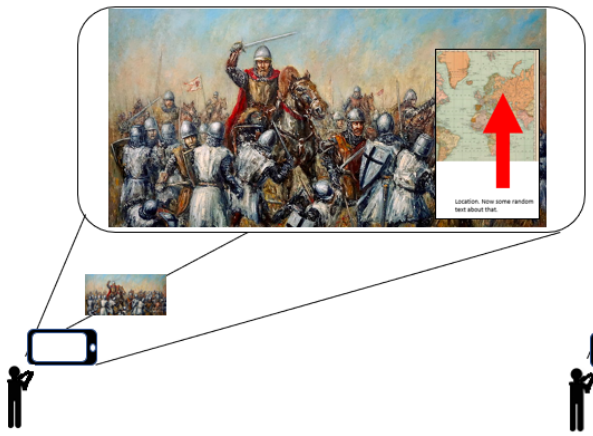




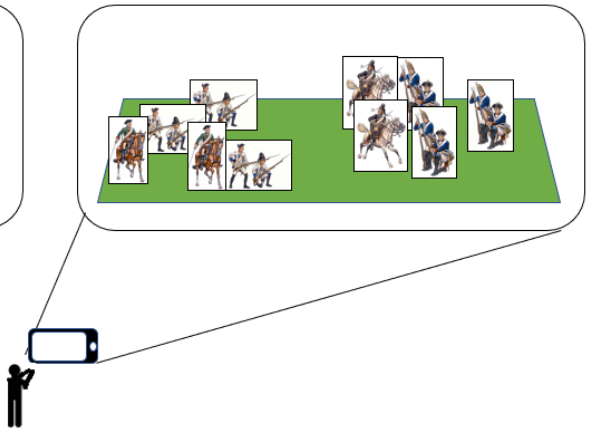
1. Bob goes to the museum. He walks into the History of Warfare Gallery. He can hear explosions, gun fire both in the distance and close by. He can hear other environmental noises associated with warfare that are often accompanied with various degrees of haptic feedback that makes Bob's senses feel heightened.



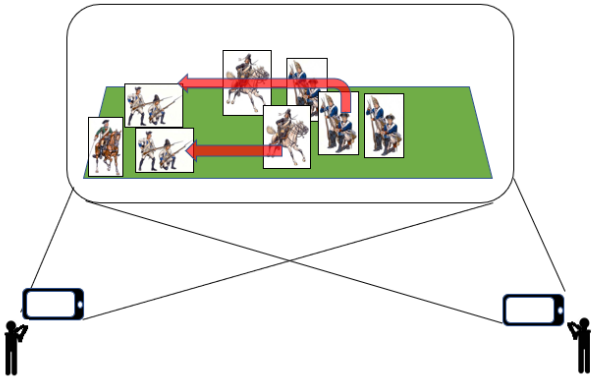
2. If Bob looks at the ceiling, he can see historical aircraft in the distance engaging in a dog fight.



3.Through his device Bob looks at a painting of a battle in a medieval warfare display. He is shown a digital map indicating where this battle took place. He can watch video and will hear battlefield noises and commentary.



4. His attention is turned to a flat surface below the painting where he will see a virtual table top representation of the battle. Bob is able to watch the table top battle from start to finish, or adjust/move key organizations within the battle to change the outcome. Bob can have "alternate history" experience by himself.



5. Bob can have a shared experience in which Jane can control the opposing force and together they can create an "alternate history" by changing the outcome of a battle depending on their own decisions/actions.

Things that are clearly out of scope.

- Development for AR headsets is currently out of scope. AR headsets will be developed in the future if the uptake of the mobile device version is seen as effective by the Museum management.
- The Prehistoric Gallery and Historical artefacts Gallery will not be implemented during this tranche of the design, development and implementation of the application. All key requirements listed previously apply equally across all three galleries and the stories outlined above. Given the intention of this application is to test the response to an AR app at the museum, the management has chosen to pursue historic warfare as the test case. They have funded the project accordingly.

Proposed Solution Design

The list of components can be broken down into the following four sub categories:

- Audio/visual effects
- Virtual object manipulation
- User interactions.
- Shared experiences

The component requirements per sub category are:

LIST OF COMPONENTS

Audio/visual effects:

1. Display a map/image and supporting text when a historic picture is identified
2. Play audio when a historic picture is identified
3. Play video on demand.
4. Display text-based information.
5. Autonomous play environmental sound effects.

Virtual object manipulation:

6. Interact with virtual objects.
7. Detect flat surfaces in the physical word to project onto.
8. Autonomously move virtual objects.

User interactions:

9. Display GUI.
10. Enable hand gestures.

Shared experiences:

11. Provide a shared virtual environment for two users to interact within.
12. Interaction with virtual and physical objects across multiple devices.

Project Development Plan

Trimester week 3

Goals:

- Confirm all audio and visual requirements before sourcing them

Designer:

- Identify audio and video requirements from Museum.
- Identify additional audio and video requirements specific to the application.
- 3d object requirements identified thus far. Grouped as follows: Ambient/environmental (Eg biplanes, explosions) that will enhance the general user experience of feeling like they are in a war zone.

Tasks:

- Source basic sound effects required to achieve suitable back ground noise.
- Source sample of Museum audio and visual media to play through application.
- Start manual
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Progress:

- TBC

Trimester week 4

Goals:

- Audio visual resources compiled and collected

Designer:

- Source all digital media from Museum
- Source any media requirements specific to AR application

Developer:

- Nil

Tasks:

- Source all audio and visual media
- Commence design of any visual/audio assets beyond historical media provided by museum.

Progress:

- TBC

Trimester week 5

Goals:Confirm 3d object requirements

Designer:

- Design all 3d objects that will need to be developed.
- Generate basic, low poly count objects as examples to use as concept demonstrators.
- Design rules for table top game.

Developer:

- Nil

Tasks:

- Complete 3d model asset list
- Complete basic models for all object requirements.

Progress:

- TBC

Trimester week 6

Goals:Complete GUI design

Designer:

- Design all GUI interactions

Developer:

- Nil

Tasks:

- Link GUI interactions to all possible user scenarios
- Provide sketches/story boards for complex interactions.

Progress:

- TBC

Trimester week 7

Goals:Confirm application design from start to finish

Designer:

Tie together entire experience using the application.

Complete case study and manual in preparation for briefing to developer.

Developer:

- Nil

Tasks:

Progress:

- TBC

Trimester week 8

Goals:

- Developer will be confirmed this week.
- Goals will change from design target to specific functionality that is available and how to validate that the application is achieving this portion of the functionality correctly.
- Likely components to be worked on this week will include Virtual object manipulation.

Designer:

- Provide detailed briefed to developer on what the requirements from designer, developer, client and user perspective are.
- Coordinate testing of this week's development at the end of the week.

Developer:

- Read manual and case study
- Confirm any requirements or points of confusion/uncertainty.
- Confirm development order.
- Likely components to be worked on this week will include Virtual object manipulation.
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Tasks:

- Detect flat surfaces in the physical world and project onto it.
- Move virtual objects in the table top game scene on predefined path.
- Autonomously move virtual objects (planes) when looking at the ceiling.
- Test above functionality.

Progress:

- TBC

Trimester week 9

Goals:

- Likely components to be worked on this week will include User Interactions.
- Display GUI.
- Enable hand gestures.

Designer:

- Likely components to be worked on this week will include User Interactions.
- Coordinate testing of this week's development at the end of the week.

Developer:

- Likely components to be worked on this week will include User Interactions.

Tasks:

- Display GUI for audio visual experiences.
- Display GUI for table top game/demonstration.
- Enable hand gestures with GUI.
- Link GUI actions to table top actions (eg move, attack, withdraw etc)
- Test above functionality.

Progress:

- TBC

Trimester week 10

Goals:

- Enable two users to interact with the virtual table tap experience
- Commence testing of all aspects of application.

Designer:

- Confirm multi user requirements are met.
- Coordinate testing of application.
- Ensure multi user networking is tested across multiple device platforms.
- Complete final draft of manual.
- Coordinate testing of this week's development at the end of the week.

Developer:

- Develop necessary networking architecture to enable two users of a shared virtual environment.

Tasks:

- Provide a shared virtual environment for two users to observe in real time.
- Enable interaction and manipulation of virtual objects in a shared virtual world.
- Test above functionality as well as full application testing.

Progress:

- TBC

Trimester week 11

Goals:

- Manual completion
- Application completion

Designer:

- Last chance to confirm no major bugs or errors. Confirmation that the application works in various different settings with different users with no previous expose to app or scenario.
- Coordinate testing of this week's development at the end of the week.

Developer:

- Final bug fixes week.

Tasks:

- Investigate any bugs reported by testers
- Final editing and proofing of manual.
- Testing of the above solution implemented.

Progress:

- Final quality assurance and testing.
- Finishing touches on manual.

Trimester week 12

Goals:

- Demonstration of final product to the Museum. Both designer and developer will be present to address Museum Management questions and queries.

Tasks:

- Present application.

Progress:

- Complete!

References:

Need for a collaborative AR experiences:

https://www.forbes.com/sites/bernardmarr/2019/01/14/5-important-augmented-and-virtual-reality-trends-for-2019-everyone-should-read/#701601b422e7

https://towardsdatascience.com/augmented-reality-ar-trends-the-past-present-future-predictions-for-2019-8e1148345304

https://www.forbes.com/sites/quora/2019/06/11/what-will-augmented-reality-trends-be-in-the-future/#2e0af77966c2

Stick figures:

https://www.google.com.au/search?q=basic+stick+figure&source=lnms&tbm=isch&sa=X&ved=0ahUKEwixoszX29HjAhUWQH0KHYpmAiAQ_AUIESgB&biw=1920&bih=920#imgrc=DjAUvv3OHz75fM:

Historical dog fight:

https://www.google.com.au/search?q=historical+dogfights&source=lnms&tbm=isch&sa=X&ved=0ahUKEwisppyK4NHjAhXPV30KHVbgBNQQ_AUIESgB&biw=1920&bih=920#imgrc=MRJhJTZq4hSFSM:

historic infantry:

https://www.revell.de/en/products/modelmaking/military/figures-history/seven-y-war-austrian-prussian.html

historic cavalry:

https://www.revell.de/en/products/modelmaking/military/figures-history/seven-y-war-austrian-dragoons.html#&gid=1&pid=6

historic battle painting:

https://pixels.com/featured/medieval-battle-arturas-slapsys.html

historic map:

https://www.facebook.com/historicmapworks/photos/a.303357169736354/2200653086673410/?type=3&theater