# Reading Guide

## Future of AR
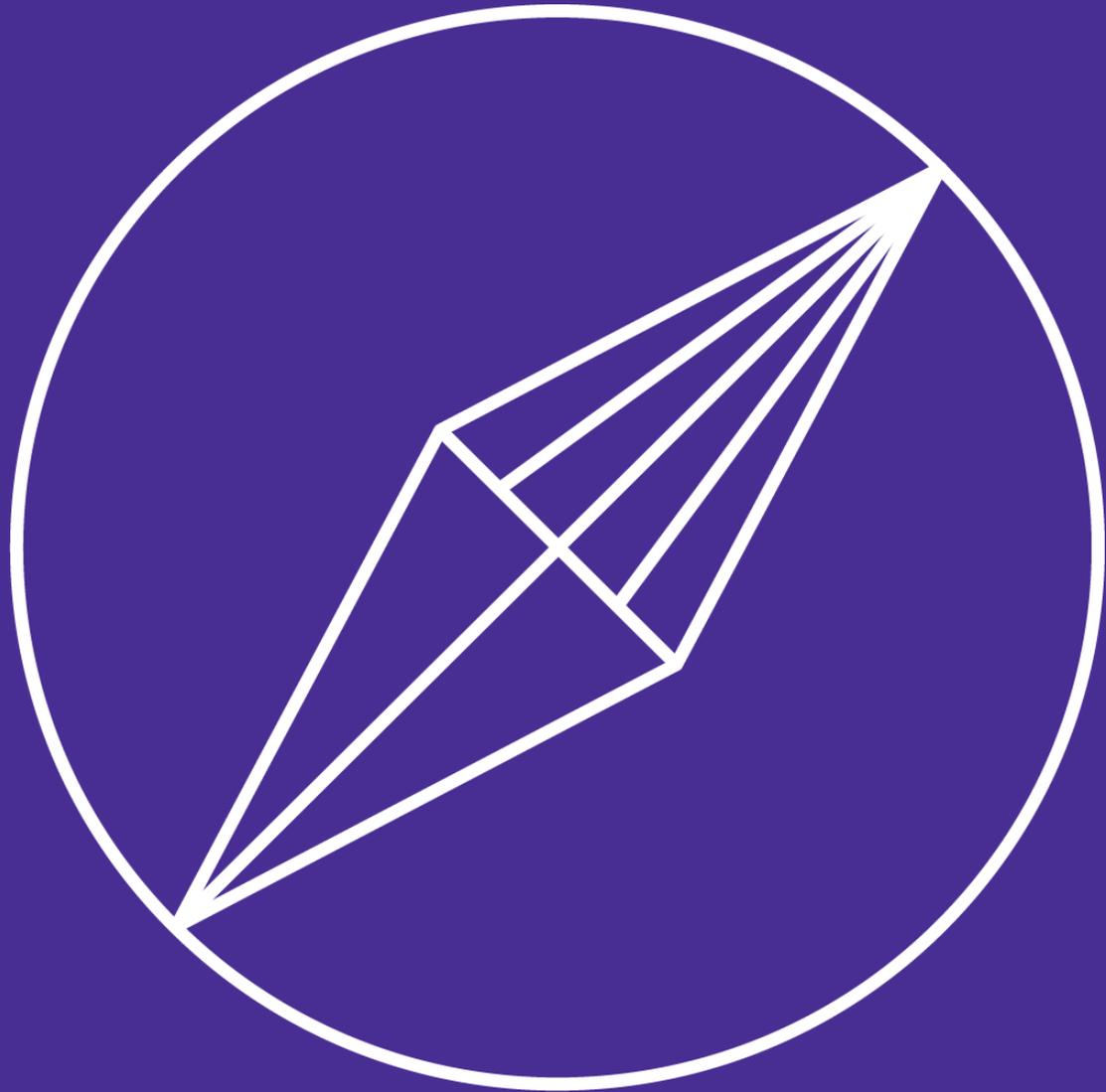
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Project period:    04/02/19 - 05/07/19

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# The assignment

## Issue

**People use technology on a day-to-day basis, spending nearly half of their day interacting with media. They take 90% of (media) information from screens, but the possibilities of interaction with screens are limited. With the rise of AR wearables we're finding new ways of experiencing information, because most senses can be freely used to control the digital environment ending up being more intuitive and engaging if done correctly.**

The last couple of years, AR has become a widely used technology. Many smartphones have the right technology to run AR-applications. The next step in the use of AR, is to make it more intuitive. AR-wearables offer more intuitivity in use, but are not yet able to reach the consumer and how to interact with them is not yet defined.

## Company

Greenhouse is a brand & performance agency based in Eindhoven. Greenhouse Group is part of Group M, one of the biggest Media companies in the world, serving a third of all global advertisements. Competitors of Greenhouse Group are other media agencies serving Dutch markets. The Labs department of Greenhouse Group exists to test new technologies that has not yet been ready for the consumer market. In Labs, students explore these technologies and look for opportunities. By testing out these technologies in multidisciplenairy teams the company creates an understanding of the potential impact of these innovations. By doing so, Greenhouse tries to stay ahead of the competition.

Greenhouse wants to explore the capabilities of the Magic Leap, one of many AR wearables, creating an understanding of how an AR experience for a wearable should be designed. Greenhouse seeks to gain a lot of knowledge about user experience in order to be prepared when the AR wearables starts to be accessible for the general public. There is an existing gap in knowledge on how such an experience should be made.

## Goals

The assignment has a main question: **'How to design a user-friendly experience for AR wearables?'** and the following design challenge:

**Set up user experience guidelines for AR wearables using knowledge gathered by designing, building and testing a prototype for AR wearables.**

These guidelines will give Greenhouse insight into the do's and don'ts of designing an AR wearable application, so they will be prepared for interested clients. Other goals are to research where opportunities are for AR wearables and what the capabilities are of such devices.

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1        https://www.thinkwithgoogle.com/advertising-channels/mobile-marketing/the-new-multi-screen-world-study/

2        https://www.nielsen.com/us/en/insights/news/2018/time-flies-us-adults-now-spend-nearly-half-a-day-interacting-with-media.html

3        https://www.statista.com/statistics/591181/global-augmented-virtual-reality-market-size/

## Approach

The internship was started by making a **Project Initiation Document (PID)**. This document described what the assignment was and how this assignment was completed. The planning had three distinctive phases: Initiation phase, prototyping phase, and presenting phase. During these phases the DOT-framework was used to get to the results required. To answer the main question, five sub-questions were made. During the internship, multiple strategies were used to answer these sub-questions.

## Implementation & Results

Before reading through all attached files, I would like to point out that these are also attached inside the portfolio as products. Going through the portfolio gives the full experience.

### What is AR used for at the moment and what might be future uses?

#### Library strategy: **Augmented Reality research**

I started doing library research into the technology I would be using for the coming internship: Augmented Reality. First, I started looking into what Augmented Reality is, then I searched for how it was used now and how it could be used in the future.

What came out of this research is that AR can have a lot of different uses. In the future, AR can make work easier by overlaying the real world with digital tips or instructions.

#### Field & Library strategy: **Current situation of technology**

To get an insight on where chances could lie for the use of an AR wearable, a Situation Complication Question Answer (SCQA) analysis was conducted. The goal of this workshop is to create an understanding about what trends are currently shaping the online environment, and why Greenhouse wants to explore AR wearables. First, a workshop was held in which the whole group brainstormed about assumptions on the state of technology and what consequences this could bring. After this workshop, I made a couple of stories with validated assumptions. Out of these stories a final story was made with the help of the stakeholders.

#### Field & Library strategy: **Customer segment**

To answer the question in the SCQA analysis, context was needed. This context was made by defining a specific customer segment. First, multiple customer segments were chosen that might be interesting for showcasing AR wearables, and a jobs/pains/gains analysis was done to define the assumed needs of the customer segment. Out of six customer segments with assumed needs, one was chosen: People working in office. To validate the assumptions on this customer segment, a survey was held.

#### Conclusion

The research done on answering this question gave me a good foundation on where chances could be for the use of AR. By specifying a customer segment, I could begin looking for the added value of an AR wearable within that specific customer segment.

### What is the added value of an AR wearable compared to other, more common ways of using AR?

#### Library strategy: **AR wearables vs Mobile AR**

Creating a good concept would first need the knowledge on where AR wearables really had an added value with reference to mobile AR. I did library research about this as well as thoroughly testing the Magic Leap that was available in office.

What came out of the research was that AR wearables are still in their infancy, and most articles did not recommend the use of AR wearables for consumer use yet. But looking further than that, I could conclude that the real added value of AR wearables was the freedom to interact with the environment with both hands. This, combined with the feeling that there were no boundaries within the AR environment, could lead to a much more immersive and intuitive experience.

#### Library strategy: **Magic Leap USP & Limitations**

Apart from researching AR wearables, the Magic Leap had to be analysed. The Magic Leap was chosen as the tool being worked with because it is the newest AR wearable in the market, and it has the most capabilities of all AR wearables at this moment.

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Field strategy & Workshop strategy: **Concept document**

To specify the added value of an AR wearable within the customer segment, a concept document was made. In this concept document, the value proposition was made from the validated pains & gains of the office workers. From this value proposition, the concept was created. The concept is described in a user journey within the office environment. The document also describes the added value of the concept.

Conclusion

It became evident that an AR wearable is not ready yet to be used as a consumer ready product. However, a real added value of the AR wearables is that it gives a user the option to use both hands freely to control the digital environment. Defining a contextual concept has helped to look at an added value of AR wearables. Within the office workers customer segment, there are touchpoints at which an AR wearable would be an added value in the future.

The Magic Leap itself utilizes a controller for precision controls and it has the biggest field of view of all standalone AR wearables.

## What are the UX design guidelines on comparable products, and how to apply these to AR for wearables?

Library strategy: **UX guidelines on other products**

To structurally set up UX guidelines, they were divided into 5 categories based on 5 important UX principles: Accessibility, hierarchy, confirmation, consistency and user control. After these categories were set up everyday things, screens, mobile AR and VR were examined.

## What kind of UI has the best usability and what is the most intuitive way of controlling it with an AR-wearable?

Workshop strategy: **Prototype & building UI**

Because the AR wearables are a fairly new technology, there is not much research about it written down. Therefore, tests had to be conducted.

To test the optimal usability of UI within an AR wearable, multiple iterations of a prototype were made. To optimize the flow of the prototype, I worked on mock-ups, wireframes and tutorials. In the prototype these were seen as the menus and tutorials. By the end of the internship, 5 iterations were made and tested and a final 6th is being built until the end of the internship.

Lab strategy: **Test usability on target audience**

The prototype was tested about every 2 weeks, and at the end of the internship, the prototype had gone through 6 iterations. The goal of these iterations was to implement all data found on research and to find out what UIs had the best usability.

## What are constraints for the user, and bystanders, when using an AR wearable?

Library strategy: **Research about constraints**

To get a complete picture of the UX of AR wearables and what could become future problems, possible physical and psychological constraints were researched. This was done by conducting web research.

Field strategy: **Interviews with users after tests**

After conducting user tests, the test persons were always asked if they experienced physical strains or experienced blackouts (cognitive overload).

What came out of these after test interviews was that nearly none of the test persons suffered anything that could be labelled a physical or psychological strain. However, due to the testing time limitation of 15 minutes, it might be that these phyiscal/psychological strains would be present if the test would have lasted longer.

When asked about the future of AR wearables, most people interviewed did see a future for AR wearables. But for this to have a future, the device should become much better and more convenient.

## Results

Showcase strategy: **Conclusion & Recommendations**

Showcase strategy: **UX design guidelines for AR wearables**

Out of the research done and building a prototype, I concluded that at the moment, setting up user experience guidelines for AR wearables is difficult because they are not yet a consumer ready product. But there is a lot of potential and it is good to know already how to use an AR wearable to its fullest potential. I defined multiple user experience guidelines to optimize the experience on an AR wearable. These guidelines are structured according to five UX principles: accessibility, hierarchy, confirmation, consistency and user control.

Through my research I could give Greenhouse valuable information on AR wearables. This information could be used in the future when AR wearables become more consumer ready, or to give clients requesting an AR wearable experience a good idea of the work required to build a user-friendly AR wearable experience.

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## My Role

"There are no problems we cannot solve together, and very few that we can solve by ourselves." – Lyndon B. Johnson

Because I have been working in a team of 6, it is very important to describe what my role was in the team. Within the team, I was the UX designer. The following things were the assignments I kept myself busy with during the internship.

**Things I did:**

User research: I conducted research on what customer segments could prove to be interesting for showing AR capabilities. When the customer segment "office workers" was chosen, I justified this choice. I made a survey to get to know the pains and gains of this customer segment.

Storytelling: I made sure that the concept had a good flow and that the people presented to could project themselves into the story. I made multiple user stories to strengthen the concept.

Design: I made multiple UI designs in an area I was not familiar with (Augmented Reality). Mock-ups were made to give the 3d designers a better understanding of how I was imagining the UI.

Prototyping: I helped the developers with the visual and usability aspect of the prototype, like all buttons, labels and layout. I optimized the usability by testing and making wireframes and I made the tutorial for the application.

Validate/Test with Users: I tested the prototypes on a regular basis to test the UI and user experience guidelines I set up.

Present the design solution to the business: Every week, I presented the progress of the group to the stakeholders, in which I tried to be as clear as possible.

Setting goals/Time management: I kept short watch on what could be valuable to test next and how much time the 3d designers and developers thought they would need to construct new features.

**Things I did not do:**

Make 3d models: This is the job of the three 3D designers within the team. For the development of these models 3ds Max and Blender where used. I did however draw out my vision on certain models to give these guys a better understanding of what I thought the experience should look like.

Unity (C#): This is the job of the 2 developers within the team (1 game developer and 1 software engineer). I had previous knowledge in using game engines (UE4), so I could help the developers whenever possible. I could plan in tests or give them some alternative options when the asked solution could not be made within a given timeframe.

Go to deep into visual design: Although I made the general design guidelines by making a style sheet, I was far more interested in user interaction when using the Magic Leap. Therefore, the design of the prototype itself was not prioritized until later in the internship.

# Reflection

At the start of the internship, I knew what augment reality was, but I had no experience whatsoever in building an AR experience. I was specifically interested in the user experience of an AR wearable. Before the beginning of the internship, I did some research on the Magic Leap and I was a bit sceptic about the technology. During my internship, this scepticism made room for optimism. I now know that AR wearables are not a consumer ready product yet, but there is surely a future if the technology becomes better.

During this internship, I worked together in a group. This had positives and negatives. The positive side was that I could learn a lot from the other interns, the negative is that I was dependant on the work too. In the beginning, I took the lead immediately. From my experience of earlier semesters as CEO of a fictional start up (semester 6), I knew a thing or two already about planning and making decisions. I think I did well on this part, because every week I wrote down a sprint goal and this goal was reached almost every time. I think the concept we had really benefited from working in sprints. Because of the many iterations the prototype went through, I could set up good user experience guidelines.

The communication within Greenhouse went well. Every time when I needed to user test, I put the test on Slack and colleagues from all over Greenhouse would come to test. I must say that I did not expect this in the beginning. I also communicated towards the organisation of Night of the Nerds to get some mistakes figured out.

The thing I loved most during this internship were the user tests. I did over 30 user tests within Greenhouse and another 30 during Night of the Nerds. It was nice to see the reactions of the test persons during tests. For me this testing was also I great learning experience, because the testing of an AR wearable is immensely different than testing a website or mobile application. Not seeing what the test person was doing was a challenge at first, but I adapted by listening carefully and asking what the tester was doing.

What could have gone better is how I structured my research in the beginning. The first couple of weeks I had some trouble finding the right sub-questions to answer my main question. After talking to my mentor (Bas), this became much clearer and the right questions were made.

I also want to point out that I had much fun building my portfolio. I have always been fond of storytelling and my portfolio tells my story in a way I have never done before. Building the portfolio in Three.js was a challenge but the result is a unique portfolio I am very proud of.

To conclude, I really enjoyed my time within Greenhouse. Despite the many hiccups experienced when building an app for the Magic Leap, I am proud of the result and I hope Greenhouse can benefit from the information gathered during my internship.

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## Evidence

In my portfolio is a whole section dedicated on evidence. Click the "switch to competencies" link in the top right corner to get there. I would recommend it, because it gives a better experience.

| | Assessment dimension | Evidence |
|---|---|---|
| 1 | Knowledge and insight | |
| Apply knowledge and insight | | |
| 2a | Manage | **Scrum**<br><br>By doing daily stand ups with my team I always knew what everyone within the team was doing. I was the Scrum master and managed every sprint goal.<br><br>**Sprint documentation**<br><br>Every sprint, I documented what I did structurally. I did this in the "Why, how, what" method by Simon Sinek. Because of this, I could fill in my portfolio easily.<br><br>**UX guidelines on other products**<br><br>I had to do research on UX guidelines of other. I made a plan on how I would do this research to methodically go through this. |

| 2b | Analyse | **PID** |
|---|---|---|
| | | By making a PID I analysed the problem and planned an approach out of this. |
| | | **Literature research on AR and added value AR wearables** |
| | | I researched the current state of AR wearables and were chances could be in the future. I analysed multiple web sources for this research. |
| | | **Literature research UX guidelines setup and stakeholder map** |
| | | I analysed the stakeholders and how they could benefit from UX guidelines. |
| | | **Customer segment research** |
| | | I analysed the target audience to give the concept context. |
| 2c | Advice | **PID** |
| | | In the PID, I set up an approach on how to solve the problem Greenhouse had. |
| | | **Test reports** |
| | | Every test report I made a conclusion out of results and made recommendations for the next prototype |
| | | **Conclusion and future recommendations** |
| | | Out of my research came a conclusion and recommendation in which I advised Greenhouse on AR wearables. |

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| 2d | Design | **Prototype 2d UI design** |
|---|---|---|
| | | I designed the menus for the prototype and tested them for the optimal usability. I took the research I did on UX guidelines in account when designing these. |
| | | **Prototype tutorial design** |
| | | To increase accessibility, I designed a tutorial to make the prototype self-explanatory. |
| | | **UX design** |
| | | I optimized the user experience within the application by applying results found out of research. |
| | | **Concept document** |
| 2e | Implement | **Prototype** |
| | | A contextual prototype was made for testing the Magic Leap. I made sure the flow of the prototype was good and I judged what things were needed for a good working prototype. |
| | | **Test plans/reports** |
| | | The prototype went through 6 iterations, with each iteration having its own test plan and test report. |
| 3 | Judgement | **Project document** |
| | | By making the PID, I demonstrated that I can make a research question from an unstructured problem. |
| | | **Literature research UX guidelines** |
| | | I went through the research of UX guidelines in a structured way. I set this structure up myself by judging what would be most important to get to the right conclusions. |
| | | **Literature research constraints** |
| | | By researching constraints of the use of AR wearables, I got a vision on what complications future extensive use of AR wearables could bring with it. Privacy and ethics were also considered to get to a conclusion. |
| | | **Test plans** |
| | | For every test round, I made a test plan. In this test plan I wrote down what I wanted to test, how I would test it and why I wanted to test. |

| 4 | Communication | **Present weekly to stakeholders** |
|---|---|---|
| | | Every week, I made a presentation for the weekly meeting with the stakeholders. In this presentation I wanted to present the progress achieved the week before and the next steps as clear as possible. Because of this, each presentation had the same composition. The presentations really helped me to get on the same line as the stakeholders, so in the end there were no surprises or expectations that could not be fulfilled. |
| | | **Present to managers half-way presentation** |
| | | To give the innovation team an idea of how usable AR wearables are at this moment, I gave a presentation. In this presentation I explained where the AR lab team was working on at that moment and what difficulties we experienced developing for the AR wearable. I finished the presentation with my personal vision on the future of AR wearables. I explained what needed to be improved for AR wearables so it could become a consumer ready product. |
| | | **Presentation Back-to-school day** |
| | | Halfway the internship, I had to present the current status of my work to another student and my school tutor. In this presentation I presented the work I did, and what I would be doing for the coming weeks. |
| 5 | Learning Ability | **Reflection reading guide** |
| | | In this reading guide, I reflect on myself and the work done during this internship. In this reflection I also consider the aspects I wanted to improve that I wrote down in the conversation form, namely planning, communication and user experience. |

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