CT-LABS

interactive info system

Communication & Multimedia Design

Game Design and Development

Bachelor Thesis

by

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CT-LABS

interactive info system

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Bachelor Communication & Multimedia Design CMD

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Graduation Project: CMVB17ASO

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Hanze UAS CT-Labs, Client Organization

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Managerial summary

Students of the CMD and CMGT programs of Hanze are being trained to become professionals in the multimedia or game technologies field. However, their practical experience is hindered by the fact that they are not fully using the facilities at their disposal, namely the CT-labs. The CT-labs were created to for students, so that they could have a place where creativity and innovation was welcomed and encouraged, a place where they could ask for help or simply socialize and engage in extra curriculum activities.

The fact that less students visit the labs and use their facilities prompted Manno Bult to search for a solution to this problem. He wishes to better inform students of the facilities and event in the CT-labs, but at the same time, wishes to engage them by offering an interactive example of what can be created in those labs.

The project sought to define a tool that would attract the attention of students, inform them while also offering entertainment and a healthy challenge. The aim was to give students a taste of what could be their own creative product and urge them to visit the CT-labs.

To achieve the above goals, the problem context was explored and based on it a direction for research was defined. Motivation, behavioral change, persuasive design and interactive technologies were some of the main concepts that were researched. Once a good grasp of those concepts was acquired, design requirements were formulated. Concepts were defined based on the design requirements, and the concept that was approved by the target audience and the client was further developed into a prototype. The technical development process was a constant cycle of evaluation and iteration.

The final result was the concept of an informational system and the prototype of the main aspect of that system. The prototype features a machine learning based system that detects poses and based on the readings manipulates information showcased on an informational screen. This interactive tool is attractive and entertaining. On the short term it delivers information about the CT-labs to students, even though by building the entire system, it could increase the traction of the CT-labs.

Preface

After four eventful years as a CMD GD student, I am finally handing in my last project. It seems like an eternity ago I first started and at the same time, I cannot believe I am in this point already. I believe that to be due to the wonderful group of friends I have gathered along the way.

I was not alone through this journey. My partner, Yahya Arahnay, who, despite going through the same academical struggles as me and even more personal ones, was always there to support me and for that I am always grateful.

Lastly, I want to thank my parents, who have always encouraged me, even when that meant that I would be living miles away. I know the struggle and hardship you went through and I hope that I can make you proud.

Elena Balan

Groningen, The Netherlands, 2022

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1. Introduction

Hanze UAS provides multiple learning opportunities for its students, and it offers the option of experimenting with multiple technologies. For the students of Creative Media and Game Technologies (CMGT) or Communication and Multimedia Design (CMD), technology is a key element of the study. Students are encouraged to be up to date with developments in technology and are trained in a few of those emerging technologies, such as VR, motion capturing, studio production, etc.

In the CMD and CMGT programs, the Creative Technology labs (CT-labs) act as a hub for students, it is the place where students can experiment with various technologies and ask for help from fellow student assistants. However, despite the obvious advantage the space could bring to the students, the CT-labs are rarely visited. Students are not fully aware of the facilities of the CT-labs. Some efforts were done to address the issue; namely hanging posters on the doors of the spaces and adding informational slides for the info screens of each space; however, it has not been a structured approach to a solution.

This is why the CT-labs are in need of a new system that efficiently informs students of CMD and CMGT about the facilities in the spaces and encourage them to visit. However, the system needs to also represent the CT-labs essence, incorporate the technological innovation and creativity through its design.

The process of creating a solution to this issue will follow the Design Cycle. Preliminary research is first conducted to produce key concepts and research questions. Afterwards, the main research effort is done to answer research questions and formulate design requirements. The design requirements will represent the basis on which concepts are created, followed by a prototype. Lastly, the prototype undergoes rigorous evaluation and is iterated multiple times based on evaluation results.

2. Client

2.1. Organization

2.1.1 Hanze UAS

Hanze UAS was founded in 1986 is the largest technical and vocational university in the northern Netherlands. Located in the city of Groningen, it offers a variety of bachelor and master programs for both Dutch and international students.

2.1.2 SCMI

The School of Communication Media and It (SCMI) includes five bachelor degrees programmes and two masters programmes. Two of the bachelor programmes, Communication and Multimedia Design (CMD) and Creative Media and Game Technologies (CMGT), are grouped in the Creative Technology cluster.

The CMD program consists of three majors: Visual Design (VD), Interactive Design (ID) and Game Design (GD). These majors have no constitutional existence outside of the C and D wing of the ZP11 Hanze building. CMGT is a new program that fully focuses on training its students for the field of game design.

2.1.3 Creative Technologies Labs

The CT-labs are physical spaces that aim to facilitate learning but also encourage creative usage of different technologies. It is a space where students of the CT cluster can go for support related to their curriculum projects as well as experiment with different technologies and assets of the spaces.

The CT-labs, at the moment this document was written, consisted of two spaces: Makerspace and Spacelab. They are positioned on the 2nd floor C-hallway of the ZP11 building. Makerspace (MS) is a space where students can experiment with equipment that allows the construction of physical objects. The equipment ranges from simple craft tolls, such as paper, markers, glue, to 3D and resin printers, laser cutters Arduino boards. On the opposite scale, Spacelab (SL) is a digital creation space. The main features are the multiple Virtual Reality (VR) headsets that students can use for enjoyment purposes by playing popular VR games or for development and experimental purposes, namely develop their own games. Spacelab also features a motion capture suit along with green screen walls to facilitate animation development. For VR asset manipulation, a 3D scanner is also available.

Both Makerspace and Spacelab have staff members on duty, namely supervisors and student assistants. The student assistants are present to encourage and guide students to experiment with available equipment as well as to help with possible issues or questions students might have regarding their curriculum projects.

2.2. Client mission, vision, goal

	Description
Vision	Help CMD/CMGT students have their optimal learning experience and facilitate their creative drive. Be a space where students can get help but also experiment and create.
Mission	Offer students the space, assistance with curriculum projects, chance to participate in extracurricular activities based on their interests and technology to experiment with and fulfill their projects.
Goal	Build a system that better communicates to the students what the CT-labs can offer.

TABLE 1, CLIENT MISION AND VISION

2.3. Contact person

Throughout the entirety of the project, the CT-labs were represented by Manno Bult, which will further be referred to as the client. Manno is the head of makerspace and oversees the majority of activities that occur in the CT-labs. He has extensive experience as an IT specialist and holds a teaching position within CMD for technology related courses. Furthermore, the client is aware of the problem from a specialist and CT-labs staff point of view but also from the perspective of a teacher. They come in contact with students and witnesses the way students interact with the CT-labs, which provides them a multi-faceted overview of the problem context.

In order to make use of the client knowledge regarding the presented problem, an initial client meeting was conducted, see Client meeting for more details. The main purpose of the meeting was to define the scope of the project, get a better understanding of the problem context and begin forming an opinion regarding possible solutions.

3. Stakeholders and target audience

3.1. CT-labs staff

The main stakeholders of the project are represented by CT-labs staff that hold leading and supervising positions (Figure 1).

FIGURE 1, STAKEHOLDERS

Apart from being familiar with the activities and equipment of the CT-labs, the stakeholders also have insight into how often students visit the spaces, what are their top interests as well as some of their grievances. Furthermore, some of the staff, such as Jonathan van Denzen, Ilja Plutschouw and Manno Bult, hold a teaching position within the CMD/CMGT program. This proved to be useful in understanding the problem context and form initial ideas about possible solutions.

Unstructured interviews with all the CT-labs stakeholders were conducted during the preliminary research stage (Appendix C to F) to better understand the problem, gather all the information from the stakeholders and get initial ideas about possible solutions. The interviews were analyzed, and main topics and ideas were extracted. The takeaways are that students do not visit the CT-labs unless the nature of the course requires them to use technologies and tools from the labs or they are incentivized by teachers. Additionally, the C-hallway is not populated by the general CMD student body, especially VD and ID students, because there are very few classes in the C wing. This makes it difficult to attract new people that are not already familiar with the CT-labs. Overall, the target audience is not engaged. The posters and info-screens the CT-labs use to communicate information are too static and not up to date.

For more in-depth analysis of the problem context from each stakeholder point of view can be seen in Chapter 6.1.1.2.

3.2 Target audience

The target audience consists of students undergoing their bachelor study within the CMD or CMGT programs at Hanze UAS. To better understand the problem context from a student perspective a questionnaire was created and distributed to the student body. The structure of the questionnaire can be found in Appendix G and the analyzed results can be found in Target audience survey.

The main goal of the questionnaire, besides creating an overview of the problem, was to verify if the perceived problem described by the client and stakeholders overlapped with the target audience perspective. Therefore, the questionnaire focused on how well students were aware of the existence of the CT-labs, the mediums they used to get informed, as well as the frequency with which they visited the labs. The results show that students barely visit the CT-labs. That is due to the students not having access to constant and updated information about the spaces and also because the C-hall is not a place they pass by anymore. Furthermore, to guide the research and identify possible solutions, the target audience was asked to identify what could be improved about the current way the CT-labs engage and inform students about the facilities and opportunities of each space.

To guide the design process, user personas were created based on the information gathered through the questionnaire (Figure 2, 3). The personas represent significant audience groups with behaviors and preferences that could impact the design and development of a solution.

3.2.1 Target audience characteristics

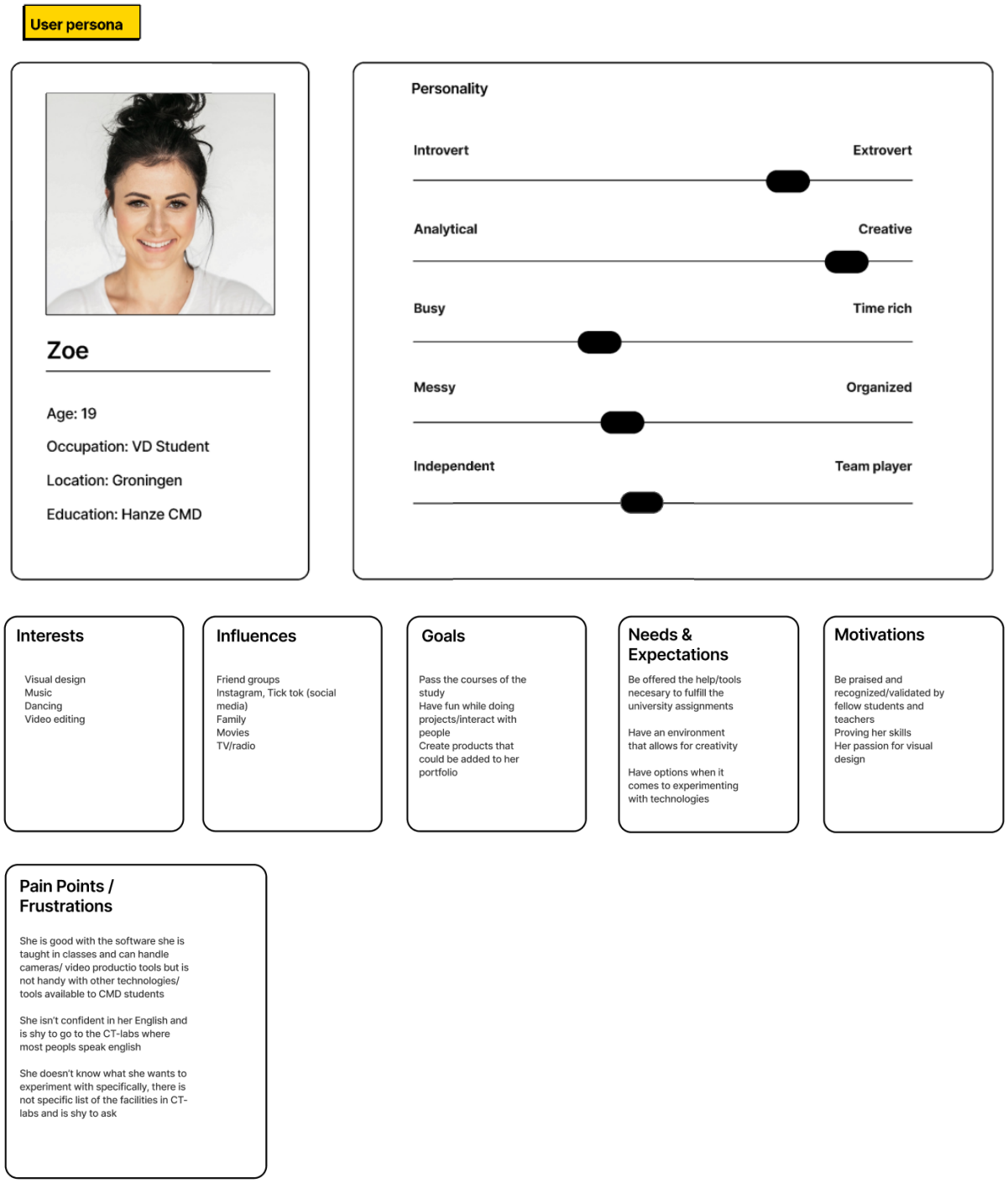


FIGURE 2, TA PERSONA, VD STUDENT

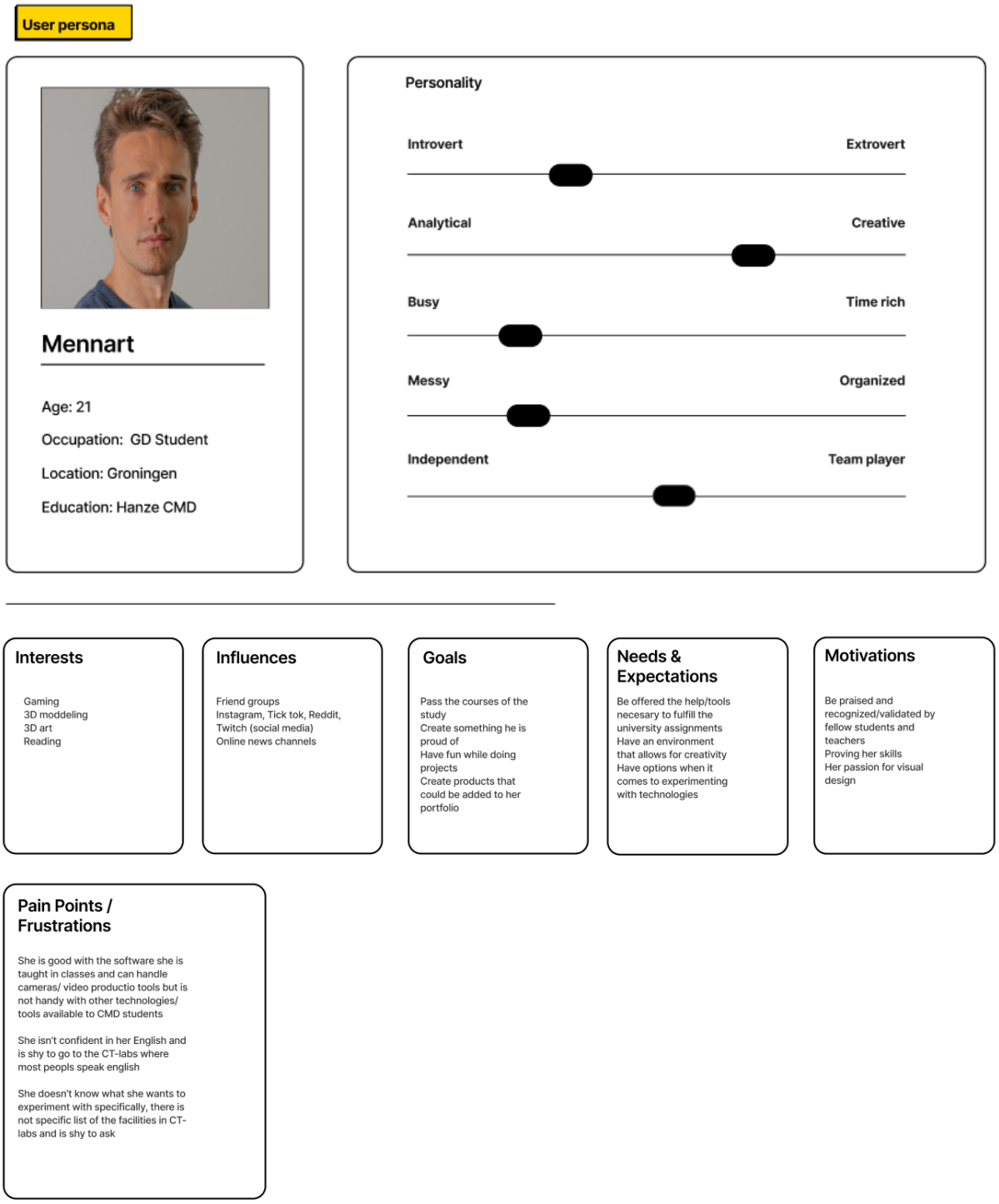


FIGURE 3, TA PERSONA, GD STUDENT

The analyzed results of the target audience research were formulated as user requirements (UR):

Code	Description

UR1	As a user, I want to be able to easily access the information
UR2	As a user, I want to access useful and up to date information
UR3	As a user, I want to customize the information I see
UR4	As a user, I want to interact with the tool
UR5	As a user, I want to see information representative of my study
UR6	As a user, I want to be able to choose a language

TABLE 2, TA REQUIREMENTS

4. Assignment

The assignment is to develop a tool that delivers information to students about the facilities and activities available within the CT-labs. The tool needs to be accessible on a physical form in the C-hall and be in itself an example of what can be achieved by exploring the opportunities available in the CT-labs. The solution has to provide information tailored to the audience and require little effort in usage. It should appeal to the interest and passions of the students by implementing interactive technologies.

4.1 Project framework

4.1.1 Problems

The current information provision system of the CT-labs consists of posters and screens that lack interactivity. The way the info screens are set up, information is displayed using slides that automatically shuffle.

The main issue with this setup is its lack of accessibility. As pointed by the target audience, both the posters and the screens blend into the hallway. Furthermore, as the information is not always updated, to get the needed information, students have to wait for the specific slide to appear on the screen. This requires too much effort form the users.

The other identified issue is the lack of appeal. Considering that students do not pass the C-hall as often due to lack of classes in that wing, there is little traction for the spaces. The few people that would look at the posters or info screens have a hard time finding the information that would convince them to visit the labs. The lack of interactivity offered to a target audience that undergoes a study centered around interactivity and multimedia makes the CT-labs seem lackluster.

4.1.2 Opportunity

The main opportunity is that of enhancing the learning process of students by exposing them to what could be achievable when using the CT-labs facilities. Also, the product itself can be an example of what could be achieved by a student using CT-labs facilities.

4.1.3 Constraints

The main constraint, some discovered along the development process, are related the Hanze technical department. Due to an increased concern for information safety and cybersecurity, there are strict regulation concerning technologies that can be implemented within Hanze. Additionally, the GDPR regulations are a constraint that impacts the development of a possible solution.

4.1.4. Possible solutions

As part of the client meeting, a few ideas were discussed to be viable solutions. The problem context suggests the main issues were accessibility and lack of entertainment or pleasure in the way students were informed about the CT-labs. Therefore, based on personal and client experience, it was thought that the implementation of interactive technologies such as motion sensors in addition to info screens could be a viable solution.

4.2 Problem statement

The CT-labs currently do not sufficiently deliver information to students of CT cluster to inform them of the facilities in each space, which leads to students not using them as part of their study or personal development.

4.3 Design challenge

Design a physical tool that would more efficiently deliver information to students of the CT cluster about the CT-labs facilities and encourage students to visit the labs by making use of interactive technologies.

4.4 Key concepts and research questions

Key concept (KC)	Research question
KC1: Motivation and behavioral change	**RQ1:** How can motivation implementations be used to encourage students of CT-cluster to visit the CT-labs? **RQ2:** What is the difference between intrinsic and extrinsic motivation? **RQ3:** What is attention and how can it be manipulated? **RQ4:** How can captured attention be translated to call to action from students?
KC2: Persuasive design in service displays	**RQ5:** What are the best practices of persuasive design for service displays? **RQ6:** How are the current CT-labs service displays being used to convey information to students?
KC3: UX and Interactive design	**RQ7:** What technologies could be implemented along the service displays to engage students of CT cluster? **RQ8:** How can interactive design and UX principles be used to make service displays more interactive

	RQ9: What are the limitations imposed by the GDPR regulations at Hanze UAS?
KC4: GDPR and technical requirements	**RQ10:** What are the technical regulations for interactive applications within Hanze UAS?

TABLE 3, KEY CONCEPTS

5. Design cycle

The project framework will follow the stages of a design cycle, namely undergoing orientation, ideation, conceptualization, prototyping and evaluation. Research is conducted throughout, followed by constant development and testing.

5.1 Explore & comprehend

In the explore and comprehend phase each key concept was explored. Using a combination of desk and field research, the research questions are answered. Furthermore, this phase in the design cycle provides the chance to explore possible solutions and make a first opinion on what direction could be taken in further development stages.

5.1.1 Setup

The methods used in this stage are unstructured interviews with the client and stakeholders, a target audience questionnaire, literature research, expert interviews and design requirements (Turnhout, et al., 2015). A detailed description of each methodology can be found in Chapter 6.1.1 and 6.1.2.

5.1.2 Results

The results outlined below focus on the desk research findings, condensing the information that is elaborately explained in Chapter 6.1.2. The preliminary research has been outlined in Chapters 1, 2, 3.

5.1.2.1 How can motivation implementations be used to encourage students of CT cluster to visit the CT-labs?

The research conducted shows that motivation can be defined as the energy one has to perform an activity and the direction in which that energy is invested (Rigby, 2014). Motivation originates from three sources: physiological needs, emotional state and physiological needs. To feel motivated, one must have all of those needs fulfilled to a comfortable amount.

The self-determination theory or SDT (Ryan & Deci, 1985; Deci & Ryan, 2008) elaborates that motivation is also impacted by the need for competency, autonomy and relatedness. Therefore, in order to trigger and promote a motivational state within the user, a product needs to incorporate elements that satisfy those basic needs.

5.1.2.2 What is the difference between intrinsic and extrinsic motivation and how can they be used?

According to (Rigby, 2014) intrinsic and extrinsic motivation can both yield good results in energizing people, none being superior. SDT proposes a new way of identifying motivation

based on its quality: autonomous motivation, controlled motivation and amotivation (Ryan & Deci, 1985).

Consequently, the solution should incorporate elements that will trigger autonomous or controlled motivation. Therefore, the product should appeal to the user's interests but also introduce elements such as rewards and encouragements when completing a task or invoke a small level of competitiveness and avoidance of shame.

5.1.2.3 What is attention and how can it be manipulated?

Kahneman (1973) describes attention as a matter of mental effort. Thus, one vital element of a digital product is its ability to manage that mental effort. The user should not feel overwhelmed with information, nor should they be presented with a complicated challenge, which ties in with both research on motivation and interactive, persuasive design practices.

Kahneman (2011) defines the two mental systems that exert mental effort, System 1 and System 2. System 1 is fast but biased and prone to errors. The errors produced by System 2 could be used to direct user attention towards a screen for example. It is reflexive to look for the source of a sound or read text that is visible and written in a familiar language. One can choose to look away afterwards but cannot choose to not understand the written words. Implemented in a product, these elements could grab attention which will then be directed to appealing content.

5.1.2.4 How can captured attention be translated to call to action from students?

System 1, defined by Kahneman (Kahneman, Attention and Effort, 1973), is biased. It is likely that students experience a bias of instance retrieval in relation to the CT-labs. In practice, this would translate to not knowing enough about the CT-labs and therefore assuming that the labs are not useful or appealing. This can be avoided if the students are presented with information that stirs curiosity, which will counter their initial assumptions.

Additionally, since cognition takes mental effort, the choice to visit the CT-labs should be framed in such a way that the positive outcomes should outweigh the effort of walking to the space or interacting with new people.

5.1.2.5 What are the best practices of persuasive design?

Based on the work of Fogg (2009), an 8-step approach to any persuasive technology can be taken. However, for the scope of this project only the first 4 steps are valuable: Choose a simple behavior or target, choose a receptive audience, find what prevents the target behavior, choose a familiar technology.

5.1.2.6 How are the current CT-labs service displays being used as a tool to convey information to students?

According to the client, the CT-labs info screens function as separate entities, each one requiring a different method to update content, since the screens are connected to individual RaspberryPi mini-computers. The content on each screen is also widely different. While the type of content is the same, namely shift details, opening hours and student content, the style difference makes them look like separate entities.

5.1.2.7 What interactive technologies could be implemented along the service displays to engage students of CT cluster?

The research and client meetings revealed that the most appropriate technologies, when taking into consideration the setting and purpose of the product are:

- Simple sensors
- Nano leaves
- Camera sensors
- ML based software

5.1.2.8 How can interactive design and UX principles be used to make service displays more interactive?

Based on the guidelines created by Norman (Norman D. , 2013), a product needs to meet 8 key points independent of the technology used:

- Visibility
- Feedback
- Consistency
- Non-destructive operations
- Discoverability
- Scalability
- Reliability

Overall, interactive service displays need to be easy to access, understand and navigate. Additionally, a product can borrow values that are associated with the company they affiliate with. In this case, the service displays, by implementing design elements representative of the Hanze, the trust correlated with the teaching institution will be transferred to the product.

5.1.2.9 What are the limitations imposed by the GDPR regulations at Hanze UAS?

According to the GDPR guidelines (European Union, 2016) and the Hanze legal department, any collected or processed user data is subject to strict regulations. However, the cybersecurity department officials suggest that a product with a backend framework that

specifically avoids the long storage of data can circumvent those regulations. They suggest the following structure Figure 5.

FIGURE 4, SECURE DESIGN (TWIQEL, N.D.)

5.1.2.10 What are the technical regulations for interactive applications within Hanze UAS?

The Hanze cybersecurity department is extremely strict with web and network-based products. Any web based or network-based commands will have to be approved by a department specialist. For this specific project, it would have been helpful to have access to scan and open ports of the RaspberryPis connected to the screens. However, that requires time outside of the project scope and thorough inspection, which is why, along with the client, it was decided that the prototype will be representative of the concept and a standalone version will be built. Afterwards there is room for further development and expansion of the product.

5.1.3 Design requirements

5.1.3.1 Functional requirements

Code	Description	Retrieved from
FR1	The tool should offer the user the freedom to choose what information is displayed	Motivation and behavioral change
FR2	The tool should make use of one or multiple interactive technologies	Interactive design
FR3	The tool should make use of informational displays	Interactive design, Persuasive design
FR4	The tool should incorporate visual and/or auditory cues to attract user attention	Motivation and behavioral change
FR5	The tool should feature a character/mascot that will guide the users through how to use the tool	Motivation and behavioral change, Interactive design
FR6	The tool should have the mascot encourage users when using it	Motivation and behavioral change
FR7	The tool should feature student projects to create a sense of community and belonging	Motivation and behavioral change

FR8	The tool should not overload users with information	Motivation and behavioral change
FR9	The tool should make clear to users how their data is used	GDPR
FR10	The tool should have a backend structure that doe not store or disclose user information to any 3rd parties	GDPR
FR11	The tool should use a clear language	Persuasive design, Interactive design
FR12	The tool should abide to the design style of Hanze UAS and CT-labs	Interactive design
FR13	The tool should feature a pleasing/appealing interface	Persuasive design, Interactive design

TABLE 4, FUNCTIONAL REQUIREMENTS

5.1.3.2 Client requirements

Code	Description	Retrieved from
CR1	The tool should make use to a degree of display screens	Client meeting
CR2	The tool should make use of new and fun interactive technologies	Client meeting
CR3	The tool should showcase information about opening hours, student assistants, facilities and student work	Client meeting
CR4	The information should be somehow manipulated by the user	Client meeting

TABLE 5, CLIENT REQUIREMENTS

5.1.3.3 User requirements

Code	Description
UR1	As a user, I want to be able to easily access the information
UR2	As a user, I want to access useful and up to date information
UR3	As a user, I want to customize the information I see
UR4	As a user, I want to interact with the tool
UR5	As a user, I want to see information representative of my study
UR6	As a user, I want to be able to choose a language

TABLE 6, USER REQUIREMENTS

The design requirements were prioritized based on the MoSCoW method and can be found in Chapter 9.1.4.

5.1.3 Justification of sources

The justifications of sources used in this stage can be found in Chapter 9.1.3.

5.2 Ideate and conceptualize

During this phase the aim was to encourage creativity and explore all options for a solution. The ideation phase was focused on generating as many ideas no matter their feasibility; while the conceptualization phase involved inspecting those ideas and composing valid design requirement-based solutions. After a concept was chosen based on evaluation, design specifications were formulated.

5.2.1 Setup

During this stage the methods used were brainstorming, sketching, pitching. To evaluate the concepts, pitching and comparison matrix were used. A detailed description of the methodology can be found in Chapter 6.2.

5.2.2 Ideate

5.2.2.1 Brainstorming

5.2.2.1.2 Individual brainstorming

To start the development process, a brainstorming session was conducted to identify possible solution. The focus was mainly the technologies that could be used in alone or in combination with service displays. Figure 6 showcases the brainstormed ideas.

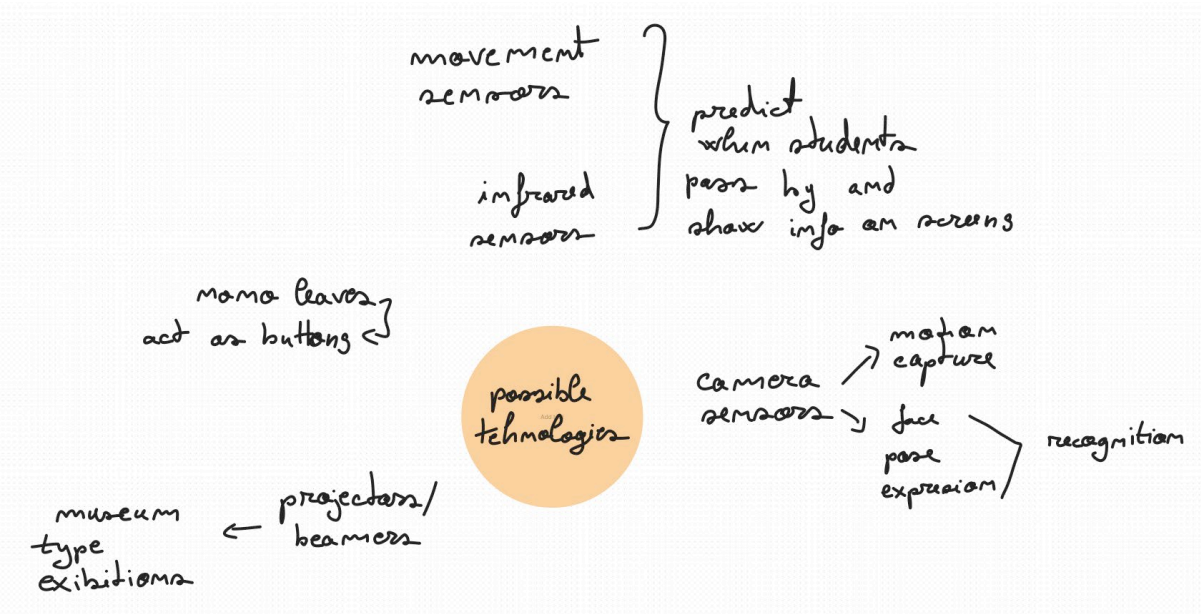


FIGURE 5, INDIVIDUAL BRAINSTORM

5.2.2.1.2 Client brainstorming

A session with the client was also conducted. Additional to the individual findings, the session involved elaborating ideas together with the client. This prevented having a tunneled vision about the possible solution and made use of the extensive client experience regarding emerging technologies (Figure 7).

The outcome of the brainstorming was a list of technologies and hardware that could be used to create an informational system, how they integrate with informational screens and

how the information can be structured. Based on the findings, the general way of structuring information would be through slides.

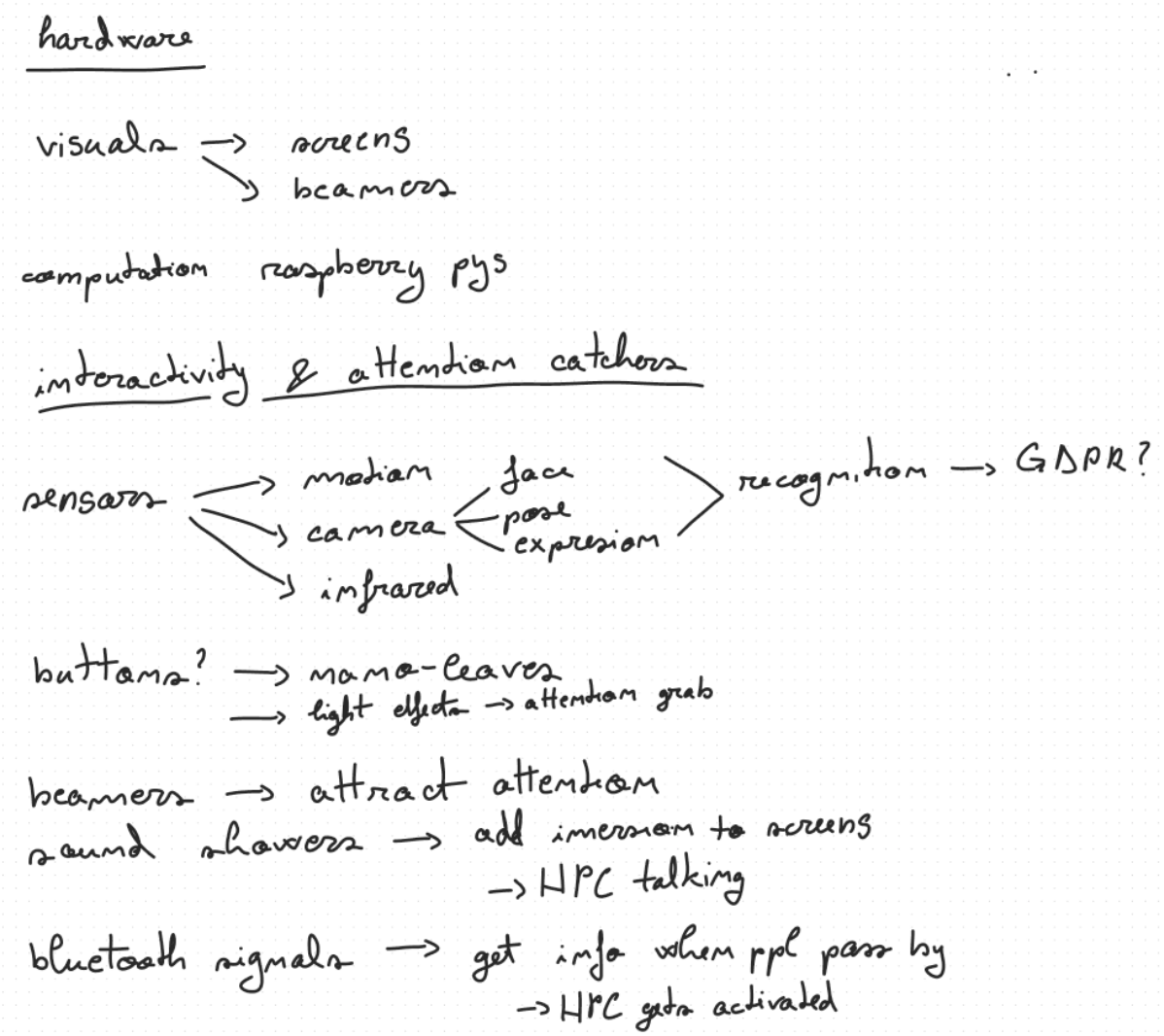


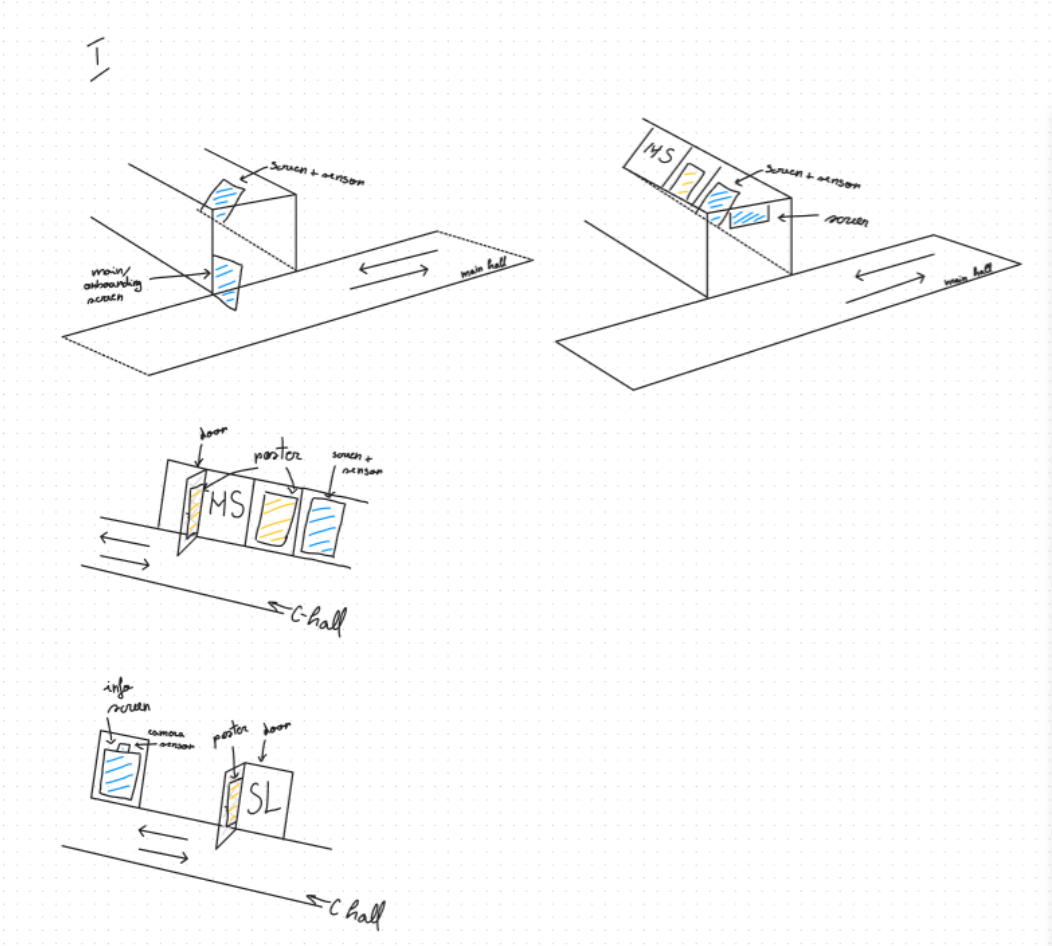
FIGURE 6, CLIENT BRAINSTORM

5.2.2 Conceptualization

5.2.2.1 Concept 1: Hands free

The first prototype makes use of screens, a camera and machine learning. It defines a 3 screen-based system, one in Spacelab, Makerspace and main hallway (Figure 8). The latter is placed in such a way that students will inevitably notice it when passing through the main hallway. This screen will act as an onboarding screen, and it features animations, sound cues and motion tracking visual output to attract attention. The motion capturing machine learning can be used as controls for the info-screens to allow content manipulation (Figure 8). Additionally, the innovative controls will set a challenge to the users, which will motivate them to use it.

The information showcased on slides or pages can be general and once a user has made a choice to see information about Spacelab, the specific screen will flash to indicate the location of the space.



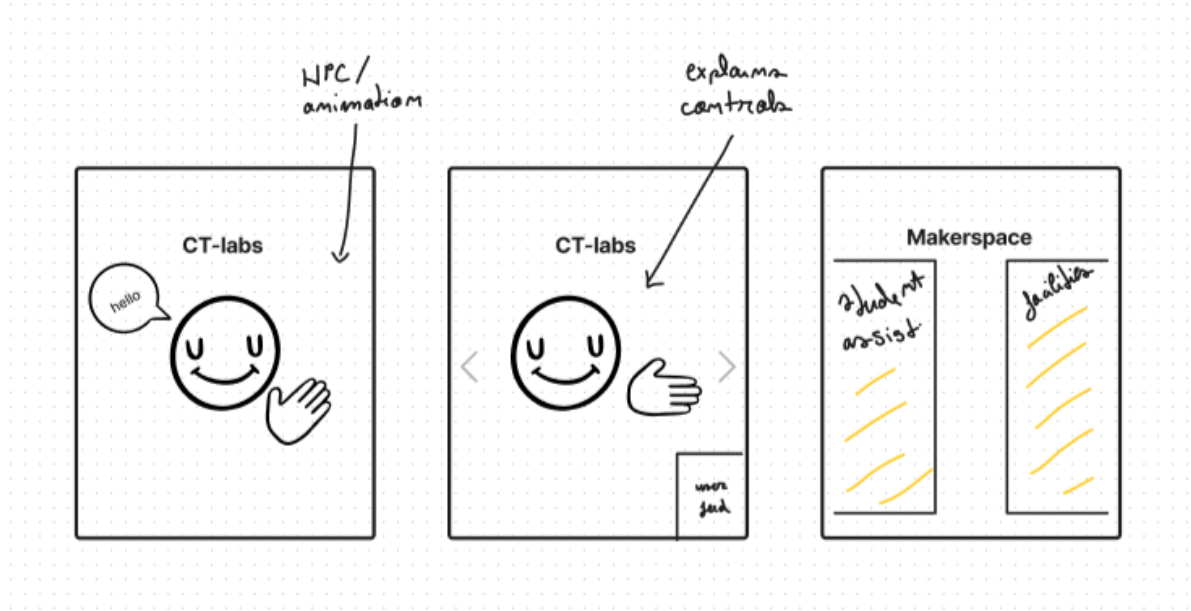


FIGURE 7, CONCEPT 1 SCREENS

5.2.2.2 Concept 2: New style buttons

This concept was created uses nano-leaves as the eye catching and interactive technology. Therefore, each space will have a screen positioned in a visible location, and next to each screen there will be a nano-leaves panel (Figure 9) that act as controls for the showcased content on the screen. There could be nano-leaves that correspond with the controls of switching between informational slides or requesting to view student work. The combination of buttons can be determined based on the needs of the students, however being able to navigate forward and backwards through the slides deck is essential.

The nano-leaves acting as controls for the info-screens satisfy the user need for control over the content they see. Furthermore, the nano leaves have light modes which will act as an eye-catching effect, a way to trigger System 1 (Kahneman, Thinking, Fast and Slow, 2011). After that, the students will be challenged by the new system, which will then trigger motivation the challenge being within their capabilities. The NPC will guide the usage, encouraging the user through the process which will try to satisfy the need for connection and boost motivation.

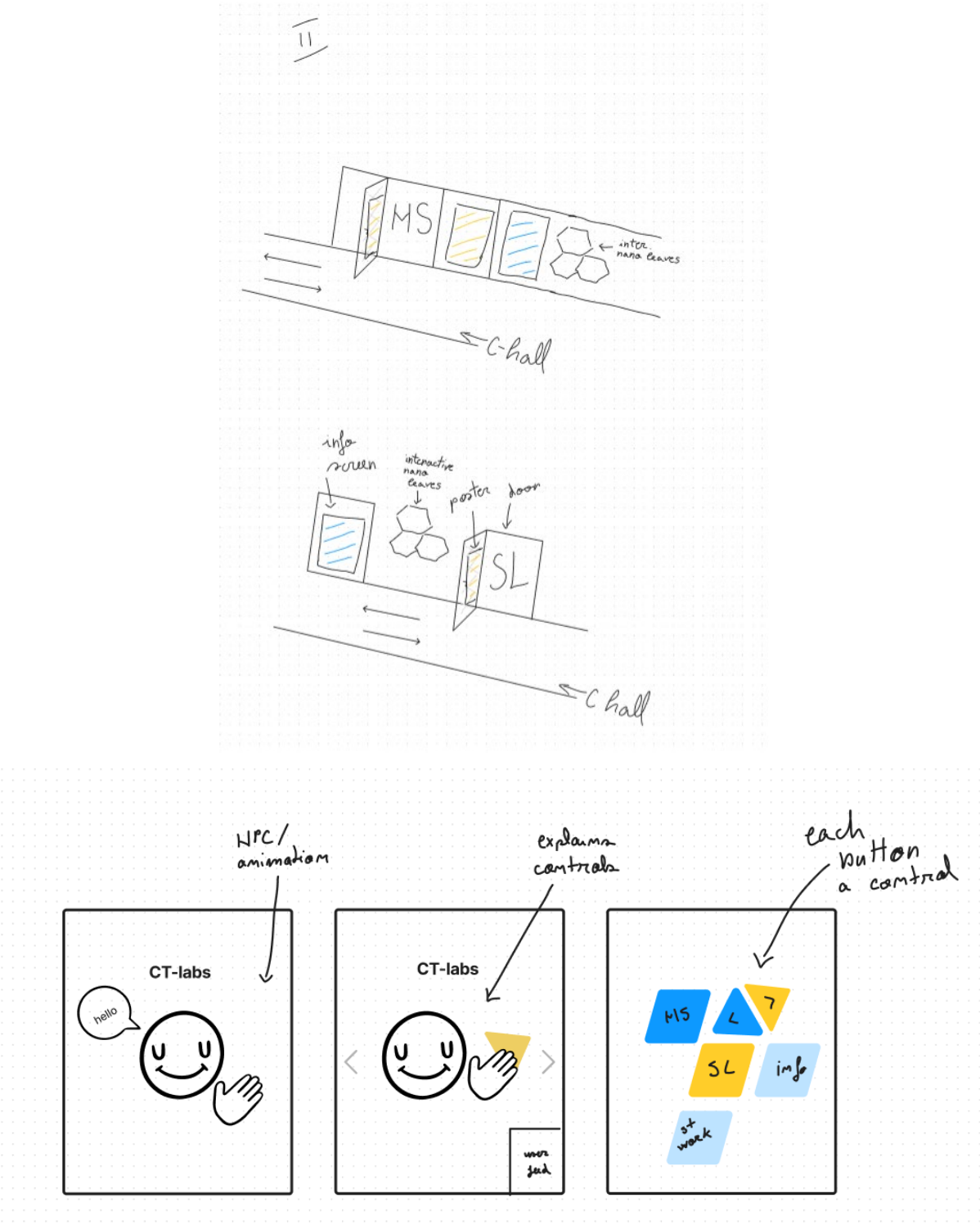


FIGURE 8, CONCEPT 2

5.2.2.3 Concept 3: The beam

This concept uses motion tracking to control the information showcased on the screens. The information will be structured in slides (Figure 10). The controls will consist of raising the right or left hand to browse back and forward through the slides.

Unlike the first concept, the screens will be placed adjacent to each of the CT-labs entrances only. To attract people and take advantage of the fact that the C-hall is dark, a beamer is used to project patterns and text on the floor. When students arrive in front of the labs, the screens will try to challenge students to use the motion tracking controls. The motion tracking is a novel aspect, which has the purpose of intriguing the users challenge them, which has the purpose of motivating students to use it.

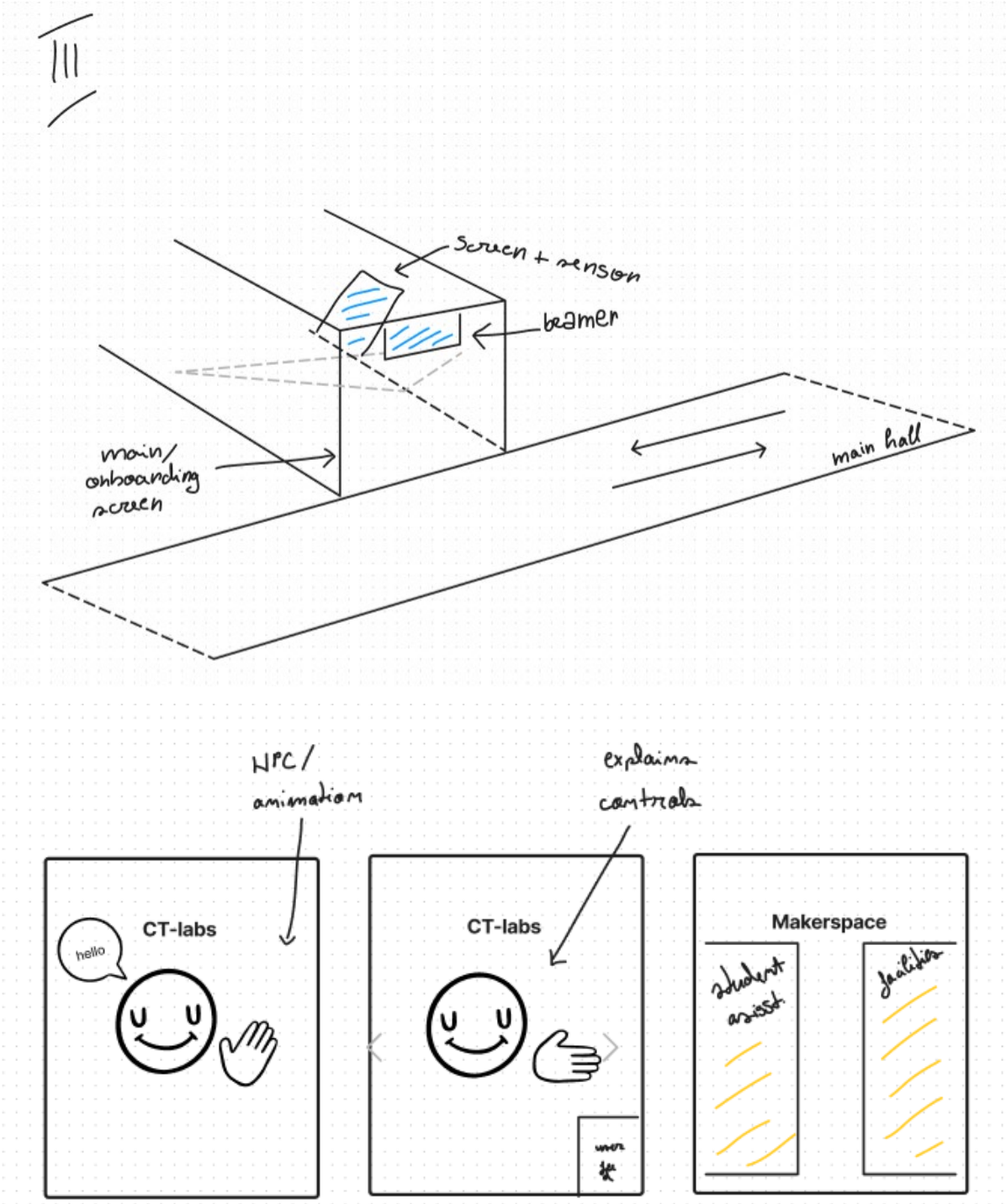
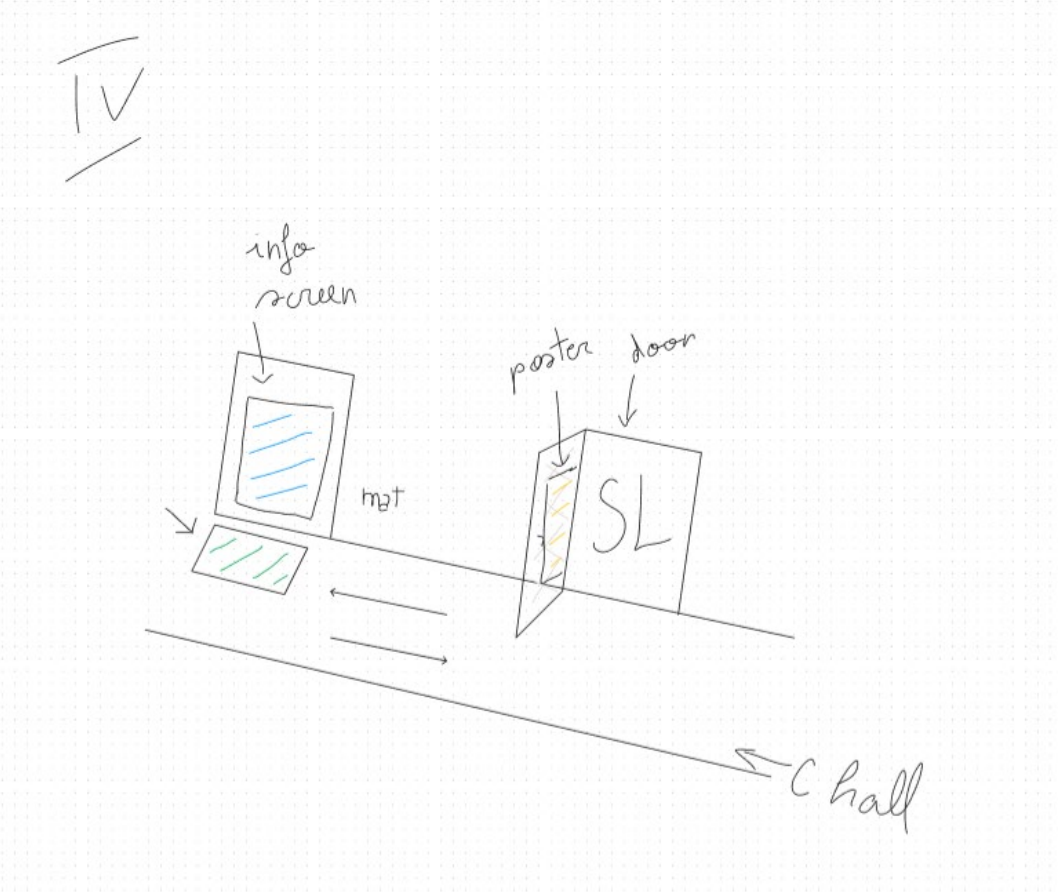


FIGURE 9, CONCEPT 3

5.2.2.4 Concept 4: The mat

This concept makes use of a sensor mat to control information on the screens (Figure 11). The information will be structured in a deck of slides, each specific for the space the screen is adjacent to. The mat will have three controls, left right and pause with which the user could choose to move forward, backward or pause the slide deck. This aims to satisfy the user need for control over the content and offer a challenge. The novelty of the controls will intrigue and make students want to try it.

The info screens will feature an NPC character that will guide the user through the controls. The NPC will also encourage them to explore the info-screens content and offer positive feedback when the user interacts with the product.



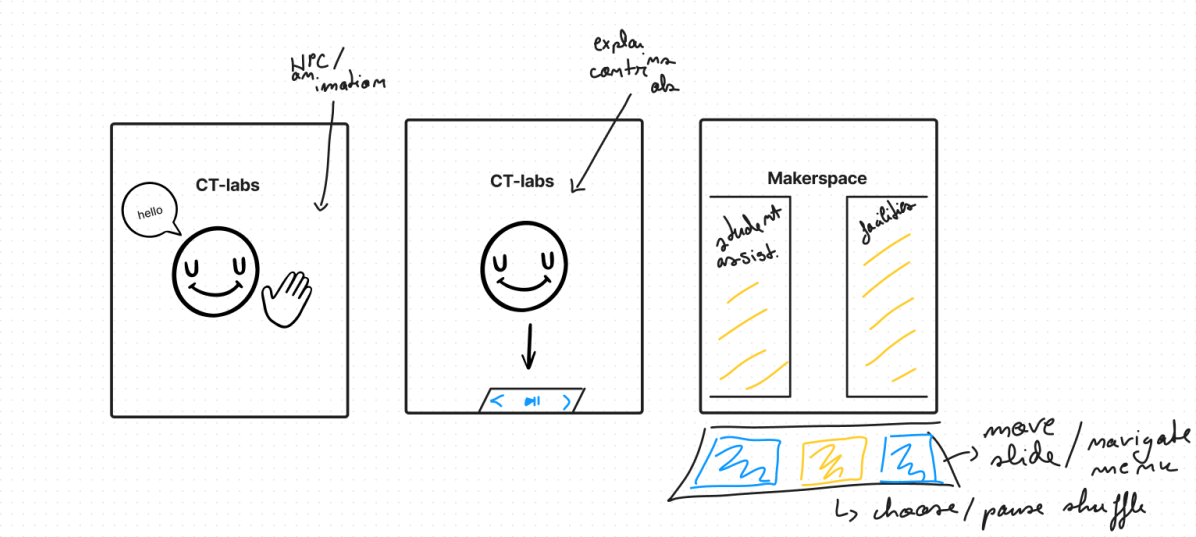


FIGURE 10, CONCEPT 4

5.2.3 Comparison matrix

The concepts developed were compared to how well they achieve ease of usage, attracting attention, having clear content and accessibility. These key points were identified based on the design requirements. Along with the client, each concept was offered a value of 1 to 5 of how well they meet those required features and based on that the concept that will be further developed was chosen. The full matrix can be found at Chapter 9.2.3.

Based on the results of the comparison matrix, Concept 1: Hands free has showed most promise and was considered a viable option for a solution. However, Concept 2 and 3 were not completely ruled out, which is why the concepts were also tested with the target audience (See Concept evaluation).

5.2.3 TA concept evaluation

The concepts were also tested with the target audience by pitching each concept to members of the target audience. Following that, the students were asked to rank the concepts as reflected in Table 18. The results show that Concept 1 was best received by the target audience.

Consequently, the results of the target audience testing the comparison matrix were analyzed Concept 1 was chosen as the most promising concept to be further developed into a prototype.

5.2.4 Design specifications

Based on the chosen concept, the design requirements were translated into design specifications to clarify the features that the solution needs to include. The table can be found in Chapter 9.5.

5.3 Visualization and prototyping

5.3.1 Setup

During this stage user journey, tinkering, wireframing and prototyping were used to deliver multiple prototype versions. An in-depth description of each method can be found in Chapter 9.3.

5.3.2 Results

5.3.2.1 User journey

A user journey was created (See Chapter 9.3.1) to offer an overview of the way the users should interact with the prototype, along with key interaction moments.

5.3.2.2 First iteration

The first version of the prototype was built in two stages. For ease of development and to allow for rapid testing, the development process was divided in UI creation and functionality creation. The functionality of the prototype involved a complex process which would have slowed down the ability to test any other aspect of the prototype.

5.3.2.2.1 UI

This stage included designing the UI of the application using interactive wireframes. The Figma prototype can be found here: https://www.figma.com/proto/4e7uFXtxJgz6OdxnXvgFZG/Untitled?node-id=38%3A47&scaling=min-zoom&page-id=0%3A1&starting-point-node-id=37%3A2&show-proto-sidebar=1

The UI was created to fit the format of a slide deck. The users should be able to navigate through them using the controls back and forward. According to the design specifications, the application should feature an onboarding, which should illustrate how the prototype can be controlled. This needed to be done through an eye-catching visual element, therefore an animated illustration was used (Figure 13). Ideally there would be an animation that illustrates the motion of raising a hand, however, limited skills in animation prompted the decision to use stock animations (icons8, n.d.).

The design is based on the Hanze and CT-labs guidelines in terms of logos used, fonts and color schemes (Figure 12). Additionally, the UI features a screen section where the camera feed is visible, along with an overlay of the ML model (Figure 12).

FIGURE 11, STYLE

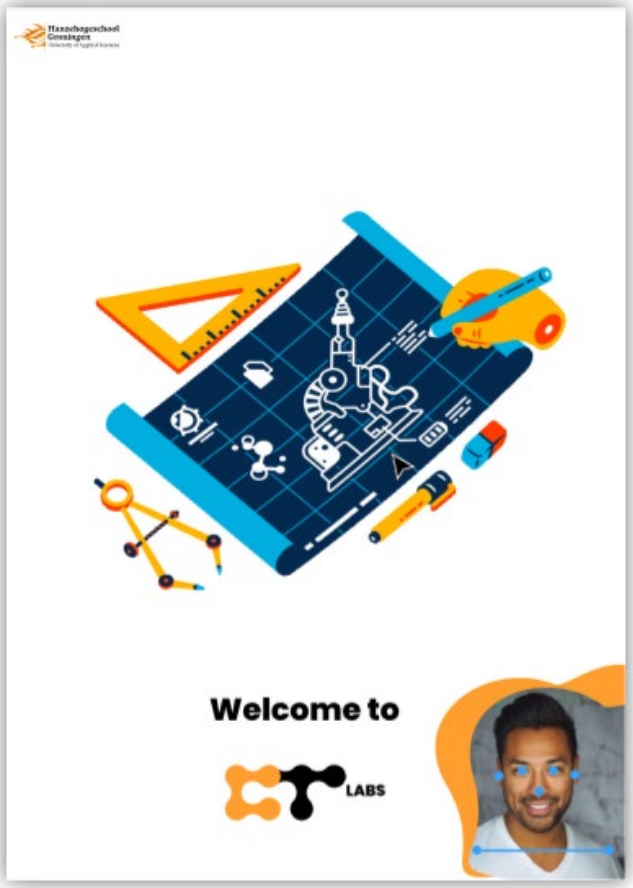


FIGURE 12, ONBOARDING

The onboarding features simple instructions about the navigation in a clear language as seen in Figure 14. When instructions are completed, the user is offered encouragement and praise for their achievement.

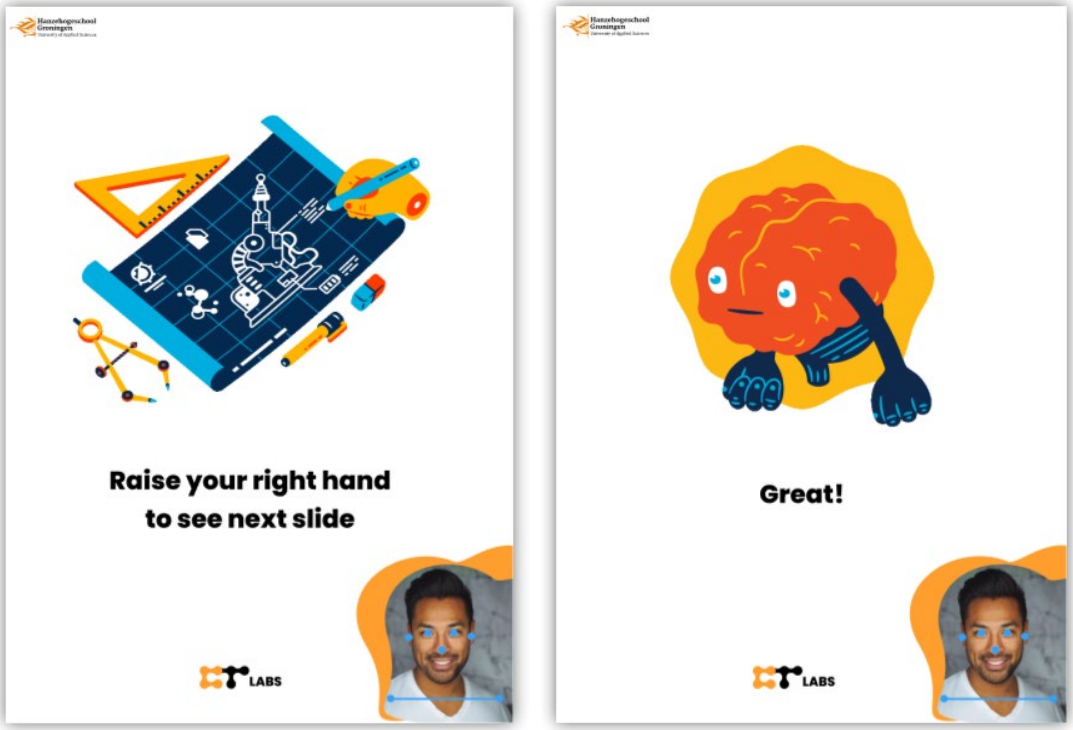


FIGURE 13, ONBOARDING 2

After completing the onboarding, the user is directed to the home screen (Figure 15). This includes a visual indication of where to navigate for Spacelab or Makerspace information as well as a tag line, which is meant to intrigue users.

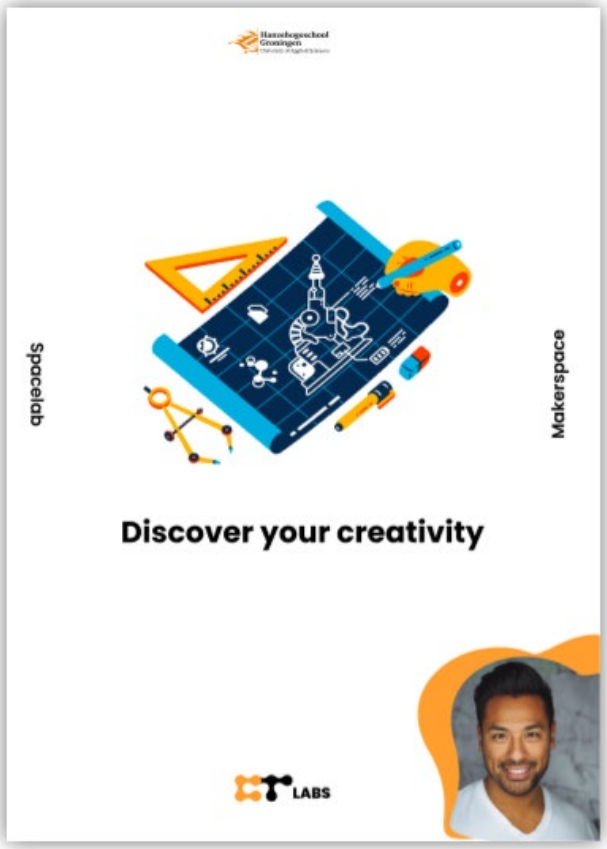


FIGURE 14, TAG LINE

The content of the pages abides by the structure described by the client, namely that it should include details about facilities, opening hours student assistants and student work. Additionally, the events page was also included (Figure 16). This format also applies to the application section dedicated to Spacelab.


Hanzehogeschool Groningen
Makerspace
facilities
Home
Opening hours
Laser cutting
3D printing
Rasin printing
Woodwork
Arts and crafts
LABS


Hanzehogeschool Groningen
Makerspace
opening hours
Facilities
Student assistants
monday - friday
8:30 - 17:30
LABS


Hanzehogeschool Groningen
Makerspace
student assistants
Facilities
Events
Monday
Benthe - morning
Linda - afternoon
Tuesday
Jorrit - morning
Ray - afternoon
Wednesday
Evgen - morning
Andrei - afternoon
Thursday
Quinn - morning
Sophie - afternoon
Friday
Jorick - morning
Eyal - afternoon
LABS


Hanzehogeschool Groningen
Makerspace
events
Student assistants
Student work
DND
Tuesday 24/05/2022
18:30
Cyber Night workshop
Tuesday 26/05/2022
17:15
Unreal Engine workshop
Wednesday 01/06/2022
18:00
LABS

FIGURE 15,MAKERSPACE SLIDES

5.3.2.2.2 Functionality

In terms of functionality, the prototype is based on Tenserflow, a machine learning and artificial intelligence library (Te, 2016) (TenserFlow, n.d.). A pose recognition model was used in combination with camera feed to process video information. The model was trained using multiple subjects to stabilize the predictions as much as possible (Figure 17). The training was done using TeachableMachine, an open-source training tool (TeachableMachiene, n.d.).

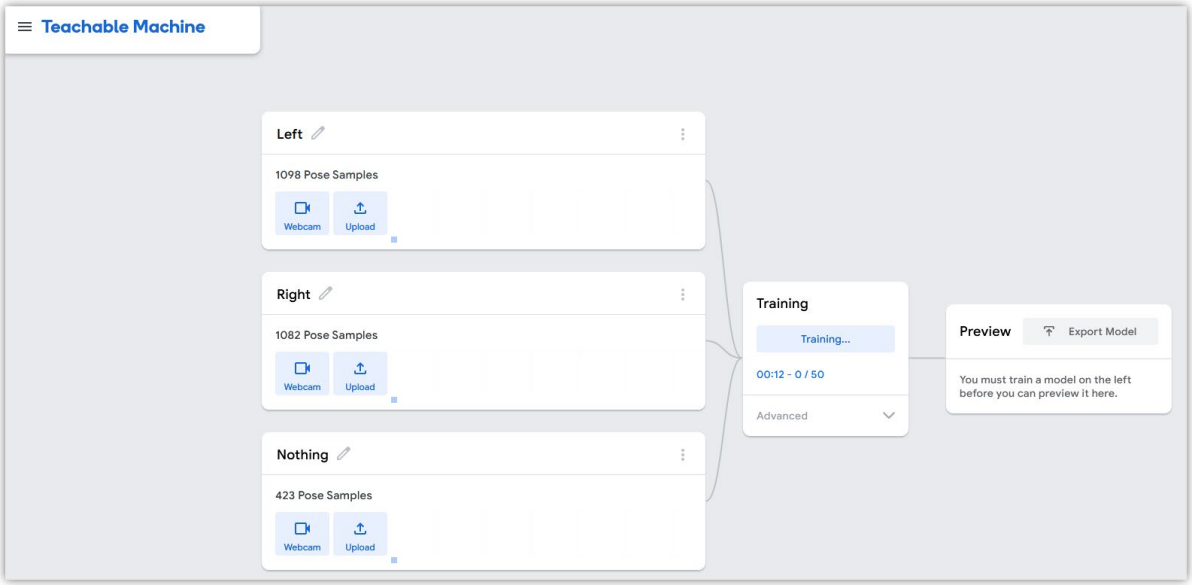


FIGURE 16, TEACHABLEMACHIENE

The model was trained to recognize three positions: left hand up, right hand up and idle, which were translated in navigation commands (Figure 18). Debugging and implementing the logic took long, which is why the first prototype was a simulation. It consisted of a video feed with the ML skeleton and the Figma prototype, which would be manually controlled to simulate how the prototype would work. This approach was taken to be able to test the prototype (See Evaluation) and improve it at an earlier stage.

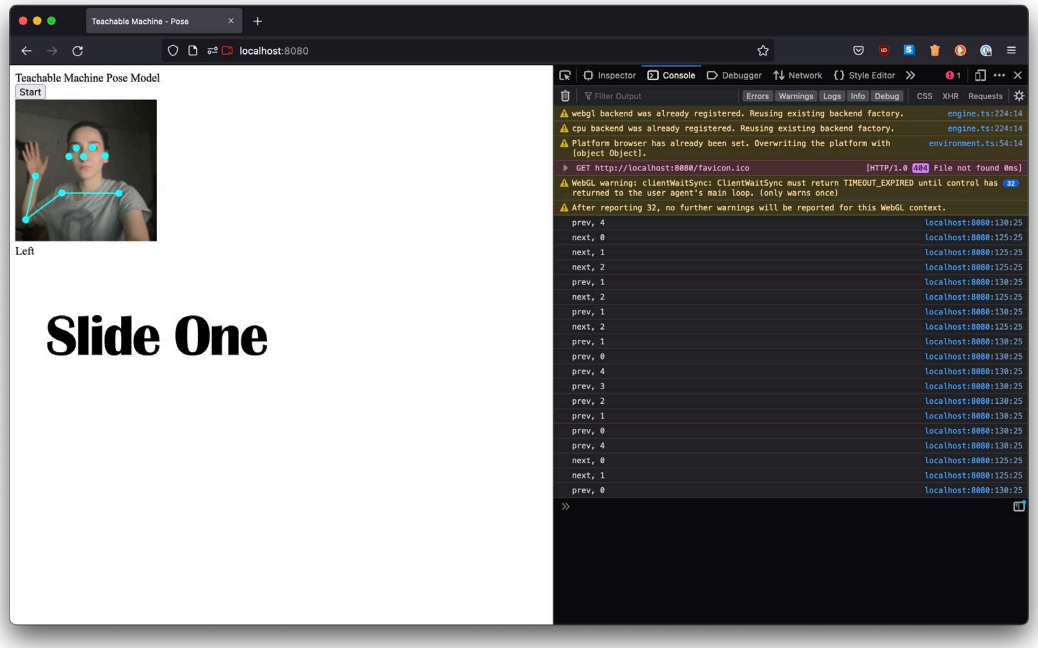


FIGURE 17, ML APP

5.3.2.2 Second iteration

The second iteration of the prototype aimed to include a solution to all the tasks from evaluation listed in Table 3.

First and foremost, the main iteration consisted of merging the UI with the machine learning logic (Figure 19). Furthermore, the machine learning model was trained again, adjusting the parameter of the poses such as lighting and background, to ensure more stable readings. The time delay between the video frame readings and the output correlated to the UI navigation was optimized. User experience wise, this accounts for more user error handling without affecting the way the prototype is navigated.

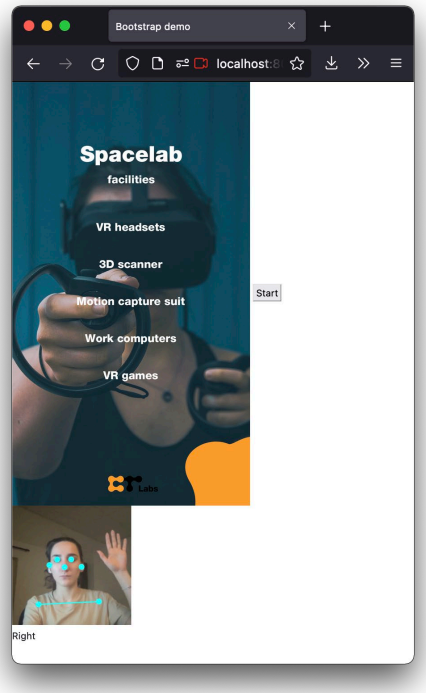


FIGURE 18, ML INTEGRATION

To optimize usability, the UI was also adjusted, mostly to better translate the instruction of how to use the controls. The UI alone can be viewed here: https://www.figma.com/proto/4e7uFXtxJgz6OdxnXvgFZG/Untitled?node-id=100%3A431&scaling=min-zoom&page-id=0%3A1&starting-point-node-id=100%3A2150&show-proto-sidebar=1

The onboarding screens were integrated in the home screen in a minimal way. Furthermore, the step-by-step tutorial of how to use the controls was changed to a more playful and exploration-based approach. The users are urged to just play with the controls (Figure 20), which could increase motivation, as reflected by research (Chapter 4.1.2). The indications for the next or previous page are more readable and include recognizable icons.

The overall readability of the text was revised. The images were chosen so the contrast with the background was higher, and the text more visible. The number of pages was also

shortened. Due to the nature of the controls, it was noted that users would have to navigate more pages than necessary. To solve that, opening hours and student assistants page were merged (Figure 20).

FIGURE 19, NEW UI

5.4 Evaluate

The evaluation phase consists of two evaluation moments used to test two versions of the prototype. The same group of people was asked to participate in both testing moments.

5.4.1 Goals and research questions

The goal of the evaluation is to determine if the design requirements have been met and that they were implemented in a satisfactory manner to both the target audience and the client. Research questions (Table 7) were formulated to determine if the prototype was developed enough to meet those requirements. Furthermore, the prototype was tested for its general usability.

Research question	Description
RQ1	Are the controls of the prototype intuitive and easy to use?
RQ2	Is the UI of the application clear in communicating the actions a user needs to take?
RQ3	Is the information showcased clear and useful to the users?

TABLE 7, TESTING RQ

5.4.2 Methodology

The methods used in this stage are target audience focus group, usability testing peer review (Turnhout, et al., 2015). For an in-depth methodology description see Chapter 9.4.

5.4.3 First rigorous evaluation

4.4.3.1 Session A: Target audience focus group

The prototype tested was a simulation of what the product will be, by presenting the UI in the form of a Figma interactive prototype along with the ML processed video feed (Figure 18). The users were asked to imagine the video feed as part of the Figma prototype and otherwise explore the prototype normally. Because the link between the UI and the controls registered by the ML software was not created yet, the pages were switched manually but done so the user was unaware of it in order to best simulate the functionalities of the prototype.

The testers were asked to go through the prototype individually and speak their mind as they do so. Their comments were noted and can be found in Appendix J. Afterwards the testers were asked to discuss their impressions about the UI, functionality and the information showcased in the prototype.

5.4.3.2 Session B: Client usability testing

The testing session was conducted at Hanze, in ZP11/C 221 on 23rd of May 2022. The client was instructed to go through the application and note the issues or discrepancies they discover. Those observation were noted down and analyzed.

5.4.3.3 Results – First evaluation

Below are the condensed results that try to answer the research questions of the testing session.

Research question	Answers
RQ1	The controls are intuitive, the only improvement would be that a swiping motion would be more natural
RQ2	The UI is simple, which adds to the likeability of the prototype. However, the indication of where the right or left control will lead.
RQ3	The information is clear. However, a few pages could be combined, and more images or visuals could be used to limit the user effort of reading multiple lines of text

TABLE 8, RQ ANSWERS

A valuable result of the testing session was that it offered a direction for future development. The iterative process of the prototype was based on the feedback gathered from the first evaluation. For that, all of the desired changes were organized and formulated into tasks (Table 9). To prevent steering too far from the initial development goals, the tasks were linked to design requirements and ordered based on urgency.

Task	Description	Retrieved from	Urgency
1	Make the onboarding part of the home page	Session A	Urgent
2	Make the UI that illustrate the controls more readable	Session A	
3	Add icons to UI controls	Session A	
4	Make the video feed box bigger	Session A	
5	Switch the controls orientation for the Spacelab pages	Session A	
6	Combine Makerspace opening hours with the student assistants page	Session A	
7	Make the UI of the home screen better represent the purpose of it	Session A	

8	Make the UI stand out more on the Makerspace pages	Session A	
9	Add more images or videos	Session A	
10	Increase delay between pose predictions	Session A, Session B	
11	Retrain the model	Session B	
12	Combine Makerspace opening hours with the student assistants page	Session A	Medium urgency
13	Add a border or banner to student work	Session A	Non-urgent
14	Add animations to the page's movement	Session A	Non-urgent

TABLE 9, ITERATION TASKS

The walkthrough of the implementation of those tasks can be found in Chapter 4.3.2.3.

5.4.4 Methodology – Second rigorous evaluation

4.4.4.1 Session A: Target audience focus group

The testers were asked to go through the prototype without any other instructions other than to talk about their observations. After all the testers have experimented the new version of the prototype, they were asked to discuss their observations, with a focus on the UI, information clarity and functionality. The notes of the session can be found in Appendix L.

5.4.4.1 Session B: Unstructured expert interview

The interview was conducted with Edwin Yanarico. The focus of the interview was mostly the UI and UX aspects of the prototype, namely trying to answer RQ2 and RQ3 defined in Chapter 4.4.1.

5.4.3.3 Results – Second evaluation

The research questions were answered by analyzing the evaluation results.

Research question	Answers
RQ1	The controls are now more intuitive. There's still a preference for swiping but the technology does not allow for reading motion, only capturing positions
RQ2	The controls are better illustrated now, and the text of the next/previous slides is clear. A few minor discrepancies in the design

RQ3	The information is clearer, however, it still needs more images, videos or interactive elements

TABLE 10, RQ ANSWERS

Based on the feedback gathered, new tasks were created to further improve the prototype (Table 11).

Task no.	Description	Retrieved from	Urgency label
1	Change the icons indicating direction to something that is not associated with buttons	Session B	Urgent
2	Make sure that the design is consistent throughout all pages	Session A, Session B	
3	Returning to home page	Session A, Session B	
4	Train ML model to recognize up as returning to home page control	Session A, Session B	
5	Have a visual way of showcasing what events are coming up soon	Session B	Medium urgency
6	Maybe have a QR code for sign up forms for the events	Session A	

TABLE 11, ITERATION 2 TASKS

6 Conclusion

After undergoing a full design cycle, it can be concluded that an interactive info-system that integrates motion capture and machine learning can engage students to at least get more information about the CT-labs. The tool is limited, as the technology is not polished, but its novelty engages people when coupled with pleasing UI. The usage of the system will not directly link to an increased student flow in the CT-labs, but it will familiarize them with the existence of the labs, which is a step closer to the final goal.

7 Recommendations

The prototype describes is only a part of the proposed system. If the client wishes to pursue its full development the following recommendations are made:

1. The screens should communicate and integrate the same system.
2. The functionality of the tool could be expanded by adding more controls
3. The attractivity of the product could be improved by adding designated animations and sounds triggered by proximity.

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9 Supporting documents

9.1 Explore and comprehend

The explore and comprehend stage was meant to shed more light on the specifics of the problem context, the specifications of the target audience and establish guidelines for the research effort. It can be delimited in two sub-stages: preliminary research and the main research phase (See Chapter 6.1.2). In the preliminary research phase the problem context is explored with an initial client meeting as well as a target audience questionnaire. The preliminary research phase represented the building block towards defining key concepts and research questions. The research questions were then answered in the main research chapter mostly through the conducted literature research as well as expert interviews, target audience interviews and focus groups.

9.1.1. Preliminary research

9.1.1.1 Client meeting

9.1.1.1.1 Setup

The client meeting was held on 01.03.2022 in ZP11/C221. The main goal of the meeting was to define the scope of the project, the client expectations and better understand the problem context. It also focused on what possible attempts, if any, were done to solve the issue and what already established requirements they had for this project.

9.1.1.1.2 Results

The client meeting represented the starting point in understanding the core issues that constitute the problem context (See Appendix B for notes). The main topic of the meeting was their opinion about why students do not visit the CT-labs and what was done to mediate the problem in the past. The unique position of the client as a head of the CT-labs as well as a teacher meant that they had more insight about the influx of students in the CT-labs but also more feedback from his contact with the students in class. The result was that the core issue is lack of awareness and information. Most students are not aware of the existence of the CT-labs of the facilities within those spaces. Efforts to mitigate this were done by having posters and screens outside the spaces with information about the facilities, opening hours and the shifts of student assistants. However, it did not impact the student influx in the CT-labs. According to Manno, one contributing factor to the failed efforts of fixing the issue is the fact that the C-hall is not normally visited by students. There are barely any classes hosted there anymore, and therefore students do not pass by it, making the posters and screen displays redundant.

The meeting also had the role of better defining the scope of the project. The client wanted to have a solution that was accessible in the C-hall and representative of the CT-labs. It was decided that the project should in itself be an example of what students can do by utilizing the CT-labs facilities. Therefore, it would be a client preference if the project would incorporate the usage of a newer technology.

9.1.1.2 Stakeholder interviews

The stakeholders of this project are the CT-labs staff that hold leading positions. These are Manno Bult, Geert Broekmann, Ilja Plutschouw, Jonathan van Denzen and Kjell Neumann. Manno Bult is the head of the Makerspace and oversees the activities of all the CT-labs. Geert Broekman is an operations manager, being in charge of the acquisitions for the spaces. Kjell Newman and Jonathan van Denzen are supervisor and senior supervisor. Ilja Plutschouw is mainly active within matters related to Spacelab.

A separate meeting was held with each stakeholder to get a better understanding of the problem context. The positions and experience of the stakeholders as actively engaged staff within the CT-labs offers them a unique point of view that could benefit the project.

9.1.1.2.1 Setup

The meetings were held between 02.03.2022 and 11.03.2022 in person or through Microsoft Teams.

Unstructured interviews were conducted with all the stakeholders, firstly to further define the problem context and second, to make use of their expertise as CT-labs staff members, teachers, UI/UX and technical experts.

The main point of the meetings was to present the problem as it was known at that time based on the client meeting and get input regarding their understanding of it. Each stakeholder was asked why they believed the CT-labs are not as visited by students and what were the contributing factors.

9.1.1.2.1 Results

The students do not visit the CT-labs either due to lack of information about their existence or because they feel intimidated by them. Kjell Neumann believes that students have a high entry barrier because there is nothing that gets them accustomed to the idea of visiting the CT-labs (Appendix C). The students are not exposed to the idea and possibility of visiting the labs enough to actually make them try it at least once. The students that do come, because they have no idea what to expect, can be scared by the number of new elements or the complexity of them. In short, the CT-labs needs to offer more hand holds to the students, get them to overcome their hesitance.

According to Jonathan (Appendix D), who is also a teacher for VD and ID students, those particular students feel intimidated and alienated by the CT-labs. VD and ID majors are similar majors that use Dutch as the primary language. Therefore, the majority of the students studying those majors are not confident in their spoken English skills. Within the CT-labs, staff tends to accommodate for international students by preponderantly speaking English, which creates a high entry barrier. Furthermore, there is no VD/ID student assistant representation in the labs, nor is it common to see VD or ID student work displayed.

Another point of view was that students were still feeling the effects of the pandemic, when two study years, the campus was barely visited. As such, Geert believes that the students

became used to not engaging with physical university related tools or they simply do not know about them.

Lastly, according to Ilja (Appendix F), the students need more incentives. They are currently incentivized by teachers to visit the CT-labs and experiment with the tools available. However, the number of students in the first or second year that visit is low. The focus is on the first and second-year students, because the third and fourth year students usually are less present on campus because they have internships, minors abroad or at other schools or graduation projects. The curriculum also incentivizes the second-year students to use the Spacelab by assigning group projects to the VR headsets that are accessible only in Spacelab. Even so, not all groups visit.

9.1.1.3 Target audience survey

9.1.1.3.1 Setup

The target audience survey was filled by 18 CMD and CMGT students, with an even distribution between the CMD GD, CMGT and CMD VD, ID students (Figure 21).

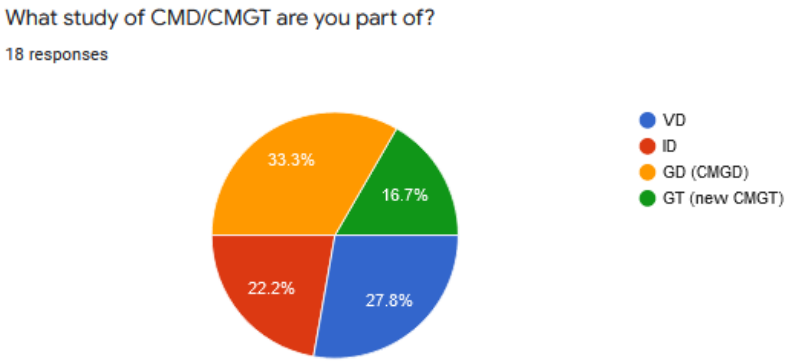


FIGURE 20, SURVEY CMD/CMGT ANSWERS

The survey consisted of 13 questions that aimed to gather information from a student perspective about why they are not visiting the CT-labs and what specific aspects could be improved that would persuade them visit the spaces. Additionally, the survey served as a way to validate the observations of the client that the main issues are lack of awareness about facilities and lack of convenience in visiting the CT-labs. The entirety of the questions and answers can be found in Appendix G.

9.1.1.3.2 Results

The results of the survey support the information gathered from the client. When asked how often they go to the C-hallway of the ZP11 building, the majority of students estimated that they never or barely go there (Figure 22). This is in line with the data gathered about the frequency with which students visit the CT-labs. When asked to rate the frequency of visits on a scale of 1 to 10, more than half of the respondents identified within the lower half of the scale (Figure 23).

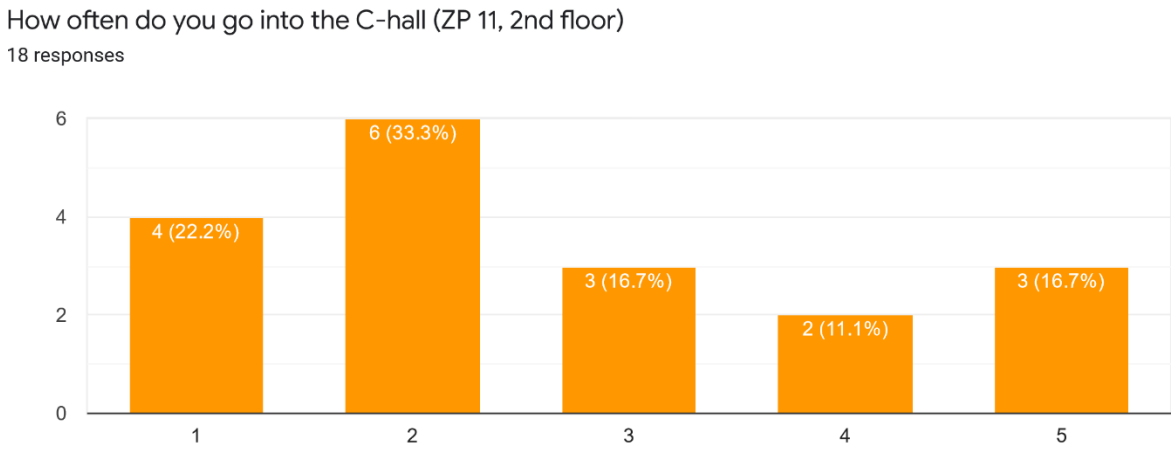


FIGURE 21, SURVEY FREQUENCY OF VISITING C-HALL

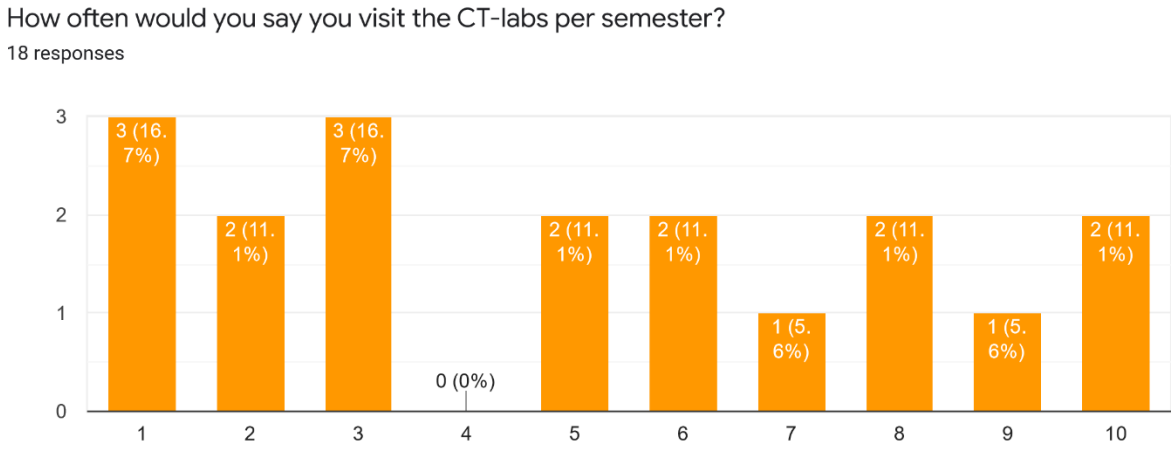


FIGURE 22, SURVEY FREQUENCY OF VISITING CT-LABS

The accessibility of the CT-labs is lacking, especially for students that have no classes in the C-hallway or the ones that have no idea of the existence of the CT-labs. Furthermore, when students do happen to pass by one of the CT-labs, the information that could intrigue them and eventually make them visit one of the labs is either not visible or is not up to date. This is supported by the fact that the majority of respondents admitted to not using the info-screens outside the CT-labs for relevant information (Figure 24). Furthermore, some of the respondents noted that they were completely unaware of the existence of any info-screens.

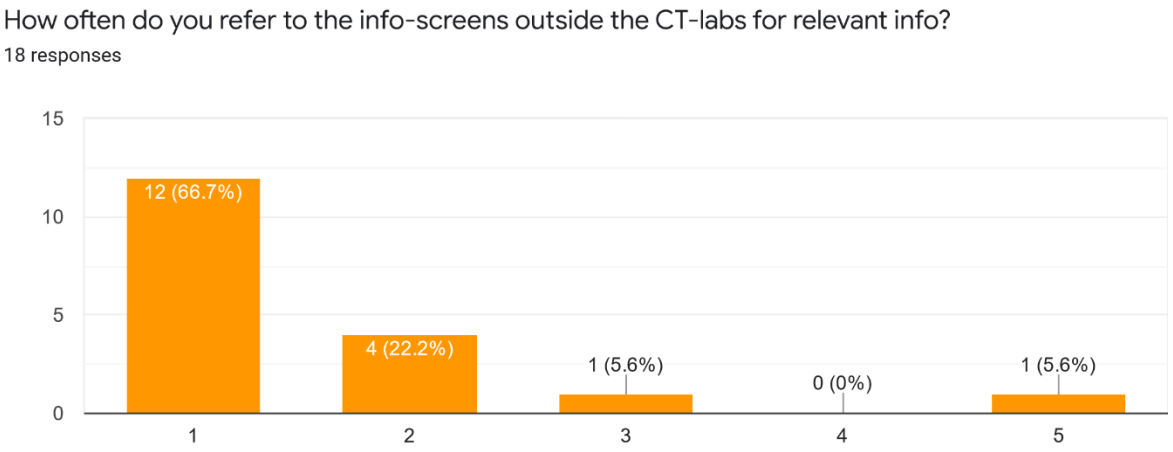


FIGURE 23, REFERING TO INFO-SCREENS

9.1.2. Main research

Once the desk research defined the problem context, key concepts were defined and then research questions were formulated in order to guide the research efforts towards finding a solution.

In this section of the document the research questions are answered using methods belonging to both desk and field research. Table 6 showcases each concept, research question and the method used to answer them.

Literature research (Turnhout, et al., 2015) was used to answer a majority of the research questions. This method allows for easy access to multiple valuable and relevant research conducted on the subject defined by the key concepts. The research questions were answered fast, based on different and multiple data sources.

KEY CONCEPT (KC)	RESEARCH QUESTIONS (RQ)	METHODS USED
KC1: MOTIVATION AND BEHAVIORAL CHANGE	How can motivation implementations be used to encourage students of CT cluster to visit the CT-labs? What is the difference between intrinsic and extrinsic motivation and how can they be used? What is attention and how can it be manipulated? How can captured attention be translated to call to action from students?	Literature research, Expert interview
KC2: PERSUASIVE DESIGN IN SERVICE DISPLAYS	What are the best practices of persuasive design? How can persuasive design be used to convey information? How are the current CT-labs service displays being used as a tool to convey information to students? How can service displays adapt persuasive design principles to convince students of CT cluster to visit the CT-labs?	Literature research
KC4: UX AND INTERACTIVE DESIGN	What interactive technologies could be implemented along the service displays to engage students of CT cluster? How can interactive design and UX principles be used to make service displays more interactive?	Literature research
KC4: GDPR AND TECHNICAL FRAMEWORKS	What are the limitations imposed by the GDPR regulations at Hanze UAS? What are the technical regulations for interactive applications within Hanze UAS?	Expert interview

TABLE 12, MAIN RESEARCH

9.1.2.1 Motivation and behavioral change

9.1.2.1.1 How can motivation implementations be used to encourage students of CT cluster to visit the CT-labs?

Motivation is a key element in the development of this project, as it governs the majority of user actions and thus can impact the success of a product. However, motivation and engagement are most times used interchangeably, when in fact they are dependent on each other and together they construct what is generally referred to as motivation. Rigby (2015) defines motivation as psychological construct that comprises of two dimensions: energy and direction. His theory describes energy as the ability and willingness to take action while direction defines where that energy is pointed and concentrated towards. Within this definition, engagement is identifiable with direction, it is a behavioral expression of a person experiencing motivation.

For most products, engagement is a quantified variable. The more engagement, the more attractive the product is to possible users. However, engagement can not be achieved without the motivational state, the energy that moves people to perform certain activities.

The self-determination theory (Ryan & Deci, 1985; Deci & Ryan, 2008) acknowledges that one of the key elements of motivation is energization of one's behavior. This energy that leads to a motivational state is said to originate from three sources. The first source of energy would be the basic physiological needs such as hunger and tiredness. Those needs are universal, and they represent a daily source of energy. The second source is one's emotional state, which can also explain why people seek pleasure and avoid pain in general, or why pleasurable experiences can energize a person. The last source would be psychological needs, which are also universal and internally generate. Furthermore, the psychological needs are closely connected to the overall feeling of well-being. All three energy sources have an impact on how motivation can be achieved, or more specifically how one can be energized to perform certain activities.

The psychological needs have received great attention within the SDT and motivation research. It has been shown that there are three main psychological needs that are universal sources of energy for motivation, namely competence, autonomy and relatedness (Deci & Ryan, 2008) (Rigby, 2014). These elements are especially crucial to creating strong intrinsic motivation.

Competence, other referred to as mastery, describes the human need to be successful in their performed activities. It energizes oneself to pursue perfection in a task or constant development of skills. It contributes to the need of seeking challenges that match one's

abilities, which has also been referred to as “flow” (Rigby, 2014). While mastery takes time and might lead to frustration, the matching of the challenge difficulty and the undertaker’s abilities leads to a continuous pursuit, despite the challenges. Furthermore, the difficulties that arise while trying to master a task become the energy that pushes one to pursue mastery. Mastery can also begin from a mindset of personal growth. The mastery mindset is defined by a constant desire to learn and compete against oneself, and most importantly acknowledging the possibility of improvement (Pink, 2011).

Autonomy is the fundamental need to feel in control of one’s experiences and choices. It is an innate and universal desire to be autonomous and volitional (Deci & Ryan, 2008) (Rigby, 2014). Pink (2014) further describes autonomy as the ability to control one’s task, time, team and technique. This need can actually be hindered by external means of control, either positive or negative (Rigby, 2014). Having users of a product fulfill their need for autonomy can be achieved by allowing them to control the time of usage, the task performed or small customizations, which will not be nullified by other crucial constrains such as mechanics. In line with the expert interview conducted with Jonathan van Denzen, students need to have control over the information they receive as well as the language.

Purpose or relatedness is a fundamental need to achieve something that matters, something that is larger than oneself (Pink, 2011). It also refers to the need to be supported by others and have an overall feeling that one matters to peers. In a product, the need for relatedness can be achieved by incorporating collaboration. However, it can also be fulfilled by having a supporting computer-generated character (Rigby, 2014). For this particular project, as supported by expert interviews with Jonathan van Denzen, Kjell Neumann and the client, a showcase of student works could help give one a sense of relatedness. Additionally, this feature could also satisfy the need for competence in the case of students that see their own work displayed as an approval of their own successful efforts.

9.1.2.1.2 What is the difference between intrinsic and extrinsic motivation and how can they be used?

Intrinsic motivation has been the main focus of the SDT (self-determination theory). It is the need to perform an activity purely for the pleasure derived from performing it, a behavior most encountered in children, who play with seemingly invaluable objects just for the sake of enjoyment. Intrinsic motivation becomes even stronger when it meets all of the psychological needs: autonomy, competence, relatedness. By contrast, extrinsic motivation is defined by pursuing an activity in order to achieve another goal which is external from the activity itself.

Contrary to popular belief, neither intrinsic nor extrinsic motivation is superior. The rate of successes of each approach rather depends on the predisposition of the person performing

those activities (Rigby, 2014). Therefore, the quality of motivation that drives one to perform an activity is more valuable (Deci & Ryan, 2008). To define the quality of motivation, SDT proposes milestones that can describe the quality of motivation (Table 13).

External regulation	Energized purely by regulations outside of self
Introjected regulation	Energized by a sense of internal pressure (feeling ashamed or obligated)
Identified regulation	Energized by acknowledgement of the goal value
Integrated regulation	When the activity itself energizes the person

TABLE 13, SDT MILESTONES

The SDT proposes a different distinction between types of motivation. This framework describes three types: autonomous motivation, controlled motivation and amotivation (Rigby, 2014). The autonomous motivation comprises of intrinsic motivation and identified extrinsic motivation, where one has identified with the values of an activity and has adapted them as their own. Controlled motivation consists of both external regulation, reward or punishment incentives, and introjected regulation, where the regulation has been internalized only partially. Both types of motivation can shape behavior. In contrast, amotivation is the complete lack of motivation.

Applications of SDT in educational settings denote that students who are regulated towards a specific behavior by autonomous motivation, namely a combination of intrinsic and identified motivation, experience positive results (Guay, Chanal, & Ratelle, 2008). The outcomes of those results can be behavioral, cognitive an affective. The behavioral outcomes can be divided in persistence and achievement. Results show that persistence and autonomous motivation can be triggered in an educational setting by activating intrinsic educational goals as well as introjected regulation. Therefore, students that have an innate desire to learn more as well as the students that feel the obligation to continue their learning tasks will persistently perform the tasks they are engaged in. Additionally, autonomous motivation is also linked to academic achievements. Therefore, a product that can trigger autonomous motivation or incorporate introjected regulations, can result in

increased persistence in using the product as well as make its users explore it and use it more effectively.

The cognitive outcomes have been linked to learning creative improvements. Students who presented autonomous motivation were associated with an increase in retention and depth of learning as well as an increased preference for optimal challenges (Guay, Chanal, & Ratelle, 2008). The affective outcomes presented that students experiencing autonomous motivation reported a greater enjoyment of academic work and overall positive emotions in classrooms. Consequently, if autonomous motivation is triggered, users could experience greater enjoyment while using the tool as well as higher retention of information provided by the product.

9.1.2.1.3 What is attention and how can it be manipulated?

Attention is a psychological concept that has received multiple attempts at defining it, however, there is no widely accepted description that comprises all of its characteristics. It involves a multitude of mental processes and psychological frameworks. Khaneman (1973) has attempted to define attention, however his approach attempts a definition by looking at attention from the perspective of mental effort.

According to Kahneman (Kahneman, Thinking, Fast and Slow, 2011) (Kahneman, Attention and Effort, 1973) the human mind can be imagined to comprise of two systems or have two "characters": System 1 and System 2 or Slow and Fast thinking. System 2 is responsible for all the conscious operations such as making choices and heavy thinking, it is slow and precise. System 1 is automatic and excels at generating ideas and patterns that are normally thought of as subconscious, it is fast but biased. The two systems coexist in the conscious human mind and have an energy efficient work structure. System 1 is in charge of the mind the majority of time, and only calls on System 2 when it requires more specific and detailed processing. The reason for this dynamic is that System 2 consumes more energy, namely it requires more effort to call on System 2 and compute details, rather than use System 1 and interpret overall impressions and feeling based on past experiences.

There is a limited amount of mental effort one can excerpt at one specific time (Kahneman, Attention and Effort, 1973) (Kahneman, Thinking, Fast and Slow, 2011). This limit can only be slightly increased when one experiences arousal. Consequently, the popular concept of multi-tasking, where attention is extremely focused on multiple complex elements at the same time is false. This finding can be utilized when designing possible solution by limiting elements that could overload the mind as well as its computational limits. This phenomenon also explains why it is likely that one will avoid a product or tool that overloads their mind, no matter the perceived usefulness.

Because System 1 is active the majority of time, when the mind performs simple tasks such as walking or conversing, it can be manipulated easier (Kahneman, Attention and Effort, 1973). System 1 operates on impressions and beliefs of previous experience, which makes it less accurate and more biased. This can be used to implement functionalities that have the sole purpose of capturing user attention, such as sounds ques or visible text. Listening for surrounding sounds is a deeply engraved habit of humans, which is why one can not choose to ignore it (Kahneman, Thinking, fast and slow, 2011). The same applies to seeing text in a recognizable language. One will hear the sound que and read the text. Once their attention is captured, persuasive design and motivational theories can be implemented to engage the user.

9.1.2.1.4 How can captured attention be translated to call to action from students?

As mentioned above, System 1 of Kahneman's analogy for the human mind is impulsive and biased (Kahneman, Thinking, Fast and Slow, 2011). The impulsiveness and instinctual reaction of it can be used to trick the minds and direct its attention towards a desired object or product such as an info-screen. The system's biased way of functioning, however, can be harder to overcome.

One such bias is the imaginability bias. It refers to the ability of the brain to assess the frequency of a class that whose instances are not stored in the long term memory but can be brought to the immediate short term memory by a given set of rules (Kahneman, Thinking, Fast and Slow, 2011). One assesses the probability and frequency of an instance based on the ease with which they were mentally generated. The bias is created when a person is not familiar with a class and thus cannot generate instance of it in which case the difficulty of identifying instances is translated into lack of frequency or relevance (Tversky & Kahneman, Judgment Under Uncertainty: Heuristics, 1974). For example, for a student that hears about the fact that there is a motion capture suit in the CT-labs but has no idea what the tool is used for, their immediate assessment will be that the tool is useless. Their lack of previous experience or knowledge of the tool will dictate that there are no useful applications for it and so deem it useless or unattractive. However, if the students were shown a practical application that would complement their activities within their study, it is very likely that bias will not occur again for that specific case.

The bias of retrieval of instances is similar in many ways. This bias solely refers to the ability of retrieving information from memory, rather than generating it using one's imagination (Kahneman, Thinking, Fast and Slow, 2011) (Tversky & Kahneman, Judgment Under Uncertainty: Heuristics, 1974). An instance that was previously familiar will have greater impact, compared to when there is no prior information about the said instance.

Additionally, having performed an activity will have a greater effect on how willing one is to perform it again, compared to just hearing about it.

In order to understand how to persuade students to make a certain decision, in this case visit the CT-labs, a closer look was taken at how people make choice and how the decision process is framed. Research has shown that people generally take decisions based on the weight of physical and psychological effort compared to the outcome (Kahneman & Tversky, The framing of decisions and the psychology of choice, 1985). If the effort is too high, an outcome of loss is averted, be it energy or material loss. Furthermore, people tend to make decisions based on the immediate outcome of the decision . In adults, that is because it reduces cognitive load. However, in young people aged below 25 years old, the mental ability to project and process future outcomes is not fully developed. For example, if students see information about the CT-labs that is not relevant at that time, they will not act on it by visiting the labs.

When it comes to how an option is framed, people tend to avoid negative outcomes (Kahneman & Tversky, The framing of decisions and the psychology of choice, 1985). Therefore, an option defined from a negative point of view will weigh more and create a greater loss aversion impulse. The same option described from an optimistic point of view will not have the same impact in the form of an attraction impulse.

9.1.2.2 Persuasive design in service displays

9.1.2.2.1 What are the best practices of persuasive design?

Research shows that designing an interactive application or technology should follow 8 simple steps illustrated in the table below (Fogg, Creating Persuasive Technologies: An Eight-Step Design Process, 2009).

STEP	DESCRIPTION
STEP 1	Choose a simple behavior or target
STEP 2	Choose a receptive audience
STEP 3	Find what prevents the target behavior
STEP 4	Choose a familiar technology
STEP 5	Find relevant examples of persuasive technology
STEP 6	Imitate successful examples
STEP 7	Test and iterate quickly
STEP 8	Expand on success

TABLE 14, PERSUASIVE DESIGN BEST PRACTICES

9.1.2.2.2 How are the current CT-labs service displays being used as a tool to convey information to students?

The CT labs currently feature 2 informational screens, one in Spacelab and one in Makerspace. The screens are placed inside the rooms, but are visible from the hallway via a glass door. The placement of those screens, however, is less fortunate. The Makerspace screen is placed behind the door, which means that it is hidden during opening hours when the door is wide open. The Spacelab screen is visible, however, it is placed after the door, so for everyone walking towards the end of the C-hall, it would be inconvenient to turn around and walk in the Spacelab even if they saw the screen. The screens, therefore, blend too much into the hallway and are barely or not at all visible.

The client disclosed that the informational screens display content that is run on RaspberryPis. The Spacelab screen uses a video on a loop and the Makerspace screen displays a website that constantly refreshes to change the shown content. To change the content showcased on the screens, a CT-labs staff member needs access the RaspberryPi directly or by using an SSH command. To add a new event to the CT-labs screen, one has to manually copy the playlist, modify the video using a designated tool and upload it again.

In terms of style, both screens use two widely different design patterns. However, a new general style was currently chosen for the CT-labs, which would have to be included in the project. The main requirement would be to clearly communicate that the CT-labs consists of Makerspace and Spacelab through the language used and a consistent style.

9.1.2.3 UX and Interactive design

9.1.2.3.1 What interactive technologies could be implemented along the service displays to engage students of CT cluster?

Intractability has become a must in digital products, which in turn has led to multiple emerging technologies. However, in order to keep a realistic development process possible, a selection of those technologies were chosen as possible solutions for the current problem. Based on the interview with the SICO of Hanze, as well as the technology and hardware available in the CT-labs or Hanze at large, the following options were found:

- Simple sensors
- Nano leaves
- Camera sensors
- ML based software

These technologies can be implemented alongside informational screens. Furthermore, the are already fully or partially used for other purposes within Hanze, which rules out the possibility that the final product will be deemed unfit to be used within the university setting.

9.1.2.3.2 How can interactive design and UX principles be used to make service displays more interactive?

Interactive design (IxD) represents the practice of designing digital products or services. It focuses on creating good communication between a user and a product (Babich, 2019). It is often used interchangeably with the term user experience (UX), the practice of designing user experiences. However, in practice, UX incorporates interactive design, as it can be seen in Figure 24.

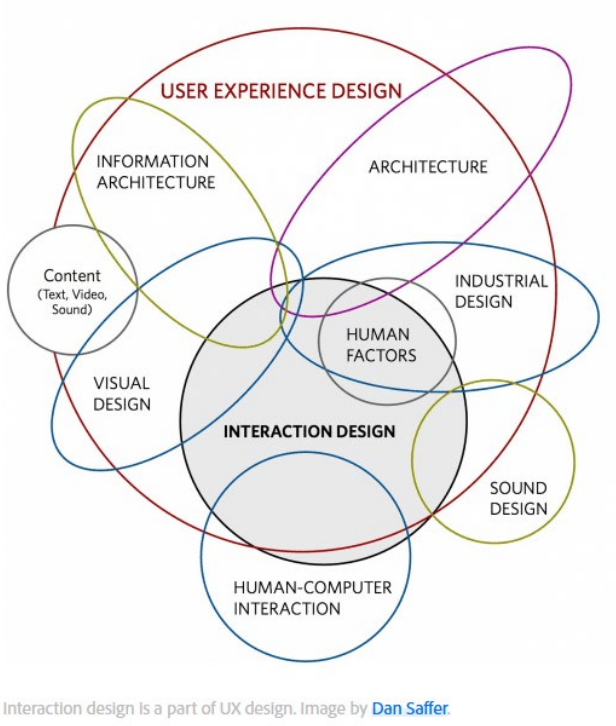


FIGURE 24, INTERACTION DESIGN AND UX (BABICH, 2019)

Therefore, in order to best define what constitutes good interactive design, one first look at the base UX principles. Usability expert Jakob Nielsen (Nielsen, 1993) identified ten UX "commandments" that represent the golden standard of the industry for creating qualitative UX driven products:

- Let users know the system status by using consistent feedback
- Order information logically
- Make sure users can easily undo actions.
- Maintain consistent standards so users know what to do next without having to learn new toolsets
- Prevent errors
- Make users remember as little information as possible
- Make systems flexible
- Design minimalistic, no clutter
- Provide simple error messages.
- troubleshooting resources, if they are needed.

Norman (2013) goes further and defines the fundamental principles of interaction design that are completely independent of technology:

- Visibility

- Feedback
- Consistency
- Non-destructive operations
- Discoverability
- Scalability
- Reliability

Furthermore, as the goal is to make users curious about the CT-labs and ultimately convince them to visit the labs, there is a certain focus on how the user feels when interacting with the product. A good first impression will only enhance the ease of usage (Interaction Design Foundation, n.d.). To evoke the feeling of curiosity, the product also needs to appeal to the passion and interests of the user. This will create a sense of identity for the user, which in tern can trigger engagement and drive to explore the product, an aspect that is also supported by the research conducted on motivation and behavioral change.

Visuals could also greatly impact how the product is received by the target audience. Besides the alignment with a brand, in the current case the branding style of Hanze UAS and the CT-labs, the overall image of the product can impact how users perceive it. Students already perceive the educational institution as reliable source of information. Therefore, by following the style guides of the Hanze (see example in Figure 26), the product will inherit the same attribute.

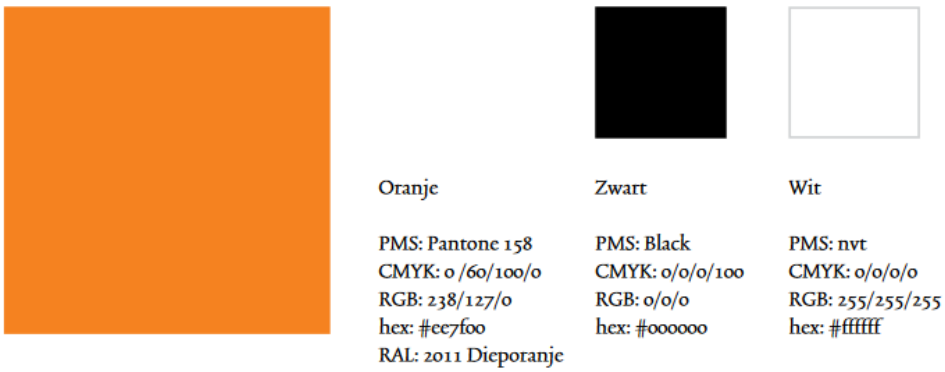


FIGURE 25, HANZE UAS OFFICIAL COLOR SCHEME

9.1.2.4 GDPR and technical frameworks

Unlike the other key concept, the one concerning the GDPR and technical frameworks at Hanze was introduced during the concepting phase. The target audience has shown an interest in the usage of cameras in the solution and the clear guidelines of Hanze were not known at that stage. Another contributing factor to returning to the research after concepting was the limited availability of the cybersecurity department.

9.1.2.4.1 What are the limitations imposed by the GDPR regulations at Hanze UAS?

The General Data Protection Regulation, or GDPR, is a security and privacy law that is meant to protect EU citizens against data abuse (European Union, 2016). As the developed solution will be part of the CT-labs, which in turn activate within and for Hanze UAS, strict regulations regarding GDPR are applied.

The Hanze legal department was contacted to get a better understanding of the limitations imposed and how a possible solution will have to be developed around them. An unstructured interview with Nghitti Saro-Kortman, legal department representative, and Gert Douma, Chief Information Security Officer was conducted.

The main takeaways are that user information should be communicated clearly. If image or video feeds are collected, they should accompany legal explaining details about the way data is used, but it should also be visually showcased what feed is used. This could, however, be circumvented by building a system that does not store any user data, but rather makes it visible to the user at the time of usage only.

The legal department along with the IT & security department were, at the time the interview was taken, working on revising the internal policy on GDPR related camera usage within Hanze. There has been a 3rd party company (TwiQel, n.d.) who performed a test running a machine learning and camera-based application within Hanze and based on their Data Protection Impact Assessment (DPIA) (European Union, 2016), the legal department is revising their policy. Where before a camera-based product would have been rejected, they agreed to allow it as long as the back-end framework does not store, process or link any data to any user. However, the final product might be subject to a DPIA.

9.1.2.4.2 What are the technical regulations for interactive applications within Hanze UAS?

Despite the willingness to accept a product that could potentially use camera-based technologies, the Hanze cybersecurity department was less forgiving. When it comes to connecting a computer to the Hanze network, either the public or private one, there a

multitude of checks and approvals that need to be given. The process would involve possibly speaking to half of the individual staff members, which would simply take too much time given the timeframe of the project.

Therefore, the following approaches were ruled out:

- Using a server, either internal or external
- Connecting multiple screens through a dashboard
- Any type of complex network connectivity
- Opening or scanning ports on the public or private network

9.1.3 Justification of sources

Source Type	Justification
Academical sources (reports, books)	Academical sources were the main source of information during the desk research phase.
Websites	These types of sources are not validated by peer-review, however, the contents were written by leading experts in the field.
Private sources	The client has also provided sources that are not publicly available, such as the Hanze and CT-labs internal design guidelines.

TABLE 15, JUSTIFICATION OF SOURCES

9.1.4 MoSCoW design requirements

Design requirements (Turnhout, et al., 2015) are a crucial component of a project development, which are used to define the goals that the product needs to meet in order to be deemed successful and solve the problem. For this project, they were defined following the research stage as a transition step that would help defining concepts and develop a prototype. The design requirements, through the entire development process act as a regulator that prevent steering off too much from the true goal of the project.

Code	Description	Retrieved from	MoSCoW
FR1	The tool should offer the user the freedom to choose what information is displayed	Motivation and behavioral change	Must
FR2	The tool should make use of one or multiple interactive technologies	Interactive design	Must
FR3	The tool should make use of informational displays	Interactive design, Persuasive design	Must
FR4	The tool should incorporate visual and/or auditory cues to attract user attention	Motivation and behavioral change	Should
FR5	The tool should feature a character/mascot that will guide the users through how to use the tool	Motivation and behavioral change, Interactive design	Should
FR6	The tool should have the mascot encourage users when using it	Motivation and behavioral change	Should
FR7	The tool should feature student projects to create a sense of community and belonging	Motivation and behavioral change	Should
FR8	The tool should not overload users with information	Motivation and behavioral change	Must
FR9	The tool should make clear to users how their data is used	GDPR	Should
FR10	The tool should have a backend structure that doe not store or disclose user information to any 3rd parties	GDPR	Must
FR11	The tool should use a clear language	Persuasive design, Interactive design	Should
FR12	The tool should abide to the design style of Hanze UAS and CT-labs	Interactive design	Should
FR13	The tool should feature a pleasing/appealing interface	Persuasive design, Interactive design	Should
UR1	As a user, I want to be able to easily access the information	Focus group	Must

UR2	As a user, I want to access useful and up to date information	Focus group, Questionnaire	Should
UR3	As a user, I want to customize the information I see	Focus group	Must
UR4	As a user, I want to interact with the tool	Focus group, Questionnaire	Must
UR5	As a user, I want to see information representative of my study	Focus group	Should
UR6	As a user, I want to be able to choose a language	Focus group	Could
CR1	The tool should make use to a degree of display screens	Client meeting	Must
CR2	The tool should make use of new and fun interactive technologies	Client meeting	Must
CR3	The tool should showcase information about opening hours, student assistants, facilities and student work.	Client meeting	Must

TABLE 16, DR MOSCOW

9.2 Ideate and conceptualize

9.2.1 Ideate

9.2.1.1 Brainstorming

Brainstorming (Turnhout, et al., 2015) was used as the main method for ideation. All ideas were noted down during individual sessions as well as client sessions, where the expertise and knowledge of client was used to discover new options.

The individual session was conducted on 09.04.2022 and was focused on finding technologies that could be used in a solution.

The client brainstorming was conducted on 11.04.2022 with Manno and was meant to built on the ideas generated during the individual brainstorming. The expertise of the client as an IT professional and teacher of CMD was used to generate new ideas and eliminate the risk of having a tunnel vision. Furthermore, this session focused on technologies that could be used but also functionalities that could best pair with those technologies.

9.2.1.2 Results

The ideas generated during the individual brainstorming session were mainly a listing of technologies and their features. Along with the client, a deeper dive was taken into expanding the technology and their functionalities. The results can be seen in Figure 8.

During the conceptualization stage, sketching was the main method used. The concepts generated were easier to present in sketch rather than text and they also communicated more clearly the main aspects of the concepts.

To choose the most viable solution, the concepts were compared based on the most important aspects the product needs to deliver, which were drawn from the design requirements. The aspects that were taken into consideration were: ease of usage, ability to attract attention, clarity of content, accessibility.

The concepts were pitched to the target audience to gather their preference.

9.2.2 Conceptualize

Sketching was used as a more accurate method to describe the concepts. To better illustrate how the concepts compare to the current approach, the C-hallway with the CT-labs info system was sketched out as well (Figure 27). Additionally, because the majority of concepts are reliant on the technology and hardware used, placement is an important aspect, which is why the sketches feature asymmetric view of the CT-labs.

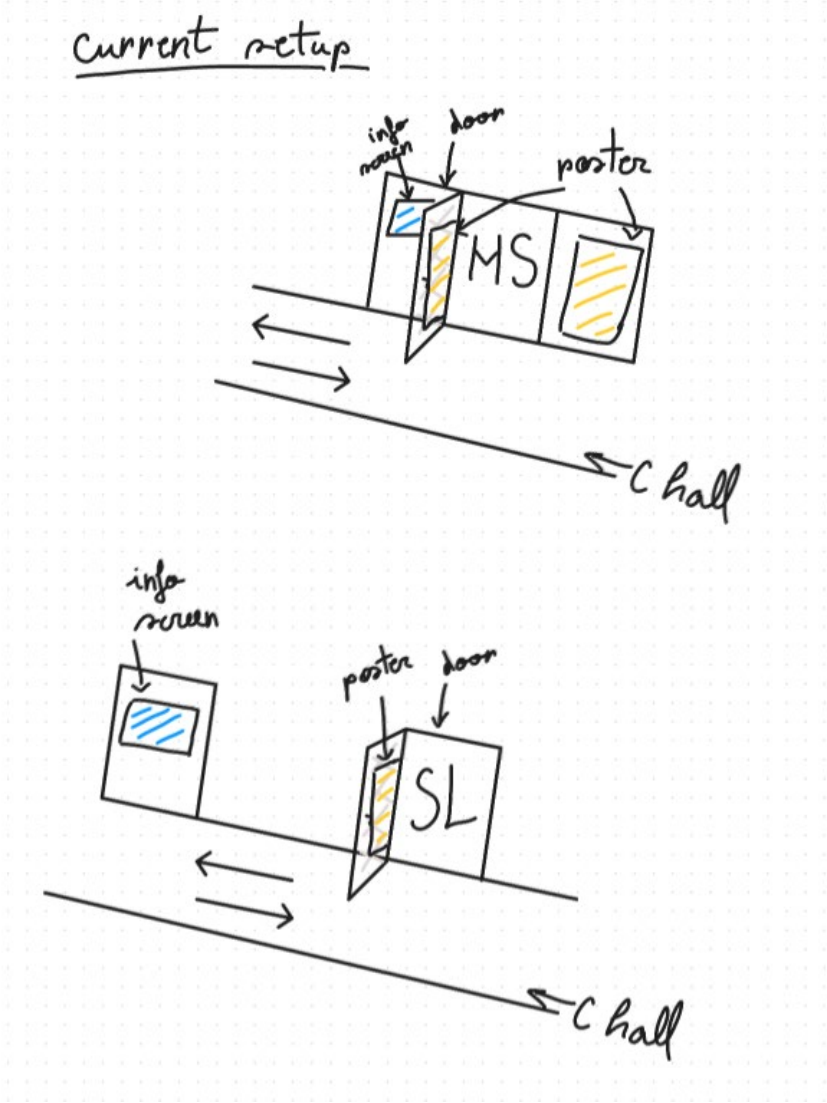


FIGURE 26, CT-LABS SETUP

9.2.2.1 Concept 1

Firstly, the screens that are currently on the hallway facing walls of Makerspace and Spacelab will be placed directly next to each respective door and they will be oriented vertically. Furthermore, another screen will be placed in the main hallway, facing the flow of people walking by. The latter is placed in such a way that students will inevitably notice it when passing through the main hallway. It is an important aspect because there were recurring comments during the preliminary research, namely during the target audience survey, about the current setup, that it blends in too much or that it is hardly visible.

The main hallway screen will act as an onboarding screen, which will be connected or communicate to the ones placed on the Spacelab and Makerspace walls. The onboarding will feature a standby screen that includes an eye-catching animation coupled with sound cues to attract the attention of students passing by. Additionally, it will have a small portion of the screen that will showcase feed captured by a camera placed above the screen. The

showcased feed will outline the skeleton of the person passing by. In addition to it being a data protection and transparency requirement, the aim is to attract people with the novelty of seeing themselves in such a format.

The captured camera feed will be processed using pose recognition machine learning to detect hand positions. Using a motion of raising their left or right hand, the users will be able to navigate the content showcased on the screens. To make it easier to understand the controls, the animation of the screen should also showcase how to use the prototype in addition to text instructions.

9.2.2.2 Concept 2

This concept was created uses nano-leaves as the eye catching and interactive technology. Therefore, each space will have a screen positioned in a visible location, and next to each screen there will be a nano-leaves panel that act as controls for the showcased content on the screen. There could be nano-leaves that correspond with the controls of switching between informational slides or requesting to view student work. The combination of buttons can be determined based on the needs of the students, however being able to navigate forward and backwards through the slides deck is essential.

The nano-leaves acting as controls for the info-screens satisfy the user need for control over the content they see. Furthermore, the nano leaves have light modes which will act as an eye-catching effect, a way to trigger System 1 (Kahneman, Thinking, Fast and Slow, 2011). After that, the students will be challenged by the new system, which will then trigger motivation the challenge being within their capabilities. The NPC will guide the usage, encouraging the user through the process which will try to satisfy the need for connection and boost motivation (Rigby, 2014).

The information shown on the onboarding screen would be divided in information about the Makerspace and Spacelab, with the student being able to choose between them by raising their hand left or right. Each choice will then lead to slides showcasing information about the facilities available in each space, the opening hours, the shifts of student assistants, upcoming events and student work done using tools from that specific space.

Furthermore, to make it easy to notice Spacelab and Makerspace themselves, not just the onboarding screen, when a choice is made regarding the space a student wants to know more about, the screen corresponding to that space will flash to indicate where the entrance is. For example, if a student raises their left hand to navigate to the slide with more information about the Makerspace, the Makerspace info-screen will flash a bright color to indicate its position. The C-hallway is rather dark and this functionality can make use of it to engage students through light flashes.

9.2.2.2 Concept 3

The third concept also incorporates machine learning and pose recognition to control information on the screens. However, unlike Concept 1, the system only contains 2 screens, the ones adjacent to each lab.

The attention attracting factor is implemented in the form of a beamer projecting patterns, text and arrows for directions on the C-hallway floor, which engages System 1 (Kahneman, Thinking, Fast and Slow, 2011). This is possible because the C-hallway is quite dark. The beamer will attract and guide students in front of the screens. There, the motion tracking will continue to intrigue the users, who will take it as a challenge to at least use it once. While they use the product to try and experiment with the technology, they browse information, which will only familiarize them to the idea of visiting the CT-labs.

Additionally, an NPC will showcase the movements that trigger the controls and will reward users when they successfully engage with the product. The information will be showcased on a slide format.

9.2.2.2 Concept 4

This concept makes use of a sensor mat that will act as a control for the information showcased on the screens. The mat will feature 3 ways of controlling the screens, left step, right step and, middle step, which would translate to back, forward and stop or select. This aims to give the user control over the content and offer a challenge that can be undertaken. The challenge will motivate users to at least make sense of the controls and thus use the product. If the information on the screen is valuable and appealing, the chance that students will reuse the product is higher.

The info screens will feature an NPC character that will guide the user through the controls. The NPC will also encourage them to explore the info-screens content and offer positive feedback when the user interacts with the product.

9.2.3 Concept testing

The concepts were tested with the client and the target audience. Each concept was pitched to the client and the target audience, presenting sketches and explaining the functionalities.

9.2.3.1 Comparison matrix

The concepts testing with the client was conducted on 22.02.22. The client was pitched all 4 concepts and was asked to determine how well each one met the following features on a scale of 1 to 5: ease of usage, attracting attention, content clarity, accessibility and encouraging users to visit the CT-labs.

The results of the testing were organized in the table below.

Concept	*Ease of usage*	*Attract attention*	*Content clarity*	*Accessibility*	*Encourage users to visit CT-labs*
Concept 1	Intuitive motion of raising a hand is simple and intuitive, very similar to swiping motion	Placed in the main hallway Animations and sound cues Video feed on screen with drawn skeleton	Simple slides	Placed in main hallway which is a populated place	It encourages students
Score	5	5	5	5	5
Concept 2	Nano-leaves act as buttons, which users are already used to	The lights of the nano-leaves stand out in the dark hallway The novelty of the technology in that context	Simple slides	Not very accessible, people still need to walk in the C-hallway	It encourages students
Score	5	4	5	2	5
Concept 3	Intuitive motion of raising a hand is simple and intuitive, very similar to swiping motion	The beamer light will stand out in the dark hallway	Simple slides	Not very accessible, people still need to walk in the C-hallway	It will lead them to the labs
Score	5	5	5	2	5
Concept 4	Not inclusive of people with disabilities	New technology	Simple slides	Not very accessible, people still need to walk in the C-hallway	It will not be as impactful
Score	2	2	5	2	2

TABLE 17, COMPARISON MATRIX

9.2.3.1 TA concept evaluation

To get more definitive feedback on the concepts and choose the concept that will be further developed into a prototype, target audience testing was performed. Representatives of the target audience were pitched the concepts and asked to rank them from best to worst.

The results shown in Table 12 reveal the majority of students preferred Concept 1. When cross referencing with the comparison matrix, Concept 1 was the general preference that best met the requirements set in the matrix. Consequently, Concept 1 was chosen to be developed into a prototype.

PREFERENCE	BEST	GOOD	OKAY	NOT VERY GOOD
TESTER 1	Concept 1	Concept 2	Concept 3	Concept 4
TESTER 2	Concept 1	Concept 4	Concept 3	Concept 2
TESTER 3	Concept 1	Concept 3	Concept 2	Concept 4
TESTER 4	Concept 1	Concept 2	Concept 3	Concept 4
TESTER 5	Concept 2	Concept 3	Concept 4	Concept 1
TESTER 6	Concept 4	Concept 1	Concept 3	Concept 2
TESTER 7	Concept 2	Concept 1	Concept 3	Concept 4
TESTER 8	Concept 2	Concept 4	Concept 1	Concept 3
TESTER 9	Concept 1	Concept 2	Concept 3	Concept 4

TABLE 18, TA CONCEPT TESTING

9.3 Prototyping

9.3.1 User journey

A user journey is used to visualize the experience of the user during their interaction with the solution product (Figure 28). It describes user cases and identifies the key points of interaction with the product.

The journey that a student needs to follow when interacting with the prototype should follow these steps: have their attention captured, experiment with the pose tracking element, use the controls, use the controls to navigate the slides and finally visit the CT-labs.

The attention can be captured with the usage of animations and sound cues, which will make the user notice the info-screen and the video feed with the ML skeleton overlaid. Even though students might be confused at first, they would be intrigued by the new technology and try it. Once they try it, they realize or are instructed through UI that there are controls for the screens. They would then try to perform those controls and watch the outcome. Once the slides have been manipulated a few times, the students will have time to focus on the information showcased. At this point, they will either go to the CT-labs once the other screens flash to indicate the position of Spacelab or Makerspace or walk away. Even though

there will be students that will not be convinced to visit the CT-labs, they will leave with more exposure to the idea of CT-labs and some information about them.

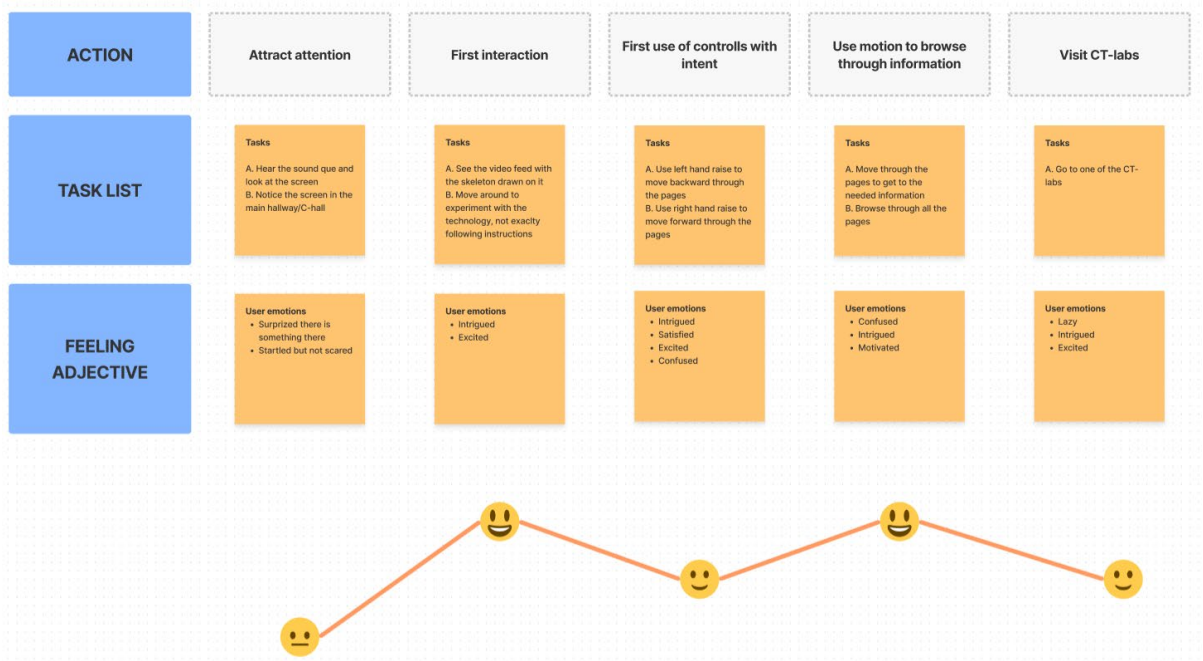


FIGURE 27, USER JOURNEY

9.3.2 Wireframing

Wireframes (Turnhout, et al., 2015)were created of the prototype UI which was used to quickly test the UI aspect even before the functionality and software logic was created. It allows for quick improvement of the UI.

The tool used was Figma because it is web-based and allows for implementation of animations. Additionally, open-source icons and animation libraries were used, such as icons8.

9.3.3 Prototyping and tinkering

Prototyping (Turnhout, et al., 2015)was the method used to design and build the fully functioning prototype, with emphasis on the back-end functionalities. The prototype utilizes machine learning and trained models, a local server. The ML library used was Tenserflow, namely the pose recognition model (TenserFlow, n.d.). The models were trained using an open-source tool (TeachableMachiene, n.d.).

The models use JavaScript as a coding language, therefore, the prototype had to be web-based. The development included using HTML, CSS and JavaScript in order to create a software that would run on a web page. The web page requires a server, and due to the limitations of the Hanze IT department, the prototype currently runs on a personal server.

Tinkering (Turnhout, et al., 2015)was used to adapt the design of the prototype to include the motion tracking technology. Motion tracking is a new technology that does not have many implementations yet, therefore technical challenges were encountered. The usage of the technology was prioritized and therefore other aspects of the prototype were adapted to fit the technical choices.

9.4 Evaluation

9.4.1 Thinking aloud

During the testing, students were asked to speak their mind as they go through the prototype. This method was used to better understand the way the target audience approaches the prototype and their instant, unfiltered impressions of the product as they go through it. This test was performed on the same group and at the same time with the focus group.

9.4.1 Focus group

The testing session was performed at Hanze, in ZP11/C 221 on 23rd of May 2022. The group consisted of 10 target audience representatives.

The audience group consisted of the same 10 target audience representatives that took part in the first evaluation.

The prototype tested is described in Chapter 4.3.2.2. The testers were asked to go through the prototype without any other instructions other than to talk about their observations, positive or negative.

The focus group was used to gather more information from the target audience in relation to the prototype and in addition to the thinking aloud method. In the setting of a group, the testers would prompt each other to comment on aspects of the prototype. Thus, they would discuss elements that may otherwise have been not mentioned or thought of.

9.4.1 Peer review

The peer review was held on 27.5.2022 on Discord with Edwin Yanarico during the second evaluation moment. It provided a different point of view and quality feedback from an expert in the field. Edwin is a UI/UX and graphic designer that works at Hanze and has been part of the Hanze marketing team. The expert is familiar with the design limitations that a Hanze product needs to abide to and was able to impart valuable feedback after having experimented with the prototype. The focus of the peer review was to determine if the changes done to the prototype were making the overall UX more intuitive.

Edwin was asked to experiment with the prototype and note the issues he would encounter either during his testing or afterwards. The notes can be found in Appendix L.

9.5 Design specifications

Code	Description	Retrieved from
DS1	The tool should have controls for the content	Motivation and behavioral change
DS2	The tool should use machine learning with pose recognition model	Interactive design
DS3	The tool should use screens	Interactive design, Persuasive design
DS4	The tool should have animations	Motivation and behavioral change
DS5	The tool should have an onboarding	Motivation and behavioral change, Interactive design
DS6	The tool should implement user feedback	Motivation and behavioral change
DS7	The tool should have as content, student work, shifts, opening hours, facilities	Motivation and behavioral change
DS8	The tool should have a simple design	Motivation and behavioral change
DS9	The tool should not store data	GDPR
DS10	The tool should show the video feed on the screen	GDPR
DS11	The tool should not use jargon	Persuasive design, Interactive design

TABLE 19, DESIGN SPECIFICATIONS

Appendices

Appendix A

Glossary

CMD – Communication and Multimedia design

CMGT – Creative Media and Game Technologies

CT-labs – Creative Technologies labs

MS – Makerspace

SL – Spacelab

TA – Target audience

ML - machine learning

DR – Design requirements

DS – Design specifications

CR – Client requirements

FR – Functional requirements

Appendix B

Unstructured interview: Client

Date and place

This interview was conducted on 02.03.2022 as a physical meeting at Hanze, ZP11/ C225.

Notes

From the user's POV

Playful/ interesting/ element of surprise/novelty factor- quantify it somewhat - more than just achieving the purpose - look into native interactions (ask Jonathan)

Example of what students could make and be inspired by it

Should people be able to see what content lies ahead (at least in the form of

The organization POV

What info should be in there?

-timelapses of laser cut or 3d print

-promotions for hardware separate from student work (open for changes)

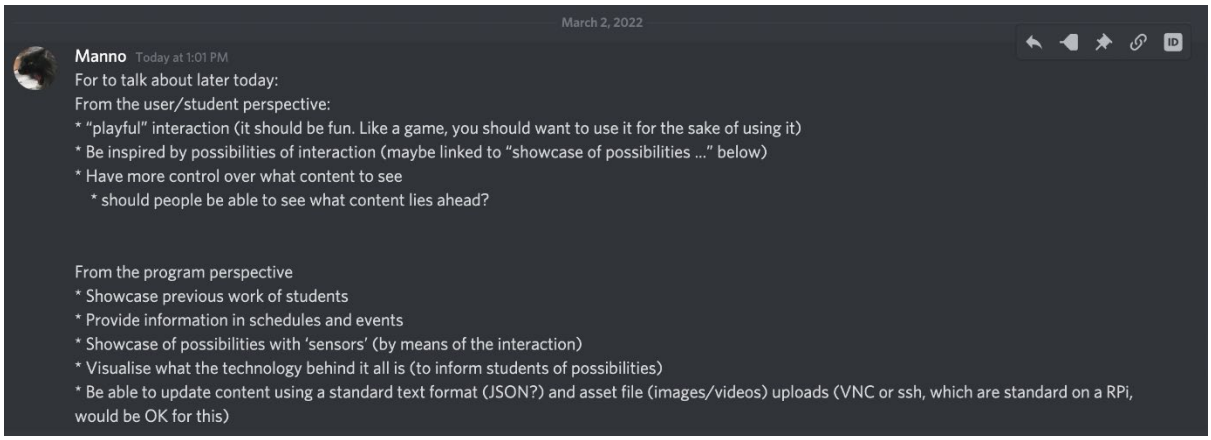
-ask Edwin for videos from MS/SL

-schedules, assistants, events

-how the prototype works, make it achievable by students (would have)

-JSON and Videos

Ask people from VD/ID Jonathan - students of that class are not coming to CT labs



Appendix C

Unstructured interview: Stakeholders – Kjell Newman

Date and place

This interview was conducted on 02.03.2022 as a physical meeting at Hanze, ZP11/ C221.

Notes

Getting people to be in here: open days, events, and curriculum.

Play with tech

Make a bad job of making it accessible. Make it accessible, lower barrier to entry

The platform is not suitable enough

The management of platform is also insufficient

We (CT-labs) don't give enough handholds

Whatever you do with the prototype, it needs to be visual

Appendix D

Unstructured interview: Stakeholders – Jonnathan van Denzen

Date and place

This interview was conducted on 10.03.2022 as an online meeting through Microsoft Teams.

Notes

Is not a space for designing, VD/ID stay away from prototyping and technical

Close to glitch

Language barrier

In introduction weeks VD/ID students are made aware of CT-labs

Maybe Rendergarden could be a part of the strategy to get attention

More workshops

No classrooms in the Makersape/C hall for VD/ID students

Interaction with sensors or other similar technologies are not typical for VD/ID but it won't be a turn off

Ask the media lab: What are they showing on the slides

Student work - ask Jonathan

Communication teachers – ask for opinions/help

Transcript from 10/03/2022

00:00:00.000 --> 00:00:17.300
Bălan EA, Elena
OK. Yeah. So it's an unstructured interview. I just want to talk with everyone who's in who's basically a stakeholder and makers do get an idea of why you guys think this project could be. I'm not sure, do you know the project is?

00:00:18.290 --> 00:00:19.410
Denzen J van, Jonathan
Nope, not yet.

00:00:20.410 --> 00:00:21.650
Bălan EA, Elena
So it's.

00:00:22.720 --> 00:00:24.520
Bălan EA, Elena
It's mostly about the.

00:00:24.570 --> 00:00:25.420
Bălan EA, Elena
Uhm.

00:00:27.330 --> 00:00:29.280
Bălan EA, Elena
Info screens outside of each room.

00:00:30.450 --> 00:00:50.530
Bălan EA, Elena
What Manno wanted to have initially was to have them centralized. So right now you update each one of them and each one of them it's updated separately and in a different way because they they're set up differently. So he wanted to centralized way to upload things to it.

00:00:46.660 --> 00:00:47.020
Denzen J van, Jonathan
Yep.

00:00:51.380 --> 00:01:02.150
Bălan EA, Elena
Uh, and then it shipped shifted a little bit because I had to have a little bit more interaction into it. So now we're looking at still having it somewhat centralized, not as.

00:01:03.250 --> 00:01:09.780
Bălan EA, Elena
Pretty a back end as we wanted initially, but still all of them in one place.

00:01:10.380 --> 00:01:26.500
Bălan EA, Elena
Uh and have a layout for the information and implement some interaction with the content. We were thinking either motion sensors and or just cameras that track motion.

00:01:27.620 --> 00:01:32.880
Bălan EA, Elena
That is in discussions with the legal department, because GDPR and such.

00:01:32.260 --> 00:01:33.490
Denzen J van, Jonathan
Alright, yeah.

00:01:34.390 --> 00:01:51.340
Bălan EA, Elena
Yeah, but I know that you are more VD ID involved, so there is the issue that VD ID students don't really go to maker space or space lab dot much even though they're spaces for them as well.

00:01:41.480 --> 00:01:42.010
Denzen J van, Jonathan
Yep.

00:01:49.830 --> 00:01:50.060
Denzen J van, Jonathan
No.

00:01:51.980 --> 00:02:02.860
Bălan EA, Elena
Uh, and I kind of wanted to get your opinion on why do you think that is and if there's a feature that we could add into this prototype that could make them more attracted to it?

00:02:05.700 --> 00:02:13.310
Denzen J van, Jonathan
Uh, we know. Why do I think that is? I think there's multiple reasons, but I think one of them might be a language barrier.

00:02:14.040 --> 00:02:31.700
Denzen J van, Jonathan

From over there sometimes get in in classes as well and that they do find it difficult to explain express themselves in English and and well 90% of our students distance can only talk English or other languages. But.

00:02:23.560 --> 00:02:23.790
Bălan EA, Elena
Yeah.

00:02:32.390 --> 00:02:34.340
Denzen J van, Jonathan
Uh, so that might be an issue.

00:02:35.130 --> 00:02:35.940
Denzen J van, Jonathan
Uhm.

00:02:37.490 --> 00:02:44.260
Denzen J van, Jonathan
I think maybe one of the things we were really close or still close very close to glitch up.

00:02:45.860 --> 00:02:49.780
Denzen J van, Jonathan
It is, yeah. So maybe the gain 5 sort of.

00:02:50.850 --> 00:02:52.680
Denzen J van, Jonathan
Radiates. I don't know.

00:02:53.560 --> 00:02:56.190
Denzen J van, Jonathan
Another thing might be debt.

00:02:58.380 --> 00:03:01.580
Denzen J van, Jonathan
CMD students so DVD ID students they.

00:03:02.190 --> 00:03:08.250
Denzen J van, Jonathan
Are usually just designing stuff and they're like it to make space. It makes space is really technical.

00:03:08.980 --> 00:03:14.610
Denzen J van, Jonathan
And there's a large population in the CMD student population that is.

00:03:15.390 --> 00:03:18.320
Denzen J van, Jonathan
I'm just trying to stay away from that as far as possible.

00:03:18.980 --> 00:03:19.470
Bălan EA, Elena
OK.

00:03:19.230 --> 00:03:22.200
Denzen J van, Jonathan
And even deck as as programming.

00:03:24.000 --> 00:03:30.670
Denzen J van, Jonathan
Uh, even simple prototyping like prototyping tools there, and they're just very hesitant to.

00:03:32.410 --> 00:03:39.570
Denzen J van, Jonathan
To do anything with that, it is not just the prom photo makes with this problem we we encounter in in, in CMD throughout the years as well.

00:03:40.560 --> 00:03:54.100
Denzen J van, Jonathan
And even though we also in the UM orientation process before they even enter the program, we emphasize on the technical part of the program.

00:03:54.580 --> 00:03:54.990
Bălan EA, Elena
OK.

00:03:55.170 --> 00:03:56.010
Denzen J van, Jonathan
There's still.

00:03:56.950 --> 00:04:12.910
Denzen J van, Jonathan
Yeah, people maybe not listening or only listening to the parts they want to hear. And like, all right. Yeah. I'm gonna make magazines and posters and and. Yeah, but it has to be interactive. Yeah, it's just me. Tackles. Yeah, but magazines and posters and. And so that is still somewhat of an issue.

00:04:13.500 --> 00:04:14.610
Denzen J van, Jonathan
Uh.

00:04:13.950 --> 00:04:14.300
Bălan EA, Elena
Yeah.

00:04:15.720 --> 00:04:17.920
Denzen J van, Jonathan
And it's it's surprises me sometimes.

00:04:18.350 --> 00:04:28.400
Denzen J van, Jonathan
Uh, because there's there's a lot of technical and makerspace stuff going on throughout the years and year one, there's the native design.

00:04:28.620 --> 00:04:31.150
Denzen J van, Jonathan
Uhm Gorshin period 4.

00:04:31.930 --> 00:04:34.320
Denzen J van, Jonathan
And which is a course.

00:04:34.420 --> 00:04:38.600
Denzen J van, Jonathan
And where do you have to design something outside of the screen?

00:04:39.340 --> 00:04:44.190
Denzen J van, Jonathan
A year or two, there's a project. Physical interfaces solely recess physical enterprises.

00:04:44.850 --> 00:04:50.260
Denzen J van, Jonathan
Uh, and also year four is a future discern.

00:04:48.100 --> 00:04:49.190
Bălan EA, Elena
You, Bart.

00:04:52.250 --> 00:04:53.280
Denzen J van, Jonathan
Could you follow up with you?

00:04:52.500 --> 00:04:53.920
Bălan EA, Elena
You got it off a little bit.

00:04:55.300 --> 00:04:55.890
Denzen J van, Jonathan
Alright, sorry.

00:04:55.530 --> 00:04:56.480
Bălan EA, Elena
Uhm.

00:04:56.980 --> 00:05:02.110
Denzen J van, Jonathan
So I was explaining where the where there's like technical makerspace stuff within the curriculum.

00:05:03.280 --> 00:05:11.010
Denzen J van, Jonathan
And I don't know if you got that, but there's there's one in year one and year 2 there's also in your 4, there's there's all kinds of courses.

00:05:11.660 --> 00:05:16.350
Denzen J van, Jonathan
Uh, where did, where the the maker space?

00:05:17.120 --> 00:05:21.530
Denzen J van, Jonathan
Can be visited and we do encourage, encourage students to do so, but.

00:05:22.990 --> 00:05:24.980
Denzen J van, Jonathan
It's the connection is still.

00:05:25.900 --> 00:05:26.690
Denzen J van, Jonathan
Lagging or?

00:05:26.020 --> 00:05:27.110
Bălan EA, Elena
Yeah, it's it's alright.

00:05:27.410 --> 00:05:28.190
Denzen J van, Jonathan
Maybe I should move?

00:05:29.270 --> 00:05:29.650
Denzen J van, Jonathan
OK.

00:05:31.110 --> 00:05:35.420
Denzen J van, Jonathan
And they render garden and it's it's crazy here the the the connection is very bad.

00:05:36.320 --> 00:05:57.520
Bălan EA, Elena
Yeah, but in India owned that. No. Do you think that maybe since it is technical and let's say that doesn't really appeal for VD ID students even when they do have courses regarding it up, do you think that maybe render guard in my view solution for that because it will be more design related or related?

00:05:36.480 --> 00:05:37.020
Denzen J van, Jonathan
Hopefully.

00:05:58.590 --> 00:06:01.210
Bălan EA, Elena
Maybe we could try them in with that.

00:05:59.200 --> 00:05:59.640
Denzen J van, Jonathan
Uh-huh.

00:06:01.890 --> 00:06:06.660
Bălan EA, Elena
It's still going to be really close to the glitch office, unfortunately, but.

00:06:02.610 --> 00:06:03.050
Denzen J van, Jonathan
Yep.

00:06:06.780 --> 00:06:09.950
Denzen J van, Jonathan
Yeah, like I I don't think that's gonna be a problem.

00:06:10.960 --> 00:06:17.230
Denzen J van, Jonathan
Precision, but uhm yeah, render garden should would definitely be a part of the the.

00:06:18.380 --> 00:06:23.210
Denzen J van, Jonathan
To get more attention, I think the, uh, the combination of workshops.

00:06:23.740 --> 00:06:29.620
Denzen J van, Jonathan
Uh, especially for more related to CMD or VD ID is also an option.

00:06:30.250 --> 00:06:43.990
Denzen J van, Jonathan
Uh, I know today, but in the coming month there is going to be all other ones as well. There's a special Photoshop workshops are doing being done by two teachers CMD.

00:06:44.660 --> 00:06:45.410
Denzen J van, Jonathan
Uhm.

00:06:46.710 --> 00:06:53.710
Denzen J van, Jonathan
And, well, streaming death or maybe looking for some sort of combination with the maker space?

00:06:53.770 --> 00:06:54.550
Denzen J van, Jonathan
Uh.

00:06:55.110 --> 00:06:58.580
Denzen J van, Jonathan
I had to do to get more students there.

00:06:59.320 --> 00:07:09.670
Denzen J van, Jonathan
To the workshops, but also from the workshops to let them know, OK, makerspace is also the place where you can get Photoshop guidance is is there might be also good idea?

00:07:10.910 --> 00:07:31.140
Bălan EA, Elena
Yeah. Do you think that maybe also even when they do happen, do you think that might be an issue of how they're how it is marketed in a way? Because unless teachers say that it's a workshop or they checked the website or they already passed by or there's a poster which they usually don't.

00:07:31.740 --> 00:07:44.200
Bălan EA, Elena
They won't know about it, so maybe we could help with this product in advertisement in the other enticements sides that they would know about it, even they if they choose not to, but they would still know about it.

00:07:47.000 --> 00:07:50.710
Denzen J van, Jonathan
I'm I'm not sure I'm I'm exactly following. And you mean by exercising on the screens?

00:07:51.350 --> 00:08:02.620
Bălan EA, Elena
Yeah, and the screens, dad, there are workshops that are targeted toward VD ID students as well. Maybe do you think that maybe the lack of information, the fact that they don't pass through in front of makerspace?

00:08:03.970 --> 00:08:08.220
Bălan EA, Elena
The fact that they don't know what's happening in there, that there's also stuff for them.

00:08:08.950 --> 00:08:11.120
Bălan EA, Elena
Uh might be an issue. Why they don't visit.

00:08:12.720 --> 00:08:17.220
Denzen J van, Jonathan
Yeah, I think everyone he did that comes into the magistrates really has to.

00:08:15.670 --> 00:08:16.080
Bălan EA, Elena
Then.

00:08:18.260 --> 00:08:18.810
Denzen J van, Jonathan
Uhm.

00:08:19.610 --> 00:08:32.450
Denzen J van, Jonathan
Oh, they they have to actively sent to the maker space since we don't have classrooms anymore in the in the in the C hallway, so they they hardly just put it Best Buy and like, oh, what is this?

00:08:33.180 --> 00:08:34.190
Denzen J van, Jonathan
And.

00:08:35.170 --> 00:08:36.480
Denzen J van, Jonathan
So that that is an issue.

00:08:37.480 --> 00:08:42.850
Denzen J van, Jonathan
Definitely. And maybe some screen or at the beginning of the way there's also another screen.

00:08:43.900 --> 00:08:45.550
Denzen J van, Jonathan
I could also play a role in that.

00:08:46.960 --> 00:08:57.210
Denzen J van, Jonathan
And and definitely if you if you have an older fuel, what is actually happening in the makerspace and whenever space lab also render garden creation station?

00:08:59.870 --> 00:09:01.080
Denzen J van, Jonathan
And and it is a.

00:09:02.320 --> 00:09:14.240
Denzen J van, Jonathan
Like a varied offerings over and there's different kinds of workshops that also are interesting for the CMD students. Yeah, could definitely help.

00:09:15.830 --> 00:09:16.290
Bălan EA, Elena
OK.

00:09:17.890 --> 00:09:23.870
Bălan EA, Elena
Me and one last question is it's very quick. UM.

00:09:22.950 --> 00:09:23.370
Denzen J van, Jonathan
Uh-huh.

00:09:26.110 --> 00:09:47.940
Bălan EA, Elena
Video ID people are interested in D interaction with more like they design more websites and applications and they're more used to that side of interactions. Do you think that maybe the type of interactions that we thought of the movement and capturing movements of we were thinking right now hence?

00:09:48.590 --> 00:09:53.630
Bălan EA, Elena
Uh, in having maybe some animations and visually be pleasing.

00:09:49.000 --> 00:09:49.320
Denzen J van, Jonathan
Uh-huh.

00:09:55.020 --> 00:10:01.450
Bălan EA, Elena
Do you think that might turn them off or would that entice them based on what you know from their classes?

00:10:04.030 --> 00:10:14.970
Denzen J van, Jonathan
Uh, I don't think it would turn him off. I think it for like the the the products that seemed these students make, it might be more like a gimmick and and not per say something.

00:10:15.820 --> 00:10:19.500
Denzen J van, Jonathan
Like the the the typical input for the products we make.

00:10:20.410 --> 00:10:31.250
Denzen J van, Jonathan
Uh, although we're or sometimes looking at that, Trudy, not cores and the practical physical interfaces there, we have actually like, OK, think outside of the mouse or a touch screen.

00:10:31.840 --> 00:10:32.610
Denzen J van, Jonathan
Uhm.

00:10:33.430 --> 00:10:42.210
Denzen J van, Jonathan
What else can be an input for your system? But usually there's still the the, the the concept arts designed the prototypes.

00:10:42.260 --> 00:10:54.050
Denzen J van, Jonathan
Uhm, where people either by device, like a mobile phone or just a regular laptop, are are interacting with the product so.

00:10:55.550 --> 00:10:57.040
Denzen J van, Jonathan
It's really difficult to.

00:10:57.820 --> 00:11:02.560
Denzen J van, Jonathan
Uhm, or to have that on a screen without a keyboard and a mouse?

00:11:00.980 --> 00:11:01.390
Bălan EA, Elena
Yep.

00:11:03.460 --> 00:11:03.990
Denzen J van, Jonathan
And.

00:11:04.670 --> 00:11:18.610
Denzen J van, Jonathan
I don't say it can't work, but yeah, it maybe needs a little bit of explaining 'cause, how are you going to interact with your hands if you just want to look at a website? Is it gonna be like this or? Yeah, it really has to go natural and not just a gimmick. Yeah.

00:11:19.250 --> 00:11:19.820
Bălan EA, Elena
Kim.

00:11:20.370 --> 00:11:48.710
Bălan EA, Elena
Uh, I'm looking into that right now. Right now I have down the the swipe moment because the way currently the format of the information from maker space in Space Lab is lights or makerspace. A website that shows slides so that could be something but at the same time we're trying to reformat the way the information is shown on the screen so it with my transition from that.

00:11:26.860 --> 00:11:27.270
Denzen J van, Jonathan
Uh-huh.

00:11:33.770 --> 00:11:34.110
Denzen J van, Jonathan
Yeah.

00:11:40.200 --> 00:11:40.650
Denzen J van, Jonathan
Uh-huh.

00:11:47.340 --> 00:11:49.110
Denzen J van, Jonathan
Slides, not model, yeah.

00:11:50.280 --> 00:11:55.920
Denzen J van, Jonathan
Yeah. And for for a lot of products and let's seem these students make I think slides this.

00:11:57.390 --> 00:12:04.360
Denzen J van, Jonathan
Is is sufficient and we just have to make sure that there might be a little preview of what's coming next or.

00:12:04.930 --> 00:12:05.580
Denzen J van, Jonathan
Uhm.

00:12:06.830 --> 00:12:10.330
Denzen J van, Jonathan
No. You could also ask the the media.

00:12:12.020 --> 00:12:12.960
Denzen J van, Jonathan
What is it called?

00:12:14.350 --> 00:12:20.140
Denzen J van, Jonathan
Yeah, across the the media desk, the big room. They also have screens outside.

00:12:18.990 --> 00:12:19.910
Bălan EA, Elena
In yellow.

00:12:21.300 --> 00:12:22.020
Bălan EA, Elena
Uh, yeah.

00:12:21.370 --> 00:12:23.910
Denzen J van, Jonathan
Medial app. Yeah, sure, if you look.

00:12:23.070 --> 00:12:40.540
Bălan EA, Elena
I asked Donna. He said he doesn't know specifically, but he thinks it's slides. Or at least it slides that are. I know the screen outside is mirrored from something inside, so a laptop or the big screen? Usually that's just a slide show.

00:12:25.250 --> 00:12:25.640
Denzen J van, Jonathan
Uh-huh.

00:12:36.100 --> 00:12:36.480
Denzen J van, Jonathan
Yeah.

00:12:38.520 --> 00:12:54.140
Denzen J van, Jonathan
Yeah, they've never a couple couple of screens. Yeah, I have a couple of screens that are just come mirror to a magnini that is standing there and one of them is I think it's just a PowerPoint on a USB stick that's plugged into the TV.

00:12:51.550 --> 00:12:51.790
Bălan EA, Elena
So.

00:12:55.370 --> 00:13:09.800
Denzen J van, Jonathan
And then it's just like there's, yeah, but uh, it's more interesting. OK, what kind of information are there showing what it what is showing on the slides? Could that be also be something? And and now are they determining what to show?

00:12:55.660 --> 00:12:56.390
Bălan EA, Elena
Cut off again.

00:12:59.230 --> 00:12:59.530
Bălan EA, Elena
Yeah.

00:13:12.320 --> 00:13:42.470
Bălan EA, Elena
Yeah, that's that's something I need to look into because the right now the information, at least that's on maker space in Space Lab is mostly formulated for C and dot. So it's games or applications that they can make. So we need to output a little bit more with applications that VD ID students also make do you can I come to you for that or where could I give permission for such a thing?

00:13:23.170 --> 00:13:23.620
Denzen J van, Jonathan
Uh-huh.

00:13:32.040 --> 00:13:32.420
Denzen J van, Jonathan
Yeah.

00:13:35.810 --> 00:13:36.160
Denzen J van, Jonathan
Yeah.

00:13:42.610 --> 00:13:45.040
Denzen J van, Jonathan
But then it likely needs student work or.

00:13:45.650 --> 00:13:47.420
Bălan EA, Elena
Yeah. Student work or yeah.

00:13:45.930 --> 00:13:47.300
Denzen J van, Jonathan
Like yeah.

00:13:48.700 --> 00:14:00.670
Denzen J van, Jonathan
Uh, yeah, you can. You can ask me if I would have to ask the teachers or course coordinators of certain locks. And I think one of the most interesting.

00:14:00.750 --> 00:14:01.110
Denzen J van, Jonathan
Uh.

00:14:02.180 --> 00:14:08.230
Denzen J van, Jonathan
Uh, things in the curriculum for CMD is the design labs in year 2.

00:14:09.390 --> 00:14:17.870
Denzen J van, Jonathan
And there was a lot of that is also there's more products coming out of that that are likely suitable for the screens.

00:14:18.590 --> 00:14:19.530
Denzen J van, Jonathan
Uh.

00:14:20.530 --> 00:14:22.460
Denzen J van, Jonathan
Or maybe graduation projects as well?

00:14:22.960 --> 00:14:23.560
Denzen J van, Jonathan
Uhm.

00:14:23.280 --> 00:14:41.870
Bălan EA, Elena
Yeah, anything goes ideally we would have projects that showcase where you could do in each room and also try to make the product itself that were showing as an example of what you could do in the sea whole or.

00:14:25.590 --> 00:14:25.970
Denzen J van, Jonathan
Yeah.

00:14:31.670 --> 00:14:32.050
Denzen J van, Jonathan
Uh-huh.

00:14:41.380 --> 00:14:41.740
Denzen J van, Jonathan
Yeah.

00:14:42.700 --> 00:14:44.070
Bălan EA, Elena
As a CMD student.

00:14:45.710 --> 00:14:56.390
Denzen J van, Jonathan
Yeah, and. And and there's also strongly tide to the creation of material in the make space itself and and and just recording stuff and.

00:14:45.930 --> 00:14:46.240
Bălan EA, Elena
Yep.

00:14:57.040 --> 00:15:06.440
Denzen J van, Jonathan
Yeah, we, we we want to have like every project that is being made in a makerspace actually should be photographed or made a video off.

00:15:07.070 --> 00:15:07.660
Denzen J van, Jonathan
And.

00:15:08.340 --> 00:15:13.480
Denzen J van, Jonathan
Yeah, it's sometimes difficult. I do have some photos, but yeah.

00:15:14.790 --> 00:15:18.330
Bălan EA, Elena
Yeah, especially when it's really busy to bit hard to do it.

00:15:17.630 --> 00:15:18.290
Denzen J van, Jonathan
Yeah.

00:15:19.470 --> 00:15:20.240
Bălan EA, Elena
Uh.

00:15:22.650 --> 00:15:32.280
Bălan EA, Elena
Yeah, OK. Uh, I I feel like I need to do a bit more research before I come back to you again with the with a few more question. I'm I'm going to talk with Bono again and also the.

00:15:32.880 --> 00:15:33.270
Denzen J van, Jonathan
Yeah.

00:15:32.990 --> 00:15:38.860
Bălan EA, Elena
The people at the media lab see maybe they have some idea and how these things.

00:15:35.340 --> 00:15:45.210
Denzen J van, Jonathan
Yeah. Deni. Deni boathouse. It's also wanna kinda somewhere you could contact. He's doing a lot of work there and he's one of the communications to teachers.

00:15:50.680 --> 00:16:00.200
Bălan EA, Elena
And I have plans to talk with both GD&DDID students to get their their feedback on it. So yeah.

00:15:58.900 --> 00:15:59.330
Denzen J van, Jonathan
Yeah.

00:16:00.260 --> 00:16:01.580
Denzen J van, Jonathan
It's good alright.

00:16:01.980 --> 00:16:03.070
Bălan EA, Elena
Yep, OK.

00:16:02.570 --> 00:16:04.410
Denzen J van, Jonathan
Well, if you need anything else, let me know.

00:16:05.230 --> 00:16:06.550
Bălan EA, Elena
Yes, thank you very much.

00:16:06.770 --> 00:16:07.420
Denzen J van, Jonathan
Hey, good luck.

00:16:07.360 --> 00:16:09.210
Bălan EA, Elena
In our lovely day.

00:16:09.640 --> 00:16:10.480
Denzen J van, Jonathan
Thank you. You too.

00:16:11.360 --> 00:16:11.700
Bălan EA, Elena
Like.

Appendix E

Unstructured interview: Stakeholders – Geert Broekmann

Date and location

This interview was conducted on 11.03.2022 as an online meeting through Microsoft Teams.

Transcript from 11/03/2022

00:00:00.000 --> 00:00:03.190
Broekmann GJ, Geert
So it's basically you're asked me what is my.

00:00:04.010 --> 00:00:04.520
Broekmann GJ, Geert
Uhm.

00:00:04.990 --> 00:00:22.370
Bălan EA, Elena
Expectations of of such a thing 'cause we have the screens right now, but I'm not sure I know what Mono thinks of it, and I talked with Jonathan as well. I want to know what you would think of of it and what expectations you would have it.

00:00:25.150 --> 00:00:25.880
Broekmann GJ, Geert
Uhm.

00:00:26.750 --> 00:00:33.610
Broekmann GJ, Geert
What's most important to me is that we, yeah, is that we get more people inside.

00:00:35.010 --> 00:00:37.500
Broekmann GJ, Geert
Uh, but. But you know that.

00:00:38.120 --> 00:00:38.370
Bălan EA, Elena
Yeah.

00:00:40.260 --> 00:00:41.810
Broekmann GJ, Geert
If that is through some.

00:00:42.730 --> 00:00:47.220
Broekmann GJ, Geert
Meet at the next level, CMGT ask.

00:00:47.270 --> 00:00:50.040
Broekmann GJ, Geert
Uh interactive installation.

00:00:51.020 --> 00:01:01.070
Broekmann GJ, Geert
That will keep people in the hallways if it's the entire hallway. If it's a just a new version of the video screen with.

00:01:02.840 --> 00:01:05.020
Broekmann GJ, Geert
Added interactive elements.

00:01:05.380 --> 00:01:05.690
Bălan EA, Elena
Here.

00:01:05.620 --> 00:01:07.920
Broekmann GJ, Geert
I'm I'm fine with all of those.

00:01:08.640 --> 00:01:11.090
Broekmann GJ, Geert
Uh, what's important to me is that it's.

00:01:13.360 --> 00:01:16.010
Broekmann GJ, Geert
Well it it, it would be nice if it could display.

00:01:16.830 --> 00:01:18.830
Broekmann GJ, Geert
If it could display. Uh.

00:01:19.930 --> 00:01:21.710
Broekmann GJ, Geert
Relevant recent information.

00:01:22.960 --> 00:01:30.530
Broekmann GJ, Geert
Like newsletter ask but but maybe opening day stuff so that I have another excuse to.

00:01:31.300 --> 00:01:55.690
Broekmann GJ, Geert
Uh have more, more assistants make, like, newsy updates? Little headlines of what's going on in the industry, what's going on in Hanze, who's sick, who's on shift where? What are we buying? New projects that students are making 'cause that it, especially the student projects shows showcasing student projects is.

00:01:50.140 --> 00:01:50.480
Bălan EA, Elena
Yeah.

00:01:56.470 --> 00:02:15.830
Broekmann GJ, Geert
Not only a way to make students proud of their work, but also it's an incentive for students to make projects that are worthy of display, and it will motivate new students to see, like, oh, this is the level of.

00:02:16.850 --> 00:02:21.550
Broekmann GJ, Geert
Is the level of stuff that other students are making. I could slash should also be doing that.

00:02:23.550 --> 00:02:24.250
Broekmann GJ, Geert
But that's.

00:02:25.500 --> 00:02:26.890
Broekmann GJ, Geert
That's just a thing.

00:02:27.960 --> 00:02:29.840
Broekmann GJ, Geert
Most important is that it is.

00:02:31.340 --> 00:02:32.670
Broekmann GJ, Geert
Attractive enough?

00:02:33.450 --> 00:02:34.150
Broekmann GJ, Geert
4.

00:02:34.940 --> 00:02:37.260
Broekmann GJ, Geert
People to walk by and go. Hey, what's that?

00:02:39.020 --> 00:02:57.740
Bălan EA, Elena
Yeah, well, the student work part, we already are planning to include in their, uh, mostly in the form of videos or images. It depends. And also we want the I at least I want the product in itself to be an example of what you could do as a CMG.

00:02:58.610 --> 00:03:01.040
Bălan EA, Elena
Uh student. UM.

00:03:02.460 --> 00:03:14.460
Bălan EA, Elena
Yeah. I think Jonathan mentioned that we could do with a bit more uh makerspace E products like videos of products or pictures.

00:03:15.150 --> 00:03:19.610
Bălan EA, Elena
Uhm, I might come to you about that a bit later.

00:03:20.600 --> 00:03:45.160
Bălan EA, Elena
Oh yeah, also, I wanted to ask something about 'cause. Uh, that's why I also talk with young Jonathan, mostly because he's more vid oriented and one of the issues that I have right now with the project is that all of these C hall or the rooms in City Hall are mostly targeting GD students.

00:03:32.140 --> 00:03:32.500
Broekmann GJ, Geert
Yep.

00:03:43.780 --> 00:03:44.220
Broekmann GJ, Geert
Judy.

00:03:44.920 --> 00:03:46.890
Broekmann GJ, Geert
Good game design, yeah, true.

00:03:46.330 --> 00:04:06.010
Bălan EA, Elena
Yeah. So, uh, and I think Jonathan mentioned that that might be because there's not many classrooms anymore in the C whole. So people will not walk by two on their way to their to their class. Is there any more classrooms for VDI D in the makerspace?

00:04:07.460 --> 00:04:10.710
Bălan EA, Elena
Maybe we could use that as a trigger or like helpful.

00:04:10.220 --> 00:04:16.050
Broekmann GJ, Geert
Well, all of them, all of the CMD classes have a class in Makerspace.

00:04:16.780 --> 00:04:18.070
Broekmann GJ, Geert
Uh, in the first year?

00:04:18.980 --> 00:04:19.530
Broekmann GJ, Geert
Uhm.

00:04:21.570 --> 00:04:33.720
Broekmann GJ, Geert
And there are some who who? Well, at least they know that it's here and what we can do there or what they could do here. But there is not a lot of overlap between what they could do.

00:04:35.080 --> 00:04:40.390
Broekmann GJ, Geert
Here and and it it doesn't. It doesn't fit into their curriculum as much.

00:04:40.890 --> 00:04:41.220
Bălan EA, Elena
Yep.

00:04:40.970 --> 00:04:42.480
Broekmann GJ, Geert
Uh, at least makerspace.

00:04:43.070 --> 00:04:46.720
Broekmann GJ, Geert
That is hopefully going to change with rendergarden.

00:04:47.710 --> 00:04:55.790
Broekmann GJ, Geert
'cause that is really focused on stuff that that well, stuff like IK once for example, because I I I asked them as well.

00:04:57.520 --> 00:05:02.070
Broekmann GJ, Geert
So the that part will hopefully attract more VID students.

00:05:02.690 --> 00:05:03.080
Bălan EA, Elena
Uh-huh.

00:05:02.800 --> 00:05:04.670
Broekmann GJ, Geert
And the the you know.

00:05:05.880 --> 00:05:08.770
Broekmann GJ, Geert
That being this close to Makerspace is also.

00:05:10.030 --> 00:05:15.290
Broekmann GJ, Geert
Isn't this gonna help? But mostly yeah. They need to see.

00:05:16.170 --> 00:05:17.330
Broekmann GJ, Geert
What they could do?

00:05:18.010 --> 00:05:20.990
Broekmann GJ, Geert
Not just in Makerspace because in in all of these.

00:05:21.050 --> 00:05:21.440
Bălan EA, Elena
Yeah.

00:05:22.480 --> 00:05:34.720
Broekmann GJ, Geert
Rooms, because the Spacelab is Spacelab studio, is getting closer and closer. That was actually what this meeting was for, and and the the chances are.

00:05:35.600 --> 00:05:40.410
Broekmann GJ, Geert
Really high that it's going to have interactive LED wall.

00:05:41.310 --> 00:05:45.120
Broekmann GJ, Geert
Uhm, with camera tracking etc.

00:05:46.430 --> 00:05:50.280
Broekmann GJ, Geert
It's not gonna be this year, of course, but soon TM.

00:05:51.330 --> 00:05:53.810
Broekmann GJ, Geert
Uh, in hanze terms, there will be more.

00:05:54.540 --> 00:05:55.190
Broekmann GJ, Geert
Uhm.

00:05:56.320 --> 00:06:08.630
Broekmann GJ, Geert
There will be more content for not only GD because GD is going to love it as well, but CMD, communication media lysm journalism they could all benefit from.

00:06:09.290 --> 00:06:13.840
Broekmann GJ, Geert
Uh, from Spacelab from the Creative tech labs.

00:06:14.590 --> 00:06:26.980
Bălan EA, Elena
OK, UM, another question would be regarding the student projects. Would you mind if we put student projects for VDI D in the room side? I guess you won't?

00:06:26.610 --> 00:06:28.190
Broekmann GJ, Geert
No, no, I love it.

00:06:28.910 --> 00:06:29.630
Bălan EA, Elena
Yeah. OK.

00:06:30.570 --> 00:06:39.300
Bălan EA, Elena
I need to grab them somewhere, but yeah, uhm and one technical I guess question is.

00:06:32.050 --> 00:06:33.240
Broekmann GJ, Geert
With consent, of course.

00:06:40.360 --> 00:06:53.770
Bălan EA, Elena
Right now we do not have any screens for rendergarden or creationstation, so I will make mockups of how the information should look like for each room.

00:06:54.840 --> 00:06:55.630
Bălan EA, Elena
Uh.

00:06:56.450 --> 00:07:00.370
Bălan EA, Elena
But I won't be able to test it. Do you know if there's a?

00:07:01.590 --> 00:07:06.860
Bălan EA, Elena
Date for when we will have maybe rendergarden 'cause. I know Creationstation is a bit far.

00:07:07.140 --> 00:07:12.410
Broekmann GJ, Geert
Creationstation is going to be hard as well because it doesn't have the glass wall that we can hang up.

00:07:13.040 --> 00:07:13.380
Bălan EA, Elena
Yeah.

00:07:13.190 --> 00:07:16.540
Broekmann GJ, Geert
A TV behind but rendergarden I can.

00:07:17.610 --> 00:07:19.590
Broekmann GJ, Geert
I can start that process up at least.

00:07:19.910 --> 00:07:20.840
Bălan EA, Elena
OK, alright.

00:07:21.460 --> 00:07:22.040
Broekmann GJ, Geert
I'm.

00:07:23.190 --> 00:07:30.130
Broekmann GJ, Geert
Yeah, I'll. I'll come. I'll start that process up. I'll see if we can find a TV for the.

00:07:31.260 --> 00:07:32.220
Broekmann GJ, Geert
For the glass window.

00:07:32.590 --> 00:07:32.980
Bălan EA, Elena
Uh-huh.

00:07:33.740 --> 00:07:34.090
Bălan EA, Elena
Great.

00:07:35.120 --> 00:07:38.210
Bălan EA, Elena
Uhm yeah, I guess.

00:07:38.560 --> 00:07:44.300
Broekmann GJ, Geert
I'm going to use your discord chat as a memo.

00:07:44.560 --> 00:07:48.570
Bălan EA, Elena
Feel free as long as you don't forget about it and ghost me again.

00:07:49.100 --> 00:07:50.770
Broekmann GJ, Geert
Uh, I I ghost everybody.

00:07:53.460 --> 00:07:55.310
Broekmann GJ, Geert
Oh, that guy for sure.

00:07:57.760 --> 00:07:59.210
Broekmann GJ, Geert
Rendergarden TV.

00:08:00.970 --> 00:08:02.280
Broekmann GJ, Geert
Rendergarden TV done.

00:08:02.560 --> 00:08:09.210
Bălan EA, Elena
Yeah. OK. So for you, I guess. Uh, most important is that people do come to makerspace and all the spaces.

00:08:09.800 --> 00:08:11.130
Bălan EA, Elena
Uh, more?

00:08:11.640 --> 00:08:18.910
Broekmann GJ, Geert
Yeah, the most important is that they know what we do and what we could do.

00:08:11.720 --> 00:08:12.040
Bălan EA, Elena
Uh.

00:08:19.190 --> 00:08:19.490
Bălan EA, Elena
Yep.

00:08:21.540 --> 00:08:28.940
Broekmann GJ, Geert
Yeah. And if that's with projects that we have, is that 'cause, I I still want to have more. I want to create more content.

00:08:29.600 --> 00:08:35.690
Bălan EA, Elena
Yeah, I know, I know. Uh, also for a if we do have a screen on creationstation.

00:08:29.630 --> 00:08:30.650
Broekmann GJ, Geert
In all forms.

00:08:36.650 --> 00:08:42.340
Bălan EA, Elena
Uh, so not creationstation the rendergarden. Why are we gonna put in it?

00:08:39.680 --> 00:08:40.180
Broekmann GJ, Geert
Rendergarden.

00:08:46.010 --> 00:08:46.500
Broekmann GJ, Geert
Whatever.

00:08:47.300 --> 00:08:48.540
Broekmann GJ, Geert
Anything. Everything.

00:08:49.550 --> 00:08:51.680
Bălan EA, Elena
'cause, technically we don't have any.

00:08:53.010 --> 00:08:58.100
Bălan EA, Elena
Student work, but I guess we could just show circulating student work.

00:08:58.370 --> 00:08:58.580
Broekmann GJ, Geert
Yeah.

00:08:58.880 --> 00:09:07.840
Broekmann GJ, Geert
That's that's, that's not going to be that hard. I mean like the the the TV is that we have right now the projects that we're running on there.

00:09:08.980 --> 00:09:10.450
Broekmann GJ, Geert
That I think, Manno, just.

00:09:11.180 --> 00:09:24.500
Broekmann GJ, Geert
Pull together in in like a weekend just from stuff that he already had, and I know Edwin is working on getting more content so so the content from students is gonna if we build it, it will come.

00:09:15.410 --> 00:09:17.480
Bălan EA, Elena
Yeah, he already had those.

00:09:25.510 --> 00:09:25.870
Bălan EA, Elena
OK.

00:09:27.050 --> 00:09:34.650
Bălan EA, Elena
Uh, alright then. Maybe give forward about that as well. If we have any graphic.

00:09:35.880 --> 00:09:45.890
Bălan EA, Elena
People in Makerspace maybe right could show something 'cause that's more more he's laying or designs and such alright.

00:09:43.090 --> 00:09:43.500
Broekmann GJ, Geert
Yep.

00:09:45.500 --> 00:09:45.900
Broekmann GJ, Geert
Yep.

00:09:50.420 --> 00:09:50.740
Broekmann GJ, Geert
Yep.

00:09:52.490 --> 00:09:52.900
Broekmann GJ, Geert
OK.

00:10:00.830 --> 00:10:01.640
Broekmann GJ, Geert
Yeah, I know.

00:10:01.690 --> 00:10:08.140
Bălan EA, Elena
With the technology is probably going to be a sensor based, something if it's not camera, it's going to be motion sensors.

00:10:08.710 --> 00:10:18.390
Broekmann GJ, Geert
Yeah. And I guess the only the only thing that I would also like if you're working with with sensors is if we could.

00:10:19.470 --> 00:10:21.420
Broekmann GJ, Geert
Integrated into our like.

00:10:22.390 --> 00:10:39.920
Broekmann GJ, Geert
Workshoppy asked. Uh, maybe. Puzzle game me. Ask things that if it's interactive enough that we could have students work with it so that we could eventually also may be integrated into some form in the curriculum, maybe.

00:10:40.480 --> 00:10:55.180
Bălan EA, Elena
Uh, we'll see about that because I'm gonna use. I mean, technically, it's not super difficult and we already have some hints added in year four, for example, in future future design 'cause Manno already talked about that.

00:10:55.700 --> 00:10:56.920
Bălan EA, Elena
Uh hum.

00:10:57.780 --> 00:11:09.470
Bălan EA, Elena
I have not sure what stage of code clean code is going to be at the end of this 20 weeks, but yeah, sure I'll I will look into it. My idea was to.

00:11:05.550 --> 00:11:06.020
Broekmann GJ, Geert
Uh-huh.

00:11:10.420 --> 00:11:16.160
Bălan EA, Elena
Gamify it as much as I could, and if UM.

00:11:11.970 --> 00:11:12.310
Broekmann GJ, Geert
Yeah.

00:11:13.630 --> 00:11:13.970
Broekmann GJ, Geert
Yeah.

00:11:17.180 --> 00:11:28.200
Bălan EA, Elena
My coach is that OK? Just moving around slides and stuff is not enough and I have to also may go small mini game in it. Meow. Sure. Oh.

00:11:27.950 --> 00:11:31.340
Broekmann GJ, Geert
Yeah, but then I I think that.

00:11:32.000 --> 00:11:34.200
Broekmann GJ, Geert
You're building a platform that will be very.

00:11:35.660 --> 00:11:38.470
Broekmann GJ, Geert
A very easy to build upon.

00:11:39.400 --> 00:11:51.280
Broekmann GJ, Geert
Like in terms of more functionalities and other like mini games that you can select or something so so if you can at least have like a little chapter at the end of things that we could research in next.

00:11:39.730 --> 00:11:40.010
Bălan EA, Elena
Yeah.

00:11:51.460 --> 00:11:53.000
Bălan EA, Elena
Yeah. Yeah. Uh.

00:11:52.260 --> 00:11:55.100
Broekmann GJ, Geert
That would that would definitely be something that I would like.

00:11:55.330 --> 00:12:09.670
Bălan EA, Elena
Yeah, 'cause. I want my my project to be usable after I finish it, maybe with a bit more work after, but like be usable. Uh, 'cause. I could have just in. In that case, I could have just forgotten about the.

00:12:03.600 --> 00:12:03.990
Broekmann GJ, Geert
Yep.

00:12:10.470 --> 00:12:14.690
Bălan EA, Elena
A dashboard or how to upload things 'cause. That's what Manno wanted.

00:12:15.050 --> 00:12:15.390
Broekmann GJ, Geert
Yeah.

00:12:15.080 --> 00:12:18.370
Bălan EA, Elena
Uh at the end of the day, I do want it to be usable.

00:12:18.710 --> 00:12:19.030
Broekmann GJ, Geert
Yep.

00:12:19.570 --> 00:12:44.680
Bălan EA, Elena
Uh, I'm not sure how easy is going to be to use at least uploading parts, because what I I talked with mono at this stage is that, uh, the dashboard is going to take a bit of a backstage, mainly because, uh, my coach in case just want a lot of interactivity and with the interface and sensors, that's it.

00:12:43.660 --> 00:13:02.630
Broekmann GJ, Geert
Yeah, yeah. No, that's not. That's not a problem. That that sounds like a second a graduation project all over. So maybe once you have the basis, we could next year or the semester after go like, hey, we have this lovely platform, you could evolve the UI, UX, the dashboard.

00:13:02.960 --> 00:13:04.080
Bălan EA, Elena
Yeah. Oh.

00:13:03.400 --> 00:13:05.100
Broekmann GJ, Geert
And so you don't have to.

00:13:05.150 --> 00:13:12.120
Broekmann GJ, Geert
Uh, uh, you don't have to design the the best dashboard in the world, just focus on your functionalities.

00:13:12.320 --> 00:13:12.670
Bălan EA, Elena
Uh-huh.

00:13:12.740 --> 00:13:14.840
Broekmann GJ, Geert
And then if it's.

00:13:15.830 --> 00:13:21.750
Broekmann GJ, Geert
If you haven't done on and on boarding little document or whatever for for future reference that that's fine.

00:13:22.150 --> 00:13:22.930
Bălan EA, Elena
Yeah. OK.

00:13:24.310 --> 00:13:24.830
Broekmann GJ, Geert
Good stuff.

00:13:25.180 --> 00:13:26.090
Bălan EA, Elena
Alright, alright.

00:13:26.430 --> 00:13:26.870
Broekmann GJ, Geert
Good.

00:13:27.620 --> 00:13:29.210
Broekmann GJ, Geert
I'm gonna get kicked out of the room.

00:13:29.590 --> 00:13:30.660
Bălan EA, Elena
Yeah, probably.

00:13:31.260 --> 00:13:32.230
Broekmann GJ, Geert
Uhm.

00:13:33.430 --> 00:13:33.930
Broekmann GJ, Geert
Thank you.

00:13:34.390 --> 00:13:36.120
Bălan EA, Elena
You're welcome. See you tomorrow.

00:13:37.270 --> 00:13:38.470
Bălan EA, Elena
Coming over with a strong.

00:13:38.100 --> 00:13:42.590
Broekmann GJ, Geert
Oh, right, yeah. If the straws do arrive tomorrow, I will. Uh, I will deliver.

00:13:43.230 --> 00:13:43.890
Bălan EA, Elena
Or Sunday.

00:13:43.940 --> 00:13:44.480
Bălan EA, Elena
Yeah. OK.

00:13:44.530 --> 00:13:47.940
Bălan EA, Elena
They do. I I don't mind. Just let me know. So I make pop up beforehand.

00:13:48.810 --> 00:13:49.600
Broekmann GJ, Geert
I'll let you know.

00:13:49.860 --> 00:13:51.770
Bălan EA, Elena
OK. Thank you.

00:13:51.120 --> 00:13:51.710
Broekmann GJ, Geert
OK.

00:13:52.360 --> 00:13:53.510
Broekmann GJ, Geert
Ciao.

00:13:53.520 --> 00:13:58.860
Bălan EA, Elena
Hopefully there's no expert, so I don't know where she is, but she says hi.

00:14:05.670 --> 00:14:06.600
Bălan EA, Elena
It's not the coding.

00:14:07.710 --> 00:14:08.200
Bălan EA, Elena
Right.

00:14:09.150 --> 00:14:09.840
Bălan EA, Elena
49.

Appendix F

Unstructured Interview – Stakeholders -Ilja

Date and location

This interview was conducted on 11.03.2022 as a physical meeting at Hanze, ZP11/ C221.

Notes

The students are incentivized to come to ct labs, especially 2nd years

This year there were fewer people because of the years that started during pandemic

The hallway is not used for classes anymore

CMGT has classes in U building due to Hanze shortage of classrooms

Events still do well though

Believes that the incentives of teachers are not as heavy

They should come by their own volition

Make known the fact that ct labs have plenty of opportunities for fun and school

Appendix G

Target audience survey answers

19 responses

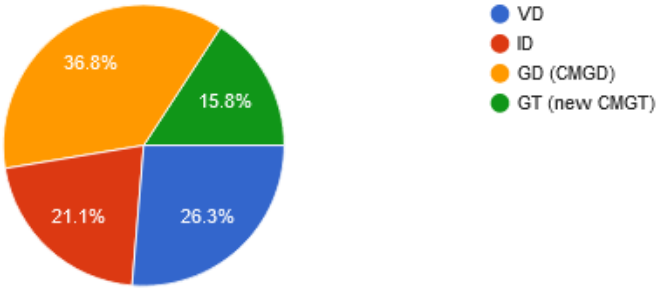
Accepting responses

Summary | Question | Individual

What study of CMD/CMGT are you part of?

Copy

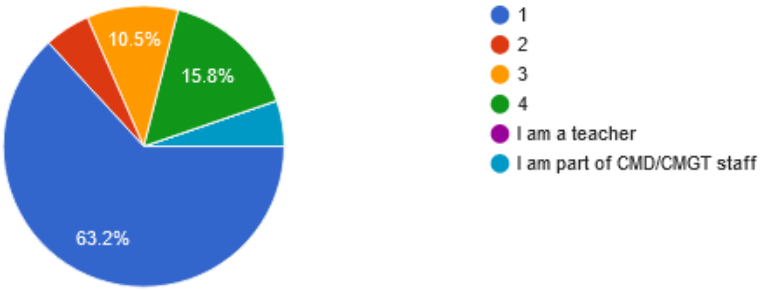
19 responses



What year of your study are you in?

Copy

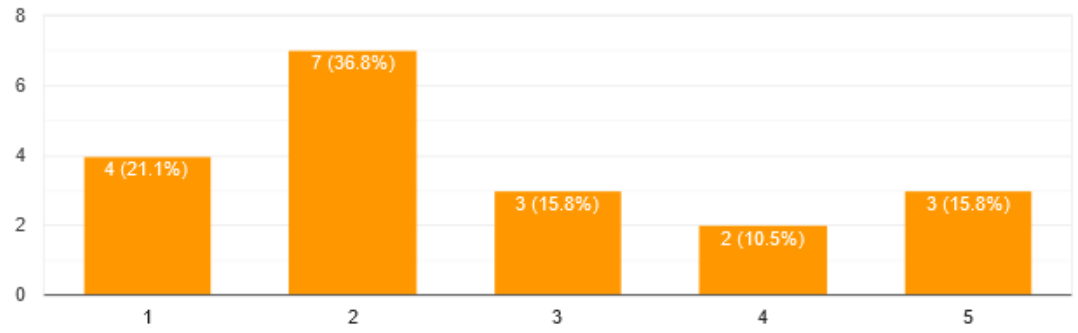
19 responses



How often do you go into the C-hall (ZP 11, 2nd floor)

Copy

19 responses



If you don't, or barely go to the C-hall what is the reason for that?

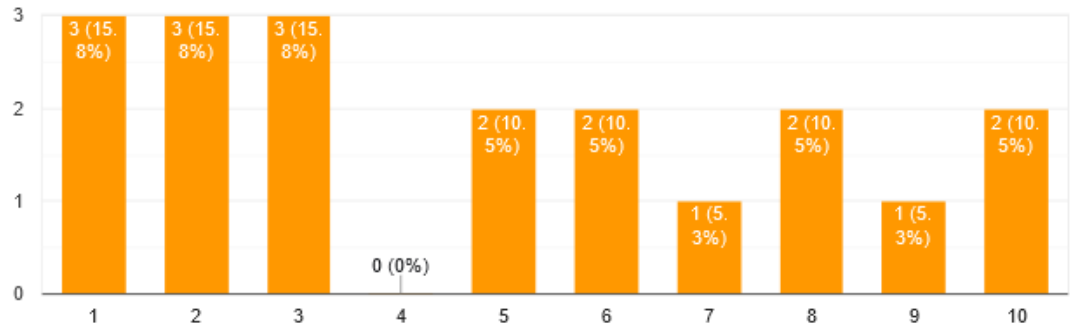
12 responses

- rarely any lessons there
- Because is it far to walk
- No lessons
- This shouldn't be an obligated question
- N. A.
- No classes
- I work there
- Busy with projects that do not relate to vr
- Only for class

How often would you say you visit the CT-labs per semester?

Copy

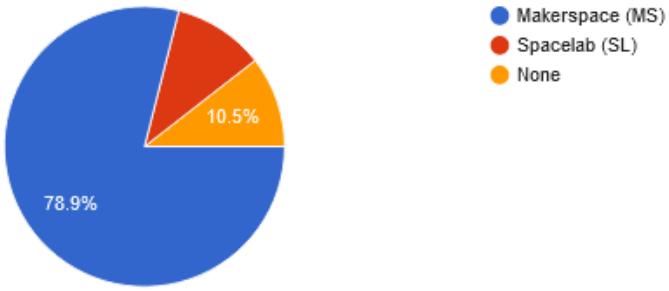
19 responses



What is the lab you have visited the most?

Copy

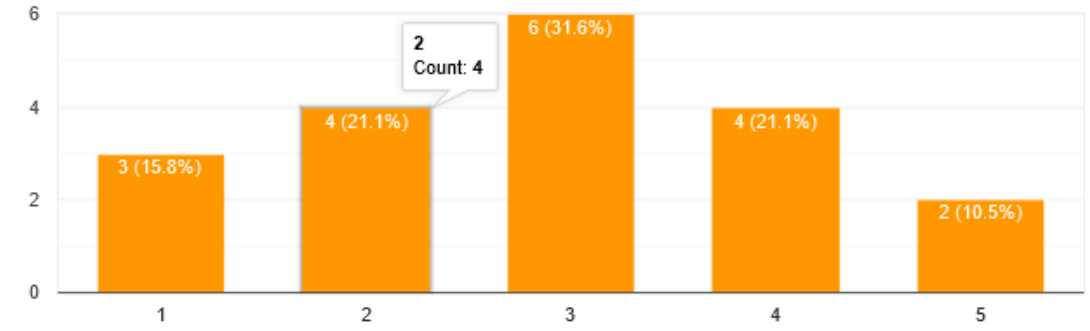
19 responses



How much would you say your visit to the CT-labs was influenced by the curriculum/a course?

Copy

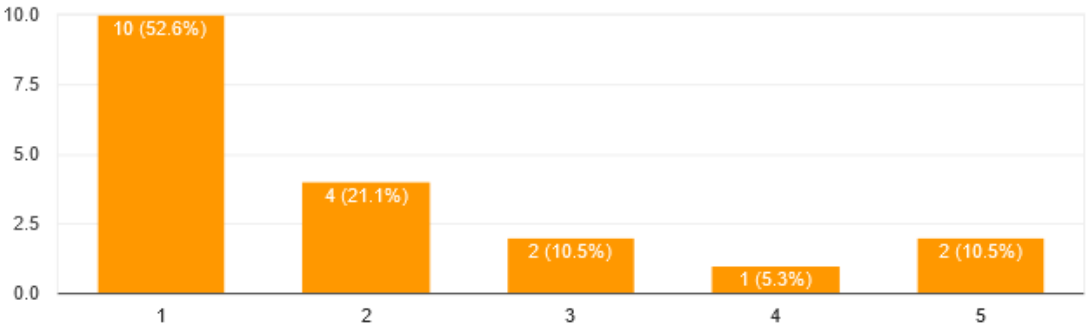
19 responses



How up to date would you say you are with CT-labs related news and events?

Copy

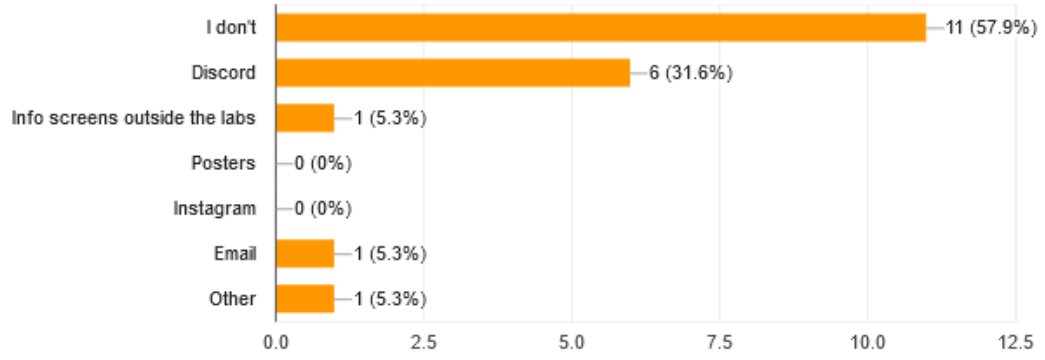
19 responses



How do you find out about these events?

Copy

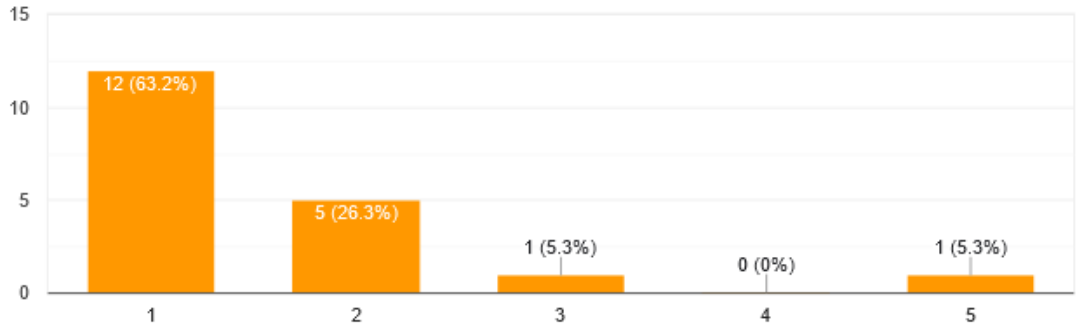
19 responses



How often do you refer to the info-screens outside the CT-labs for relevant info?

Copy

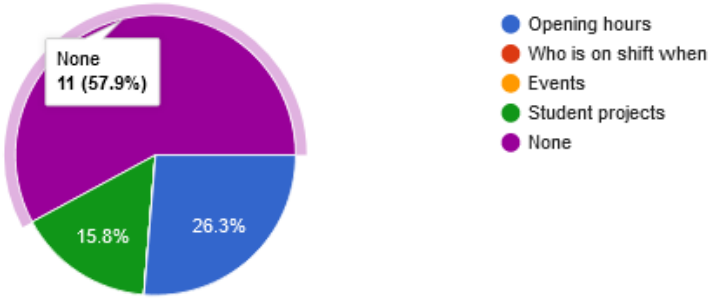
19 responses



What information do you get most from the info-screens?

Copy

19 responses



What would you say is the biggest issue with the info-screens currently?

19 responses

- they don't stand out
- I didnt know that they exist :)
- I dont even know there where info-screens
- -
- Never seen them
- It's no info- just showcasing. Which is nice, but it also hasn't updated in a long time (new student projects)
- I actually don't look or read at them, mostly I would look if the MakerSpace is open or ask if I can work there
- They are not visible enough
- Mostly repeated community content, less news

What would you suggest be done to improve your experience with the info-screens?

19 responses

info on what i can use these screens for at the beginning of the school year

.

maybe a tour with al the cmd functions

-

Make them more visible

Make them more visible to everyone- not just CMD/cmgt people and showcase more actual information like upcoming events or workshops

Maybe the issue is that in my opinion, that it doesn't stand out much, it's not very visable and easy to miss, I don't even know where the info screen is to be honest

Make them pop more and make them more interactive

Appendix H

Target audience personas

User persona

Zoe

Age: 19

Occupation: VD Student

Location: Groningen

Education: Hanze CMD

Personality

Introvert	Extrovert
Analytical	Creative
Busy	Time rich
Messy	Organized
Independent	Team player

Interests

Visual design
Music
Dancing
Video editing

Influences

Friend groups
Instagram, Tick tok (social media)
Family
Movies
TV/radio

Goals

Pass the courses of the study
Have fun while doing projects/interact with people
Create products that could be added to her portfolio

Needs & Expectations

Be offered the help/tools necesary to fulfill the university assignments

Have an environment that allows for creativity

Have options when it comes to experimenting with technologies

Motivations

Be praised and recognized/validated by fellow students and teachers
Proving her skills
Her passion for visual design

Pain Points / Frustrations

She is good with the software she is taught in classes and can handle cameras/ video productio tools but is not handy with other technologies/ tools available to CMD students

She isn't confident in her English and is shy to go to the CT-labs where most peopls speak english

She doesn't know what she wants to experiment with specifically, there is not specific list of the facilities in CT-labs and is shy to ask

User persona

Mennart

Age: 21

Occupation: GD Student

Location: Groningen

Education: Hanze CMD

Personality

Introvert	Extrovert
Analytical	Creative
Busy	Time rich
Messy	Organized
Independent	Team player

Interests

Gaming
3D moddeling
3D art
Reading

Influences

Friend groups
Instagram, Tick tok, Reddit, Twitch (social media)
Online news channels

Goals

Pass the courses of the study
Create something he is proud of
Have fun while doing projects
Create products that could be added to her portfolio

Needs & Expectations

Be offered the help/tools necesary to fulfill the university assignments
Have an environment that allows for creativity
Have options when it comes to experimenting with technologies

Motivations

Be praised and recognized/validated by fellow students and teachers
Proving her skills
Her passion for visual design

Pain Points / Frustrations

She is good with the software she is taught in classes and can handle cameras/ video productio tools but is not handy with other technologies/ tools available to CMD students

She isn't confident in her English and is shy to go to the CT-labs where most peopls speak english

She doesn't know what she wants to experiment with specifically, there is not specific list of the facilities in CT-labs and is shy to ask

Appendix I

Concept testing

Tester 1:

Order: 1, 2, 3, 4

First one is my favourite because it will attract attention of all people walking by on the main hallway, not just people that will come on the C-hall anyway

The mat one might be a bit harder to use because you can bump into people while doing it

Tester 2:

Order: 1, 4, 3, 2

Likes the first one most

Second best is the mat one

The nano leaves one will probably break very easily, and they are sometimes impractical because they register touch a bit harder after long usage

Maybe sound can be incorporated into the first prototype

Tester 3:

Order: 1, 3

With the Nano leaves there should be a sign or way of telling people how to use them

The first concept is nice because if there's something interesting on the screens it will attract people

The interactivity with the screen flashing

The beamer concept is nice, the hallway is dark, and it would be a good use of it plus it will attract people

The Nano leaves would be more intuitive than a mat

Tester 4:

Order: 1, 2, 3, 4

Likes the first one because you can display more info and it brings people in by being on the main hall, there's more expendability.

You could use glass that is being projected on as well, more gimmicky way of showcasing compared to a normal screen. The way finding feature is nice

Second one is more attractive with the lights from the nano leaves and all

3 and 4 concept are close together

The mat might seem cool but It can restrict people in their movement

Also, a beamer is a bit outdated so it won't attract that many people. They've seen it before, even if it might be interesting at first it will wear off quickly

Tester 5, year 1 CMGT

Order: 2, 3, 4, 1

The button (Nano leaves) one would be the most interesting one

People will notice the beamer on the ground and will be interested

The motion might be too complex so the hand movement one would be the least practical for them

The pressure plate thing will probably not work anymore, people stepping on it when they pass by

Tester 6, year 1 CMGT

Order: 4, 1, 3, 2

Pressure plate for disabled people is not practical

The button ones would be the most interesting one

Tester 7, former GD, year 1 CMGT

Order: 2, 1, 3, 4

It's intuitive. It's easier to use as well. It seems more intuitive

Not sure about the mat, how can you portray that

The beamer, light attracts attention, but then again so does a screen

Motion capture would people really use it when the info is not that interesting. Maybe the info in that case is the issue.

Tester 8

Order: 2, 4, 1, 3

No other feedback

Tester 9

Order: 1, 2, 3, 4

The motion I like the most

The mat will require physical action and explaining to do, students will not have patience for that

The physical buttons are always fun and pretty standard

Appendix J

First Evaluation: Testing session A, focus group

Date and location

The session was held at Hanze, C-hallway on 23rd of May 2022.

Notes

Tester 1:

UI

Heading stand out more

Instead opening hours make an excel tab

Combine opening hours with students

Information

The onboarding needs to be more clear

Functionality

Controls stand out

Go home easier

Tester 2:

UI

When and how the onboarding is done?

Information

Info is good, maybe condensed a bit

Functionality

The movement gesture is intuitive

It would be sort of gamified if you discover the movement but have a bit of feedback

There's not a lot of products like these, so very new

Tester 3:

UI

Framing of student work

Readability of text

The navigating points are not readable. It makes it less intuitive

Maybe replace with icons and horizontal text

Functionality

Structure it as a tile with the home in the middle branching to ct-labs

Maybe have a swipe feature, increase usability

Swipe transition between pages

Indication of home page that it's the home page

Information

It's good

Tester 4:

Functionality

Controls are clear and intuitive, even someone who struggles with technologies

The Home Screen is intuitive

Home button, they needed to go to home easier

UI

The text is readable

Likes it, pleasantly surprised

Information

Is good

Tester 5:

UI

Indicator of how long you need to hold the hand up somewhere around the text to indicate what you'll see next

Bg makes text hard to read

The controlls is not readable or intuitive. Not immediately clear what I'm supposed to get from it

Different images to make clear of dif slide

Banner for student work to make it more coherent

Functionality

When going to SL move towards left to go further instead of right, more intuitive that way

Tester 6:

UI

Controls hard to read take them out of the image with a border or something similar

The onboarding could be added into the home screen

Functionality

Swiping might be more intuitive

Tester 7:

Functionality

Swap orientation of slide labels to make it more intuitive

Movement is good and intuitive

UI

It doesn't look too busy or complicated

Information

Not too much text and readable

Tester 7:

Functionality

Swap orientation of slide labels to make it more intuitive

Movement is good and intuitive

UI

It doesn't look too busy or complicated

Information

Not too much text and readable

Tester 8:

Functionality

Needs a cooldown or indication of how long it needs to stay up to be picked up

UI

Needs a bigger image of the video feed, so that people see better what they do

Maybe more images, a bit too much text

Information

Too much text, replace with video or images

Tester 9:

Functionality

Pretty intuitive, not hard to get the hang of

Needs a bit more playing with, a bit buggy

Maybe also showcase what the AI reads, if it thinks there's a right hand

Pretty inclusive for people with disabilities

UI

Needs a bigger image of the video feed, so that people see better what they do

The controls on the home screen are a bit hard to read, they're also inverted

Information

Combine opening hours with the student assistants or facilities

Maybe less slides or more images in a loop

Tester 10:

Functionality

It’s pretty cool

A bit buggy, it needs a second to recognize the movement

Maybe add a bit more stuff for the ML, like moving objects with theirs hands

UI

Pretty clean and concise

Information

A bit too much text

Appendix K

First Evaluation: Testing session B, client testing

Date and location

The session was held at Hanze, C-hallway on 2th of May 2022.

Notes

Tester 1:

UI

Looks nice

Like the animations

Would be nice to have animation waving

Information

Its not explained as much but it's easier to navigate

Better to have lessslides

Functionality

Still needs a go home button

Tester 2:

UI

Looks nice

Arrows on home screen look like buttons though

Information

Info is good

Functionality

The movement gesture is intuitive

Like the gamified part where you kind of find the controls

Tester 3:

UI

Readability of text is better

Maybe a hand instead of the arrows

Functionality

Swipe feature still would be nice

Animations between pages

Information

It's good

Tester 4:

Functionality

Controls are intuitive

UI

It looks really cool

Information

Is good

Tester 5:

UI

Looks nicer

Functionality

Seems smoother

Tester 6:

UI

Looks nice

Functionality

Swiping might be more intuitive still

Tester 7:

Functionality

Movement is good and intuitive

UI

Good

Information

Not too much text and readable

Tester 7:

Functionality

Swap orientation of slide labels to make it more intuitive

Movement is good and intuitive

UI

It doesn't look too busy or complicated

Information

Not too much text and readable

Tester 8:

Functionality

Needs a cooldown or indication of how long it needs to stay up to be picked up

UI

Good

Information

Too much text, replace with video or images

Tester 9:

Functionality

Pretty intuitive, not hard to get the hang of

Needs a bit more playing with, a bit buggy

UI

The controls on the home screen are a bit hard to read, they're also inverted

Information

More videos and pictures

Tester 10:

Functionality

It's cool

Smoother

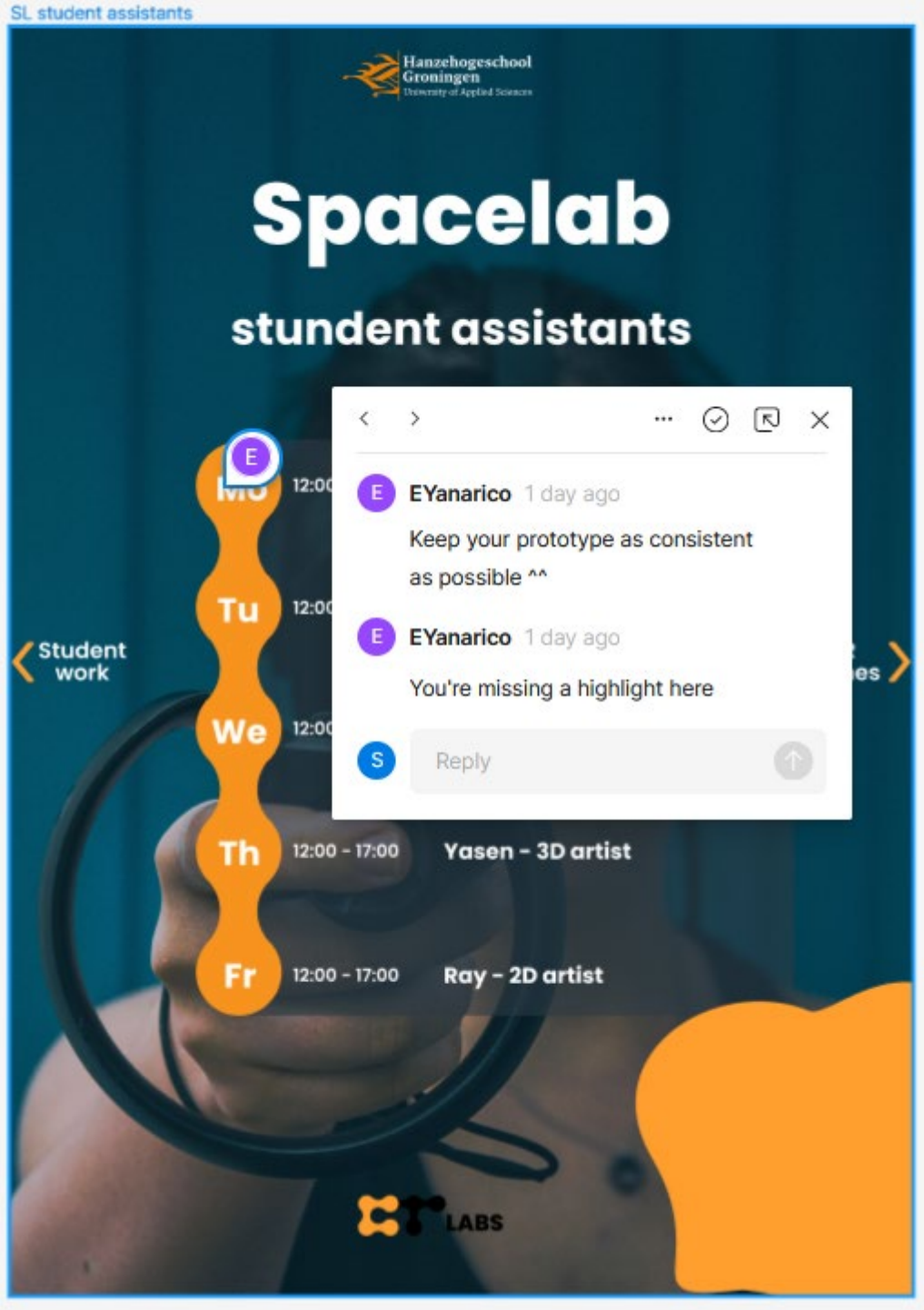
UI

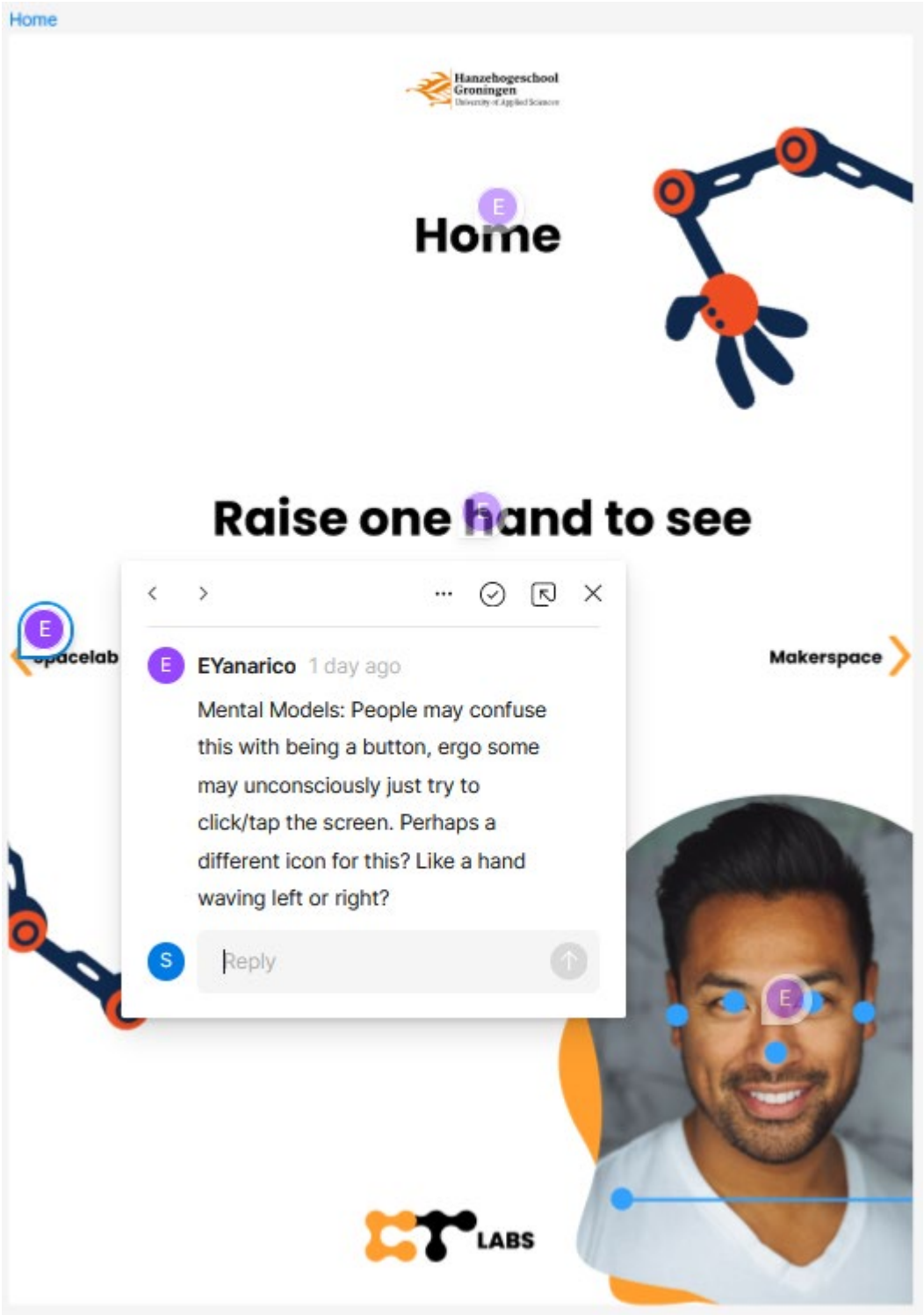
Pretty clean and concise

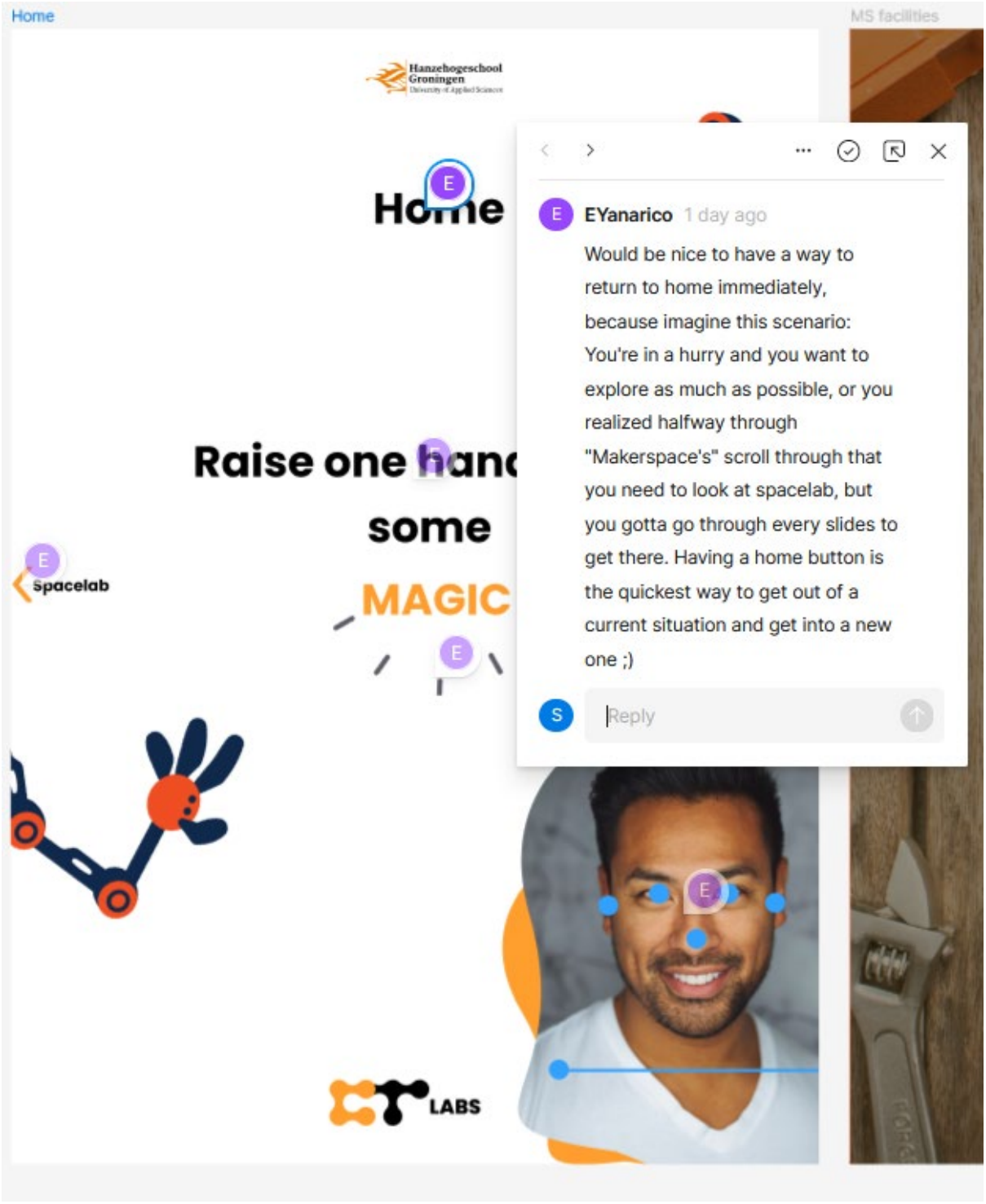
Information

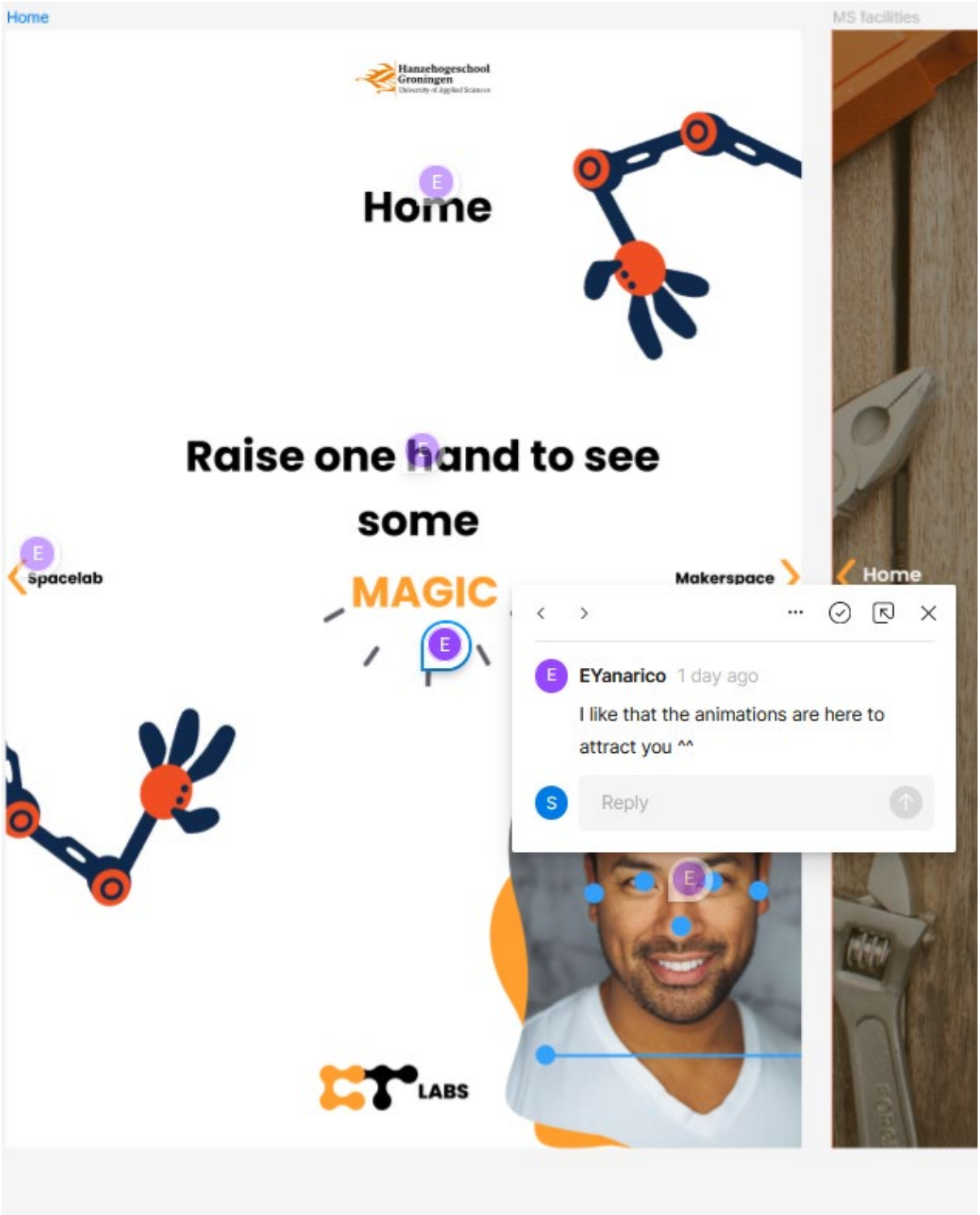
More videos and pictures

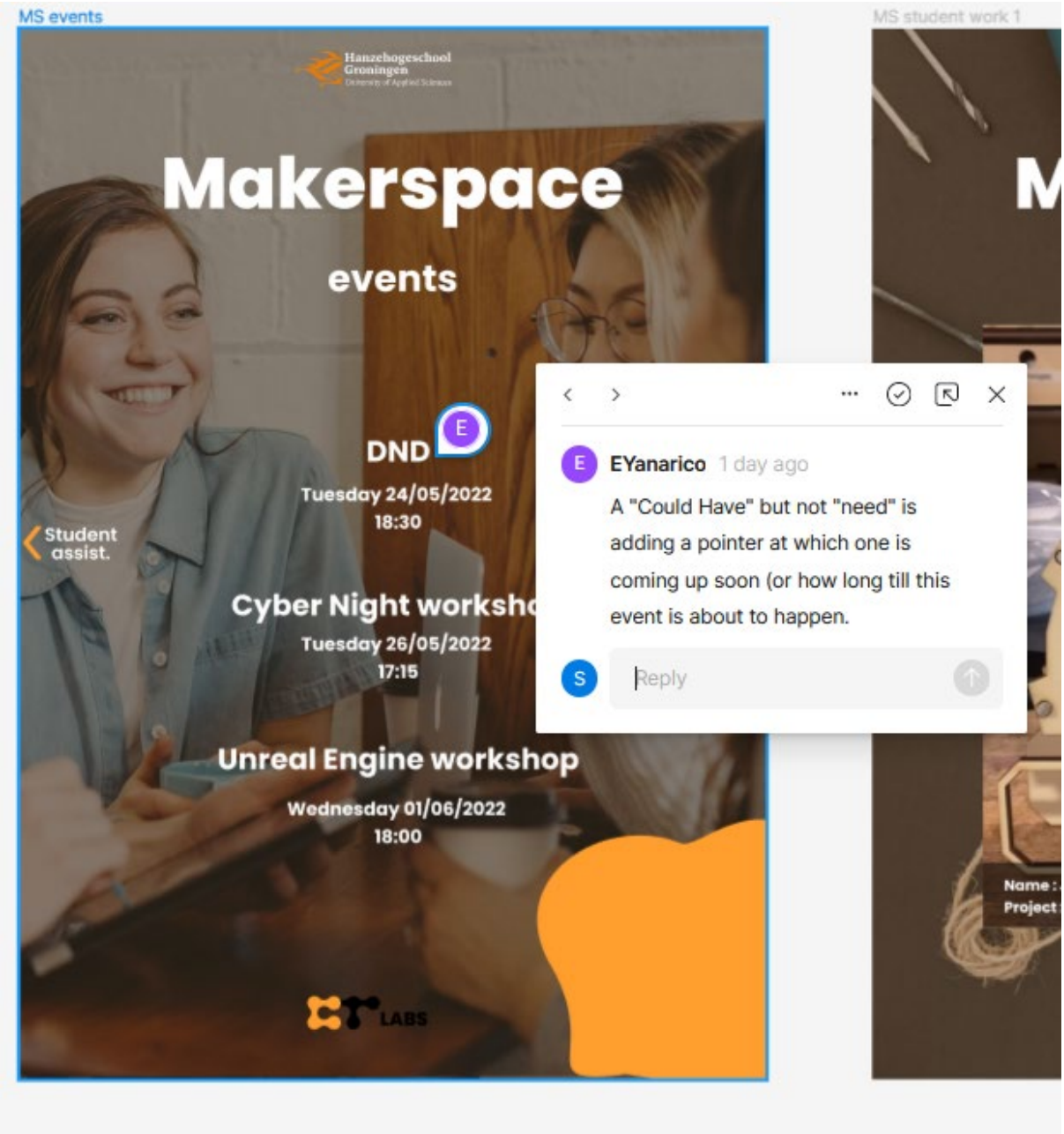
Appendix L

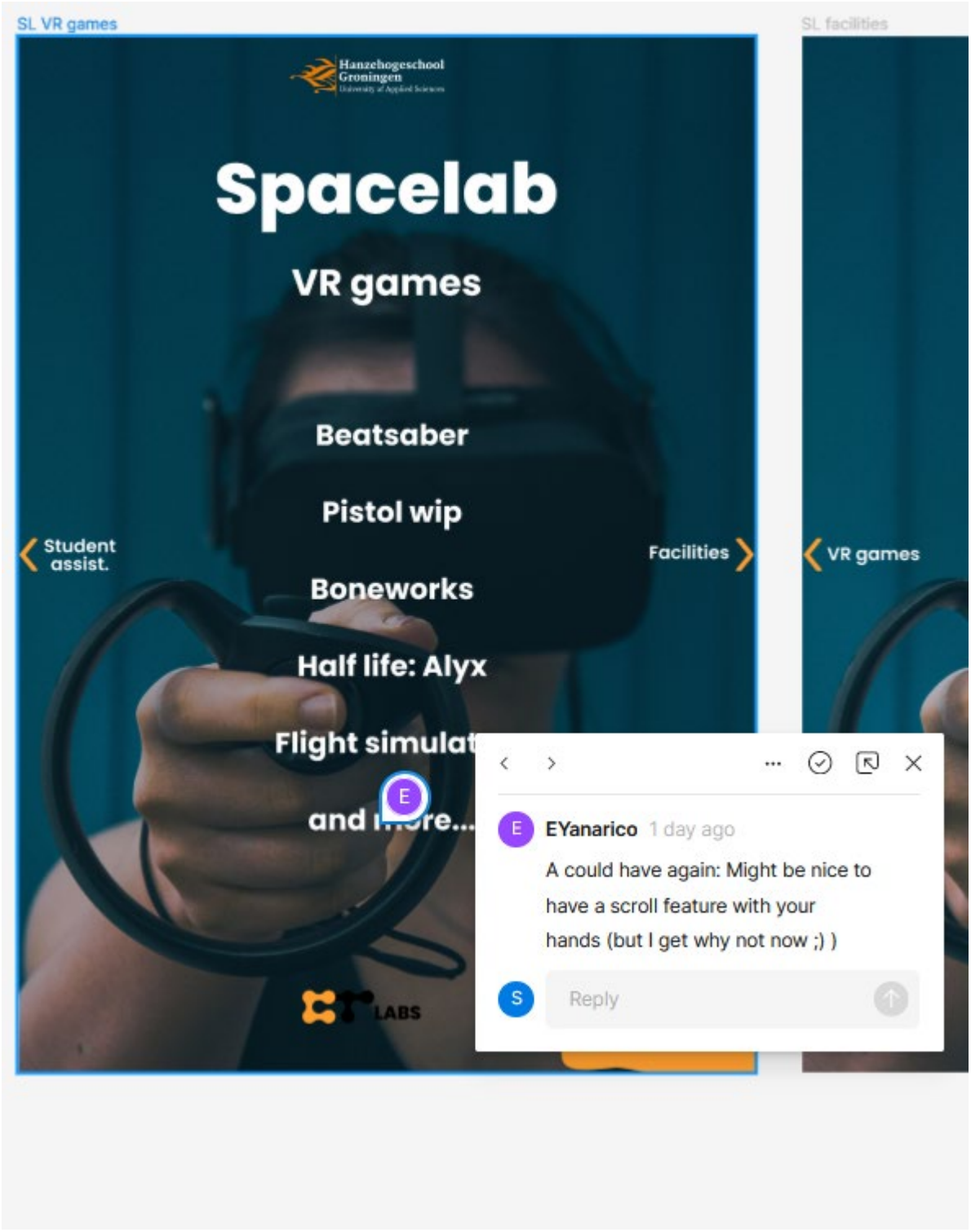

SL student assistants
Hanzehogeschool Groningen
University of Applied Sciences
Spacelab
stundent assistants
EYanarico 1 day ago
Keep your prototype as consistent as possible ^^
EYanarico 1 day ago
You're missing a highlight here
Reply
Student work
Tu
We
Th
12:00 - 17:00
Yasen - 3D artist
Fr
12:00 - 17:00
Ray - 2D artist
LABS


Home
Hanzehogeschool Groningen
Home
Raise one hand to see
EYanarico 1 day ago
Mental Models: People may confuse this with being a button, ergo some may unconsciously just try to click/tap the screen. Perhaps a different icon for this? Like a hand waving left or right?
Reply
Makerspace
LABS


Home
MS facilities
Hanzehogeschool Groningen
Home
EYanarico 1 day ago
Would be nice to have a way to return to home immediately, because imagine this scenario: You're in a hurry and you want to explore as much as possible, or you realized halfway through "Makerspace's" scroll through that you need to look at spacelab, but you gotta go through every slides to get there. Having a home button is the quickest way to get out of a current situation and get into a new one ;)
Reply
Raise one hand
some
MAGIC
Spacelab
LABS


Home
MS facilities
Hanzehogeschool Groningen
Home
Raise one hand to see some
MAGIC
spacelab
Makerspace
Home
EYanarico 1 day ago
I like that the animations are here to attract you ^^
Reply
LABS


MS events
Hanzehogeschool Groningen
Makerspace
events
DND
Tuesday 24/05/2022
18:30
Student assist.
Cyber Night worksh
Tuesday 26/05/2022
17:15
Unreal Engine workshop
Wednesday 01/06/2022
18:00
LABS
EYanarico 1 day ago
A "Could Have" but not "need" is adding a pointer at which one is coming up soon (or how long till this event is about to happen.
Reply
MS student work 1


SL VR games
SL facilities
Hanzehogeschool Groningen
Spacelab
VR games
Beatsaber
Pistol wip
Boneworks
Half life: Alyx
Flight simulat
and more...
Student assist.
Facilities
VR games
LABS
EYanarico 1 day ago
A could have again: Might be nice to have a scroll feature with your hands (but I get why not now ;))
Reply