

A report submitted by group 9 in partial fulfilment of the course: 0HM110 – UX Design

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Group 9

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## WAYFINDING ON THE TU/E CAMPUS

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### Abstract

For the course 0HM110 - User Experience Design, given by the TU/e, a design challenge is proposed. The design challenge is come up with a solution for the wayfinding problems that are experienced by visitors of the TU/e campus. The groups focused on within this document are international students and visitors from outside the TU/e. From these groups, participants are gathered to participate in focus groups.

During these sessions, the cognitive process and experienced emotions during wayfinding are extracted from the participants and captured on paper. Multiple focus groups have been conducted in groups of three to four participants. The data revealed that issues during wayfinding arise in three different stages. First, users start their navigation at home and look for a rough estimate of the direction and travel time. Second, the navigation outside where people do not always use digital devices and look for constant confirmation of travel direction. Third, the navigation inside a building. Inside a building, people need confirmation of direction at each moment they need to change direction and also a confirmation that they have arrived at the correct room. These stages, as well as the personal traits of a typical user, are translated into a persona and a scenario.

These two descriptions are used to create a concept design. The solutions comprise of multiple prototypes that together solve the challenges user's' experience during the wayfinding on the TU/e. These prototypes are consistent with the three problem stages. Due to time limitations in this course, only the prototype -for the first stage, wayfinding at home-, is worked out as a low-fidelity prototype and tested with potential users. The received feedback should be incorporated into the next design iteration.

# Chapter 1: Introduction

This is the final document for the course 0HM110 - User Experience Design. It describes the methods of data collection and proposed solutions for the design challenge. The challenge is focused on wayfinding on the TU/e campus.

The TU/e campus comprises of multiple buildings that accommodate multiple rooms. Locations are often indicated with the name of the building, followed by the name/number of the room. However, this information is, according to the design challenge, often not sufficient to find the correct location.

We, as students of the TU/e, have experienced navigation around campus can be difficult. When a new location should be found, finding the building or the room can be a struggle. We, therefore, have an understanding of the problem.

### Wayfinding

Wayfinding is a process that can benefit from the previous knowledge. When a location has been visited before, the user can use this knowledge to locate the destination again. Taking this into account, the users that probably face the most issues navigating are users who have no or very limited experience of navigation on the TU/e campus. These users can be, but are not limited to international students, first year students and people without a recurring purpose to be at the TU/e campus.

It can be argued that the process of wayfinding is modified based on experiences. Inconvenient wayfinding can create modifications of the natural process. Most ideally, these modifications should not be included in the working on the optimization of the process. (International) first year students have been here for only a limited time and have no or limited experience of navigating on the TU/e campus. Modifications to their natural process are limited, which is desirable in our research. We want to improve navigation on TU/e campus itself, not improve the modifications that have already been made in an attempt to improve navigation on campus.

User-centered design (UCD) is a design process that is focused on usability goals, user characteristics, context and user process environment (Henry & Martinson, 2012). The UCD design method has a defined toolbox that contains multiple defined tools in order to analyse, design and evaluate processes. This design challenge is approached using the user centred

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design method. There are three principles of UCD (Henry & Martinson, 2012), that also have been implemented in our design process. The first principle is to have an early focus on the user and tasks. Secondly is doing empirical measurements and the testing of prototypes with actual users. Third is the iterative design process, that implies that space for a complete overhaul of rethink of a design in the prototype phase. The first two principles are implemented in our design process. The third principle, the iterative design, has not been executed given the limited time in the course. The next step is to take the feedback on the user test into account and start to rethink about our product.

### Outline of the report

In the remainder of this report, the process that leads to the prototypes is described. Chapter 2 provides a more detailed background on wayfinding, as well as an overview of the tools that the TU/e already uses to navigate around the campus. Chapter 3 describes the research that has been done to identify the user goals and needs. Chapter 4 focuses on the concrete themes that are identified from the user research data. These themes are described in detail. Chapter 5 is mentioning the user requirements by describing the persona and scenario. Chapter 6 shows the ideas, concepts, prototypes we have for the identified problems. Chapter 7 contains the received reflection and evaluation of the prototype. Chapter 8 describes the limitations and future work on the created work.

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# Chapter 2: Background

### 2.1 Concept of wayfinding

The concept of wayfinding is something that includes many subtopics. Either outdoors or indoors, everybody uses certain techniques of wayfinding to arrive at a specific destination. In this report, the focus of wayfinding is both outdoors and indoors, but only at a restricted area: the TU/e campus.

There are many strategies someone could use while navigating outdoors: one could for example look for signs, look for landmarks, use the position of the sun to deduce where the north is located or use a navigation system to guide him. For indoor navigation, people mostly rely on the way a building is designed or rely strongly on signs (Passini, 1980). Beaumont et al. (1984) studied the major reasons for wayfinding difficulties, which appeared to be the lack of a receptionist to give directions, problems with interior design, problems with signs and difficulties in locating the building and its main entrance. These studies show that people heavily rely on structures around them and try to make sense of them. It also shows that the usage of signs should not be underestimated.

Despite the fact that the TU/e has already tried to improve information around campus for outdoor navigation, it is unknown whether it has resolved the problems people could have while navigating around campus. Next to that, the consistency of the used signs for indoor navigation is low which could result in problems while navigating indoor.

While designing tools for wayfinding, a few things should be taken into consideration: what are the current problems for navigation, what is the audience that will use the navigation tools and can the tools be used by people with (small) disabilities like color blindness, visual impairment or mobility problems.

### 2.2 Existing wayfinding tools on the TU/e Campus

The TU/e provides digital tools and physical tools to help their visitors to find their way on campus. Information about these tools can be found on the TU/e website and is grouped by the user's way of transportation (foot, bike, car).

### Group 9

### Wayfinding on the TU/e campus for international students



Figure 1: Static map of TU/e campus



### Static digital map on the TU/e website - for all visitors

The TU/e provides a digital static map on their official website (Figure 1). The map provides an overview of the buildings and location of departments.

### Visitors on foot

Visitors who travel on the TU/e campus on foot, can use the blue pillars as a guide (Figure 2). The pillars are equipped with a map and names of the buildings. The TU/e explains their system as follows: *The maps indicate where you are and in a circle show the information within a 5-minute walking distance radius. After having walked in the right direction for 5 minutes, the next map indicates the next 5-minute-radius area. You will be guided until you reach the relevant building.* 

### Visitors by bike

Cyclist can use the red pillars on the campus (Figure 2). They indicate the (supervised) bicycle parking spaces and/or bicycle shelters near the building where you need to be.

### 2.3 Mission of TU/e

For developing a new product of solution for the TU/e, it is useful to have some background information about the mission of the TU/e to make sure that the new product is coherent with the products that are available on the TU/e. From the website, the following can be concluded: products of the TU/e should be internationally-oriented, innovative and/or sustainable.

# Chapter 3: User needs research

The challenge of this project is to understand the issues that arise when navigating around the TU/e campus. To accomplish this, user research should be conducted to understand the user process and underlying needs. In order to get to know what problems the target group encounters several different methods could be used.

Observing the participants would be useful to see what users actually do when navigating on TU/e campus, however, we expect that the majority of people does know where they have to go. The people who need help to navigate on campus are hard to find. Additionally, interviewing users would be helpful to get insight in their thought processes, but with this method the contribution of the researcher is relatively big, introducing phenomena such as researcher bias.

Focus groups are very useful to reduce the role of the researcher. They are also very useful in the early stage of development to learn more about the user's problems that the product is supposed to solve (Hassenzahl, 2010). The dynamics of a focus group can lead to a good discussion on the topic, providing valuable insights. We organized focus groups to gather information from the users.

The goal of our focus group was to give people the experience of getting lost on campus just before the focus group and evaluate this experience from start to end during the focus group. Furthermore, we aimed to elaborate with the focus group on previous experiences they had with navigating on campus and a design that could help to smoothen their navigation process.

## 3.1 Method

### 3.1.1 Participants

In total eleven people participated in the focus groups. The eight males and three females had an average age of 26 years. Five of them were occasional visitors of the TU/e and six of them were first year international master students. All participants came by bike or by foot to the focus group. They were contacted via personal connections and we made sure that they were not totally familiar with the buildings on campus.

### 3.1.2 Procedure

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The two sorts of participants were spread as evenly as possible over three focus groups. Each participant received an invitation for joining the focus group for a specific date, 19:00h at a given location. This location was only to make sure that the participants were dispersed over the campus. Together with the invitation, they got the message that the booking system had some issues, so they needed to keep their phone nearby in the case of a change of location. Around ten minutes before the focus group would start, the participants received a text message with a new location which was Metaforum Study Cell F.

If a participant did not reach the destination within twenty minutes after texting, they were called to ask what their current location was. If one of the participants was still too far away, but the others had arrived, the focus group would already start.

In Metaforum Study Cell F, the participants were welcomed to sit down and had a cup of coffee or tea. One of the researchers explained the purpose of the experiment, namely: gathering information on the needs of wayfinding on the university campus. Before the focus group started, all participants had to read and sign the informed consent form (see Appendix C) and complete an individual questionnaire (see Appendix B2) to gather some personal information like age, gender and how well they know the campus. It was explained to the participants that they did not have to answer on all questions if it would make them uncomfortable and were allowed to ask questions at every moment in time.

The focus group consisted of two parts: gathering information about finding their way to Metaforum Study Cell F and gathering information about the ideal navigation tool for the campus.

During the first part, a few open questions were asked to get people thinking about the wayfinding experience they just has. All questions can be found in Appendix A. After a short round of questions, participants were asked to use post-its to describe their experience on a timeline. The timeline had two dimensions. The horizontal axis described time: from the start to reaching the study cell, their destination. The start was something they had to indicate by themselves, this could be for example the preparation at home or from the moment on that they received the change of location. The vertical axis was an indication on how helpful a used navigation tool was.

The participants got ten minutes to write on post-its what navigation tools they used and indicate how useful they were and when they used them. The leader of the focus group looked at all the post-its and would ask in-depth questions about remarkable tools or extreme high or low tools with respect to usefulness.

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After discussing the timeline, the participants were asked to tell about other navigation problems around campus before going to the second part of the focus group.

The second part was about designing a navigation tool which would be ideal. There were no restrictions on the used techniques and they did not have any limitations, like money for example, into account. The idea of this assignment was to discover what the participants regarded most important.

After ten minutes of discussing, the group had to 'pitch' their idea to the focus group leader(s) as a final assignment. This was the end of the focus group and if participants did not have any questions, they were free to leave.

During the focus groups, video and audio recordings were used to save the data and use for analytical purposes. The focus group lasted approximately ninety minutes.

### 3.1.3 Material

The materials used during our focus group were laptops with an online version of the personal questionnaire, a timeline made on paper, different coloured post-its and plain paper for the second assignment. Audio and video recording devices to be able to record and later transcribe all data.

### 3.1.4 Data Collection & Analysis

The results from the online individual questionnaires (Google Form) were used to see what kind of people had participated in the focus group. During the focus groups, the discussion the participants had about their experiences to find the location in Metaforum was recorded with video and audio recorders to save the data. The timeline with the post-its were photographed to store what the participants mentioned. These pictures were later transcribed to form the start of the document with data snippets.

There were audio/video recordings of three focus groups to analyse, and we had six people in our group available to transcribe the data. The data was divided in a way that nobody had to translate his own focus group and two people would translate the same focus group to make sure all useful data was extracted.

After the transcription, we created a document in which all data snippets/quotes that seemed of any importance were summarized. If a few quotes had the same concept, an overarching theme, for example navigation problems, was added. In this way, an overview

was created that summarized all findings. While creating this document, it was also taken into account how many times something seemed like a problem or proved to be helpful for the participants. These data snippets were made bold.

Finally, we looked at the document with all the data snippets and started to re-categorize them on a mind map. From what we had seen up to then, we thought of some themes to start with. Then we looked at the data snippets to see whether it belonged to a theme already, or whether we should add an extra theme. This way a mind map was created (Figure 3) in which some findings had more nodes connected to other findings than others. By doing this, it became obvious that there were multiple stages in wayfinding which all had their own characteristics and possible problems people could run into and different types of aids that could be used.





# Chapter 4: User Research Findings

### 4.1 Themes / Insights

The thematic analysis was used to identify, analyse and report patterns within the data. With these patterns we were able to get an overview of the data that could be used to design a product. Themes represent the most important and recurring bits of the data in relation to the design challenge. To create the themes, data that was gathered in our focus groups was transcribed. After the transcription, recurring findings and interesting relationships were identified and grouped in themes.

### 4.1.1 Stages of navigation

While navigating to the TU/e campus there are different stages of navigation, namely: at home, outdoor and indoor. Users like to look up their destination when they are at home, they navigate when they are on campus to find a building and also when they are inside a building they need to navigate to find a particular room.

At home, the users look up for the location that they have to go to. "When I'm at home I usually google the location". Also the users want to be well prepared on where they want to go before they leave home, "I was asked to go to LvA, I didn't know what it was or where it was, I Googled and found the lab of acoustics. Found a link to the lab of acoustics in the TU/e website", these quotes show that the users would like to make themselves familiar with the location where they have to be by either looking for it on the TU/e website or they google the location.

The second stage of navigation is when the users are on the campus. They then navigate to find a particular building on the campus. "I came by bike, so I used a static map that was on the campus to find the building" "I found a campus map when I entered the campus, so I used it to locate Metaforum" "When I am on campus I use my phone as a main navigation tool to find the building, because there are no signs to guide me to a particular building". This stage of navigation is not only to locate the right building but also to make sure that the participant was heading to the right building, as becomes obvious from the following quote: "I

used the ground map to find the building, after a while I found another map so I used it to recheck if I was heading to the right place".

Once the users have located the building, they need to find the room they have to go to, which is the third stage of navigation. For navigating inside the building the participants of the focus groups used the signs available inside the building, the floor plan of the building, asked the receptionist and also asked people in the building for information about where the room was. *"I asked the receptionist and found the floor where the room was at, then I didn't find the room so a senior guided to find the Study cell F" "I looked for signs to guide me to find the Study Cell F" "I once had to go to a room in the Vertigo building, I looked for signs and the floor plan, but the information was terrible" "I usually look for signs, but when I have no time I simply ask people to help me get to the room". From this data in the focus groups, it is evident that the users also faced difficulties in navigating inside a building.* 

### 4.1.2 Information in the environment

A part of the information that is needed to navigate around the TU/e campus, has to do with features that are inherent to the environment. The structure of the campus and the naming of buildings all around could be informative and helpful in the navigation process of users. With the help of these features a solid basis for navigation could be laid.

Also, the layout of buildings in TU/e campus were considered to be unstructured. One participant "expected the TU/e to serve him. He doesn't feel like downloading an app because he expects to see it when he enters (customer serve thing). The campus has to guide him." The structure should be easy to comprehend to guide the user in navigating. When talking about solutions in one of the focus group the idea "that the campus itself can be a solution" came up. The participants explained this by telling that by applying for instance a grid over the area and giving the building names that are coherent with the grid navigation would be a lot easier. Additionally, the participants had problems to find a bike shed or parking area close to their destination building: "The building wasn't a problem. But had to look for where to park the bike." and "I don't know where to park because I want to park at a lot which is close to the building and I don't know which building I have to go to". When applying this structured grid also bike sheds and parking areas coherent with the logic of the grid and the building, these problems could also be overcome.

Furthermore, every building is structured differently and makes use of different principles to name the rooms. People who come to the TU/e campus are given information on where they

have to be, for example MF 15, IPO 1.26, etc. The information given normally contains the building name, floor number and room name/number. Some participants used maps to find these locations, but they often encountered problems when trying to find their destination. This happened because the information of locations given to the user can be obscure or illogical at times. For example, people cannot decipher much information out of locations like MF Study Cell F, LvA, Gemini A308, especially if they are new in the campus. Nevertheless, the regular visitors of TU/e were also confused with the location of MF Study Cell F. One participant found the rooms *"hard to find since most of the room descriptions make no sense.* 3.03 is logical, since it is floor three and then just find, but Study Cell F doesn't mean anything". Both of the groups had difficulties in locating the exact room or the building in the map because they do not know what an abbreviation, for example MF Study Cell F, stands for.

We could conclude that the users sought a structure in both the building and the rooms in the buildings. Navigation on the TU/e could be more straightforward by applying logic in the layout and naming on campus.

### 4.1.3 Navigation aids

When navigating around the campus, participants depend on different tools that help them to find the location where they need to be. These tools, or navigation aids, are pieces of information that either carried around, find in the navigation process or which present themselves as cues in the environment (e.g. a familiar building or landmark). The usability level of any navigation aid influences the choice for a specific aid. This usability level of aid can be supported by the following factors: the aid should be stand out in the environment, lucid and confirmative, and the familiarity of participants to choose the chosen aid.

When the participants have no previous experience, guiding information will have to be deducted from the environment. Upon searching for this information, our participants noted that several signs were not salient or completely unavailable although we know there is information present. This indicates that participants completely missed the information that should guide them where to go: "*It would have been nice if there were some visible signs on the streets or in the buildings which told me where to go*". Even if there is some information present, it sometimes is difficult to locate the room because the signs do not stand out enough. There is a need for salient information and signs to guide the users.

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Additionally, some signs miss the information that is required. When the participants try to find their way to a building using signs available on the TU/e campus, they experience difficulties because all information written on all signs outside are the street names, while the information given to them is often only a building name or even the abbreviation of the building name. Participants mentioned that "Street signing was not useful for finding a building. Sign should say 'MF' instead of 'De Rondom', etc." and "Street names are not helpful for a first-time visitor. Street names do not resemble the names of the buildings." The information that is already available at the TU/e campus does not provide what the participants needed, it should be lucid and helpful in the process to help the user during their navigation process.

Furthermore, when navigating around the campus, people tend to search for confirmation of their current position and heading. Nearly any object which makes either the current position, heading or the objects surrounding the user clear (and thus giving the user information to localize itself) will help in the process of gaining confirmation that they are heading in the right direction: *"When I was close to the destination I used another aid to be sure that I was in the correct place."* Another participant indicated that *"Google Maps is better for finding your way because of the confirmation you get with real-time navigation"*. When they think that they have arrived, they wanted to be reassured of the fact that they have arrived at the correct building: *"Confirmation for the right buildings by having visible building names on the building's."* This need for confirmation should be kept in mind be designing where the navigation aid should be placed and what information is on the aid.

Finally, people showed the tendency to use aids that they are familiar with. The participants like to use aids they have used successfully in the past for a similar challenge. The participants know how to use them and trust these aids. For example, Google maps<sup>1</sup> and Here maps<sup>2</sup> are applications that were often used by the participants of the focus groups. One participant mentioned: *"Usually I Google the location"*. Another participant described the start of his search by the following sentences: *"Didn't know the Lab of acoustics. Googled the lab of acoustics. Found a link to the lab of acoustics in the TU/e website"*. According to the participants, Google and Here maps are usable aids to navigate around the campus. Another example is that some participants entered the name of the destination into the Google search

<sup>&</sup>lt;sup>1</sup> Google Maps is an online maps service of Google Inc. and can be used to search for locations.

<sup>&</sup>lt;sup>2</sup> Here WeGo is an online maps service of HERE Global B.V. and can be used to search for locations.

engine<sup>3</sup>. Based on the data given by the participants, it can be concluded that people prefer applications that are used in a different context, but serve the same goal.

### 4.1.4 Chosen aid

There are many navigation aids that help people to navigate to a place. The participants from the focus groups used different aids: Google maps, Here maps, static maps on the campus, signs boards on campus etc. There are many factors which determine what aid people choose to use to help them get to their destination.

When navigating on the TU/e campus time and the current location play a vital role when a user is deciding which aid to use. Any user who needs to be on campus will have a specific time that he/she has to be there. You can divide these factors while navigating in two phases: your preparation phase and the navigating phase itself. In the preparation phase, a person already uses navigation aids (like Google maps) before leaving home. "I want to be on time so I search on forehand where I need to go, I Google it. If I do not find it, I meet up with somebody and search together". The user chooses his preferred time to leave depending on how far he is from the destination, the time he expects to need for travelling there and the time he wants to be there before the meeting time. Then, when arriving on the TU/e campus, phase two begins. Now, the user has several different navigation aids to choose from to find their way. Some people what to figure out how to get to destination themselves and start to look for signs. "I want to be autonomous and find it myself, so I first search for signs, if I cannot find these I look at a map and if that also does not help me I will ask someone." Maps could help to gain insight into the structure of the area or building, but one of that participants mentioned that "he did not want to look for a map when in a hurry." Searching the internet for information would be the next step for some people and asking others to find the location is often seen as a last option when time is running out.

Also, the chosen aids are also determined by the social costs the users are willing to pay and expected benefits from the chosen aid. The following quotes: "I didn't want to seem stupid to ask someone how to get to this room" "I want to be autonomous and find the way by myself" "I don't want to be late even if it is a small meeting like this, so I looked up the location when I was at home" all indicate that the users may try to avoid social embarrassment of asking someone or being late at a location. The benefits (clear directions that help the users to get to a destination) also determine what aids they prefer to use "I was running late, so I didn't want to waste time looking at a map, but I just asked someone." "I

<sup>&</sup>lt;sup>3</sup> Google is used as a reference to a web search engine of Google Inc.

ask people, especially when I do not have the time, when I am really lost/don't know where to go, or when the signs do not tell me what I need. When Google didn't give me the right location, I just asked people.". The personality of a user is also a factor which determines which aid a person chooses to use. There are users who want to be self-sufficient, autonomous and time efficient as follows from the following quotes: "Didn't want to disturb you guys and didn't want to sound stupid that I didn't locate the room so I tried finding the room by myself." "I didn't want to waste time here, so I looked at the map on the website to locate the place". Apart from these personalities there are of course also people who appreciate the social contact of asking others.

### 4.2 Persona

### 4.2.1 Persona Creation

It is possible to have more than one user type relevant to the subject: "navigation on the TU/e campus", but from the participants in our focus groups, we could identify two main user groups: first time visitors and first year international students. The persona that we decided to focus on is a first year international student who faces challenges in navigating in the campus because he is not familiar with the campus yet. The common challenges faced by an international student can be inferred from the following quotes: "New to the country and new to the campus. I want to know where to go to, to be able to make a estimation of how much time it will take me.", "In India you don't have to go different buildings for classes. All the classes are in the same building", "Also the name of the buildings and few maps on campus are in Dutch" and "People get confused with similar names of different buildings".

Their patterns to use the available aids includes using digital maps like Google Maps: "Usually I google the location." and asking for help to another person: "couldn't find the Study Cell, so I asked people where the Study cell F is at". Their characteristics included being self-sufficient: "Didn't want to disturb you guys and didn't want to sound stupid that I didn't locate the room.", being time efficient by looking up a map beforehand: "We looked at a map on the website", looked for signs and need confirmation of where they were: "No name on the building to confirm that it is the right building."

After comparing the data of the two types of users from the focus groups, it was certain that these users encountered common problems, shared common traits, used and looked for similar kind of navigational aids. For instance, both the user groups had difficulties in locating the *MF Study Cell F*, because they were not familiar with the structure of the building. Also the users from both the groups looked up a map beforehand and when they still did not find the location they looked for signs or asked someone to help them find the location. Even

though the first year students were on the campus for a month already, they only knew the buildings they visited during the introduction week or the buildings they have had lectures in. Hence they were almost as clueless as the first time visitors when they needed to find a new location on campus. Both the groups preferred to be self-sufficient and looked for confirmations to guide them during the process of navigation.

Looking at the commonalities both the user types shared, it is clear that they did not differ much from each other. This is mainly because both the user types are not familiar with the campus. The first year International students encounter challenges in finding new locations on the campus on a daily basis given the time constraints to be at a lecture hall or an exam hall and are therefore more suitable for the persona. Hence the resulting persona is a first year international student, whose traits and needs almost match with those of the first time visitors.

The main characteristics we used in our persona were traits such as: slightly introverted, being autonomous and having the tendency to be initiatory. We think that these three traits are characteristics which differ within many people, so it really can define a specific group. In the persona, we also included navigation goals, navigation challenges, a short bio, preferred aids for outdoor navigation and preferred aids for indoor navigation. We chose to leave out information about emotions in the persona description felt during navigating and/or finding the destination because these vary too much between persons to assign to a persona.

Figure 4: Persona, Rahul



# <u>"I want to</u> find the way on my own'

# Work: First-year internation master Age: 21

Location: Eindhoven, the Netherlands dependent on other people. He would people for help immediately. When he initiative rather than sitting around and Family: Unmarried, in a relationship like it most if he can finish tasks by himself and does not want to ask Character: Rahul is an introvert person who does not like to be is with friends, he usually takes student at TU/e



vaiting.



Apathy

Social	
Punctual	
Self-sufficiënt	

# Navigation goals

- He does not want to let people down in appointments.
  - He wants to be at the destination five minutes earlier.
- He wants to know the location on forehand by looking it up online so he will be time-efficient.
- Wants to find the way by himself, but would ask people as last resort

# Navigation challenges

He encounters challenges if...

- he does not get confirmation if he is going in the right direction
- he does not get confirmation if he arrived at the right location
- the street signs do not include building names
  - the name of a location is not self-explanatory
- he has to navigate to buildings on the campus he has never visited before
  - he only gets an abbreviation of the location
- the aids on campus do not facilitate his navigation process

# Bio

Rahul is a first year HTI student from India and is now studying at TU/e in the familiar with navigating inside the campus. Also, he only knows the buildings he confounded with Dutch abbreviations. Rahul always looks up at the location using campus on the maps, he is dissatisfied. He wants to be punctual and self-reliant all Netherlands. He had to leave his family and still miss them a lot. He already has made a few friends which he meets during lectures. Just as in India, he rides a bike to the campus everyday. This is his first month at the campus and he is still not visited during the introduction week like Metaforum and Auditorium. Rahul is not amiliar with the naming of the other buildings and their abbreviations, he is still Soogle Maps before he leaves home. Due to the lack of information about the he time and hence he looks for confirmations, like signs to make sure that he is at the right place.



### 4.2.2 Persona Description

# Chapter 5: **Requirements**

### 5.1 Introduction

The scenario describes the functional requirements of the system. It provides information about the time and context where the system is used as well as the required information that the user should receive. The most important findings from the focus groups are included in the scenario. The scenario is chosen in a way that it follows from our data. and fits in the context. To support this, data snippets of the focus group are included in the text.

In the remainder of the chapter, the process that leads to the functional requirements is described. First a shortened overview of the data that is included in the scenario is provided. Please note that the provided data is a shortened version of the all the data included in the scenario. Please see Appendix B1 for a complete overview of the data. Secondly, the scenario is described. Third, the goals that follow from the scenario are described.

### 5.2 Data translation

Most of the participants usually google the location. "We looked at the website on a map." "It is very important that I should be there on time " "I always search on the forehand and otherwise meet up with somebody and search together." These quotes imply that participants try to prepare well before coming to the campus. They gather information about the destination before the start of the journey. They gather their information from digital (like google maps), as well as analogue sources (physical maps).

*"It was already getting late, hence I didn't want to look into the map or look for signs and find out where the room is at.".* This claim emphasizes the need for salient information. Furthermore, the information that is given should be unambiguous and clear.

The following quotes "When I was close to the destination I used another one to be sure that I was in the correct place." and "real-time navigation instead of confirming along the way through tangible maps. With real-time you get confirmation every time." teach us that the students desire to get confirmation during their navigation. Therefore, this is facilitated in the scenario. Begin reassured of the right building and a way to find the entrance were important struggles for our participants and will be solved in the scenario. Many participants noted that there was "no name on the building, so no confirmation that it is the building I am looking for." "When I finally was at the staircase I thought this must be it, in front of this staircase I was looking for a sign of confirmation." The participants were looking for confirmation that they had arrived at the correct building. Next, they looked for more information on where they could find the (main) entrance: "To locate the entrance of the building I need some sign that shows the way to the entrance."

Once the students arrive inside, the quest is not over yet and therefore this part is also included in the scenario. The students find that *"mentioning the floor number would be helpful."* Furthermore, the students *"felt stupid walking past people again and again"* so they would want to be able to quickly figure out where to go themselves.

Multiple scenarios that take the above mentioned items into account are imaginable. Most participants start the navigation activities at home. Therefore, the chosen scenario starts at home and include the aspects that often occur when navigating your way to a location on campus. One of the most important reasons to select this scenario is that it frequently occurs to a large group of people during their study period, which is reflected in our persona. This indicates that the created solution has a large target audience and works in a situation that occurs regularly.

### 5.3 Scenario

It is Sunday, 20.00h, November 13th as Rahul opens his laptop in his student room in central Eindhoven. As the bright blue light hits his face he looks concerned at his screen. "Let's see where I have to go tomorrow for lecture" he mumbles. "TR.Dorg.Zaal, where is that...". He would like to have an indication where this location is, so he can make an estimation of the time it takes to get to the destination. He looks up the abbreviation and finds the full name of the building and gets a clear indication of the location. He feels confident that he will be able to find the location tomorrow. Rahul then shuts down his laptop and sets his alarm clock a little earlier than usual. He does this to compensate for any unexpected delays. Last time he was a little late in class and even though the lecturers at home didn't mind that much, here in The Netherlands they expected the students to be on time.

It is 8:00 AM as his cell phone produces the most annoying sound Rahul could ever imagine. He swiftly gathers some breakfast, hops in for a quick shower and takes his bike from the shed at 8:20 sharp. After a bike ride of about fifteen minutes he arrives at the campus. While he merely avoids a collision on the limbo path with another student he sees several buildings that he remembers from the introduction week: Auditorium and Metaforum. "It is hard to identify where you are allowed to cycle on the TU/e campus", he thinks. He makes a right turn passing the construction site and then behind Metaforum. "Euh.. Was this the right way?", he thinks puzzled by the odd view. He scans the environment and finds the confirmation of the direction he has to go to find the building he is looking for.

Upon arrival, he parks his bike at the first bike shed in front of the cars. He gets a quick confirmation that this is the correct building and where he needs to enter the building. This confirmation gives Rahul a satisfied feeling. "Yes, I am in time and found it smoothly" However, as he enters the building he realizes he still needs to find the correct room. Luckily, the provided information gives him a very quick indication where he needs to go. The information is lucid and provided at every point he needs to change direction. He is able to find the location quickly and without mistake. He arrives at the classroom and is in a relaxed state, because he was able to find the location before the lecture starts.

### 5.4 Requirements from scenario

From the scenario it is clarified that the problem comprises of three sub-problems. This split is made because both sub-problems occur at different moments and serve different goals.

The first stage of the wayfinding process start outside the campus. Our persona, created from our target group data, starts at home and has an internet device at his disposal. Here, the persona has his first interaction with the system and the first goal.

Requirement: The user finds the information by using a search engine. This will direct to the internet pages that contain the information needed. With this information the user should learn where he has to go to be able to make a rough estimation of his time of departure.

The second stage of the process during wayfinding is the process while traveling on the TU/e campus. Here, the persona as continues interactions with the system.

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Requirement: While traveling on campus, information is provided frequently (on every point that a choice has to be made to confirm the user that his travel direction is correct.

Requirement: When arriving at the building, confirmatory information is provided on what building the user has arrived.

The final stage of the process starts when the user enters the building.

Requirement: When entering the building information should be provided to enable the user to quickly decide which direction to go for his desired location.

Requirement: Along the way the user is continuously guided to his destination.

Requirement: The user is confirmed to be at the correct location when he arrives there.

The designed system should treat these multiple problems as one in order to solve the navigation process. Chapter 6 translates the described user goals into concrete concepts.

# Chapter 6: Ideation

The ideation phase elaborates on the design process from requirements to concept, which leads to the prototype. We created three different concepts, of which one was used to design a prototype. In the remainder of this chapter, we will elaborate on these three different concepts and the developed prototype.

### 6.1 Concept Development

Referring to the requirements section, our users have difficulties navigating within three stages of navigation. Which are:

**1) At home**, specifically finding the location of the meeting based on abbreviations, incongruent or odd naming of locations. This stage can be divided in two subsections, namely: finding information needed (i.e. actual building name) and the location of the building itself.

**2) On campus (outdoor)**, people looked for indications around them where they had to go. The stage is characterized by confirmation seeking. The user wants confirmation that they are on the right track and confirmation when they have arrived at the building.

**3) On campus (indoor),** the problems from outdoor on campus recurred. First thing people do is look for information that shows how the building is structured to get a rough idea of where to go. Then, along their way more information is required and again confirmation is sought. When arriving at the destination, they looked for confirmation that the navigation task is completed.

In a brainstorm session, the three main stages of navigation and their main requirement have been noted down and possible solutions were created. All solutions are categorized near the stage that it belonged to. After we could think of no new solutions any longer, we explained all solutions briefly and evaluated their feasibility. All solutions that required renaming of streets, buildings and rooms were dropped as those would mainly cause more confusion and less coherence in communication, which was already a pitfall in the current navigation.



Figure 5: Brainstorming for concepts

After this evaluation, some redundant solutions remained for every stage. As there are already many navigation tools on campus, we decided that we wanted to focus on improving these instead of introducing additional aids. We looked at the requirements of the solution for every stage once more and determined that the following set of solutions would cover the challenges encountered by our persona during the scenario:

1. Online map that is easily found through an online search engine (e.g. Google) explaining abbreviations etc. and showing the location of the building (Figure 6).



2. Building names on the navigation aids on campus (instead of street names) and salient/lucid name of the building on the building (Figures 7 & 8).



Figure 8: Concept #2 - Salient building signs



Figure 7: Concept #2 - Changed signs

3. Overview of building (rooms/structure) at entrance, from which coloured / patterned lines depart to the different rooms in the building and salient/lucid names of the room at the entrance of each room (Figures 9,10 & 11).



Figure 11: Concept #3 - Coloured room signs



Figure 9: Concept #3 - Coloured routes



Figure 10: Concept #3 -Coloured routes

# 6.2 Design Concept

As described above we identified solutions for every stage solving the current problems. We decided to focus on the 'at home'-phase of navigating as this is the start, and thereby also the baseline level, for the experience. We aim to make navigating a better, more pleasant experience and we believe that within the navigation process the most gain can be achieved with minimal effort in this stage. Additionally, by offering a solution for the problems in the starting phase of navigation, the challenges in the other stages may also be affected. Evaluation of this first concept will lead to a conclusion on what to do for the other stages of navigating.

The solution for the troubles experienced at home is twofold. Whenever users receive an unknown location for their meeting, they tend to use an online search engine to find where they have to go. The first element of our solution would thus be that every search for a location (in the form of an abbreviation) should immediately lead the user to the TU/e map we designed. Our main focus, however, is on the second element of the solution: an improved version of current online maps provided by the TU/e.

Within online searches the user is greatly dependent on information provided (in text) on the map (e.g. PDF), the webpage and the name under which the document is saved on the website. These pieces of information are gathered (crawled) by search engines. Upon querying in a search engine the algorithm behind the engine decides upon the information to view from their gathered information. By creating a map in HTML5 instead of a static map, we will greatly improve the amount of crawlable information. Furthermore, by making a dynamic map in HTML5, we improve the updatability of the map, since separate static versions of the map will become obsolete swiftly. However, since only the final product will be programmed in HTML5, we cannot test this before final production. The application is interactive and the maps are programmed in HTML5.

The second element of the solution is a part that can be prototyped and tested: it is the information provided upon the map itself. The user should be provided with all the desired information. When opening the application, immediately a high quality TU/e map is shown. In a search bar the user can enter the building name, the abbreviation or the department/faculty. Using this information, the application recognizes which building the user is looking for and highlights this building, shows the entrance and the full building name and street address. Furthermore, the map gives the user the option to look at the indoor floor plans to help them orientate where they have to go. Any other information, such as opening times, services, location of nearby parking places / bike racks can be added to the map as well.

### 6.3 Prototype

The purpose of our prototype is to observe the user's interaction with the interface and try to find out what information is useful to show and what information is redundant. Users will experience the new map by searching for different buildings and see what kind of information is given instantly and which information could be seen by clicking a 'read more' tag.

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The appropriate prototype for this is a mock up, which will be programmed for use on a computer. The most important aspect of our prototype that users find it intuitive to use. Because of this we chose to use Axure, a program to create, among others, mock-ups. The prototype is programmed in this environment to be interactive and respond to the user's input. Users can experience the desired interaction and evaluate upon this. However, it should be noted that this prototype will be of low-fidelity. This is done to prevent the user from thinking that the test setup is a finished product during the test and encourage people to give feedback on the lay-out or the usages of the prototype.

Additionally, we think it is important to see whether the supplied information fulfils the need of the users. We do not want to supply the user with an overload of information, but we aim to allow the user to use the map to quickly find all the desired information in one overview. For this reason we chose to include the information we think, based on our focus groups, persona and scenario, are important to see in one glance and include the rest of the information under a 'read more' tag. Information showed immediately is the name of the building, the address, opening hours and the place of the building on the map together with the closest bike racks. Especially having the building accentuated in the map will resolve the biggest problem people have. After you clicked the 'read more' tag, people will be able to see all facilities which are located in the building. This might give people confirmation that they found the right building. Next to the facilities, people will also be able to see the floor map of the specific building. This gives them the opportunity to check beforehand where the specific room is they have to go to.

In the following screenshots, the prototype is demonstrated. It shows the application after landing on the homepage and during the search for a building. After enter is pressed, the building is highlighted and has some information on the side (Figure 12). The second figure, (Figure 13), shows the information shown after clicking the 'read more' tag.



Figure 12: Prototype of digital map (searching for Metaforum)



Figure 13: Prototype of digital map (more info selected)

# Chapter 7: Evaluation/Feedback

The purpose of evaluating our prototype is to observe how the user interacts with the prototype and find out what information was useful and what could be done to improve the usability of the product. These insights could be collected to be used in the second iteration of the prototype. The prototype of the static HTML5 map that we created using Axure, was shown to a group of users to obtain their feedback, this chapter will elaborate on the process of how we evaluated and obtained feedback on the prototype created.

### 7.1 Feedback

The prototype is tested in the focus group with participants of first year international students. The purpose of the focus group is to get more insight about the usability of the prototype map. This section elaborates on how the we received the feedback from the users.

### 7.1.1 Participants

The participants were four first year international students living in Aurora building on the TU/e campus. The users consisted of international students as they reflect the user type from our persona. They were contacted via personal connections.

### 7.1.2 Procedure

We conducted a focus group with four users, the users gathered at one of the user's apartment in the Aurora building. We then showed the prototype to the users, they were asked to search for different buildings (Metaforum, Helix, Flux) based on the information they have. The researchers informed the users that they can also enter the abbreviations of the building in the prototype.

Once all the users tested the prototype, they were asked to provide feedback on what they thought about the prototype. The users provided insights on what could be added to the prototype so that the product will be more usable to them. The data from the users are audio recorded and collected for evaluation which will be followed by the second iteration.

### 7.1.3 Data collection

During the user testing, the participants were recorded with an audio recorder to document the process of the testing and the data. After they finished with the testing, they were asked to explain their experience about the prototype. The discussion about the prototype recorded is used to be analysed. The data from each focus group is transcribed into text by the researchers and saved into separate documents (see Appendix D).

After the transcription, we summarized all of the data that have the same concepts/categories. The purpose is to find the common insights about the prototype. Based on the data snippets, we had a clear idea about what participants experienced during the user testing and their thought about to improve the usability of the prototype.

### 7.2 Evaluation of the feedback

The sole purpose of user testing was to obtain feedback from the users. The feedback is evaluated to obtain insights on what the users thought about the prototype, what they wanted from the product, what they thought could be done to improve the usability of the product, from the prototype that was presented to them. We evaluate the feedback from the users to know what we can further do to improve the system (the static HTML map) as a whole and how the users interact with the system. This section consists of a thorough analysis of the data that was collected from the users and the insights that we obtained which we could use for the second iteration of the prototype.

### 7.2.1 Data Analysis

From the data we obtained when we tested the prototype in a focus group, we received a good amount of feedback from the users. When the users were introduced to the prototype, they had to figure out what to do with the system. The prototype had a search box in which they could enter abbreviations of the building and the details of the building shows up. The users tested the prototype for Metaforum(MF) and Helix(STA). After entering the search keywords, the Metaforum building was highlighted in blue and parking was highlighted in red, the users at first were sceptical about the spot highlighted in red "*What is that thing highlighted in red?*" "If you make the building in red and the parking in blue it would be better, because the blue merges with the background and I want the building to be more visible"

The users felt that indication to the entrance of the building was missing, "*The entrance to Metaforum is in the centre, if you indicate the entrance in the map, it would be very useful*". The users were happy with the additional information that is available about the building like the opening hours and facilities and the floor plan of the building provided in the prototype.

But they thought that there could be an indication about how to get to the destination, and the users came up with suggestions regarding how they want the product to help them in their navigation process. For instance they had ideas like, "*If you make the address clickable which will maybe go to google maps, that would be really helpful*", "*If you can highlight the shortest path to the building from the entrances, it could help us get to the place quickly*", "*I live in the campus, so it doesn't matter where I come from, but if I live outside the campus there could be an option which I could select so I get instructions on how to get to their destination.* 

The users thought that the static map is a great aid to find additional information about the building, but they wanted additional features which will help them navigate in the campus as well, for instance "I live in the Aurora and I need to get to MF from here, I wouldn't know how to get to MF since Aurora isn't marked in the map", with feedback like this we know that the users look for an instruction to get to their destination from their current location. Also they wanted features like "If I type in cosmos or a study cell, I would like the map of MF to show up" So I don't have to search where these facilities are at.

### 7.2.2. Insights

From the focus group we conducted to test the prototype, we received quite an amount of feedback that may be used in the second iteration of the prototype. Firstly, the users thought that it was a great aid that the abbreviations led to the building map, which is a common problem that most of users faced in the focus group, that the buildings in TU/e have weird abbreviations. Secondly, they wanted the building to be highlighted in a brighter colour and they wanted us to indicate where the entrance of the building is located at. Also, the users wanted a High resolution map of the campus and a visible floorplan that they can use to navigate in the campus.

The users thought that if the map could guide them to get to the highlighted building with a list of instructions from their current location, it would be great. They thought that if they use the map at home, they would want to know the route to the destination, so either a clickable link of the address which leads to google maps or highlighting the path from the entrances of TU/e would be a great aid.

Thus these insights/feedback from the users on the prototype that we created should be used to improve the usability of the product in the second iteration of user testing.

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# Chapter 8: Discussion & Conclusion

As was described until now in this document we've investigated into the matter of wayfinding on the campus of Eindhoven University of Technology. During this process we encountered multiple iterations in which we gathered data regarding the users of this campus. Through focus groups we decided on recurring themes and connections between. Data provided by other research groups was used to reaffirm these beliefs leading to the creation of a persona: Rahul. For this persona a hypothetical scenario was created in which key moments in time and place -as described by our users- were pinpointed. Then several prototypes were created to resolve issues at these key moments. To check these prototypes several new users were invited to user test these prototypes.

### 8.1 Reflection & Limitations

The observer-expectancy effect is maybe one of the most challenging biases which anyone can encounter in a quantitative research design. Especially when working with focus groups, one is often challenged with the level of influence that should be exerted on a group of users. When offering too much information the researcher might end up influencing the group's opinion. Whilst offering too little context or information might turn the user group into a group of staring people without any clue on how to proceed. We found out that the answer lies -as often is- somewhere in the middle. By reviewing focus group data from the previous day the new focus group "leaders" would know more accurately at what points to intervene and at what points to take a step back in the discussions. Also we observed that as the users get more comfortable with their role as "experts" on wayfinding well-funded answers increase and elaborations get more vivid. In our focus group setup, we incorporated a small task which intentionally allowed participants to get lost. This proved beneficial to the focus groups as participant had great call-back of their experiences during these tasks. However, when asked for other experiences of wayfinding responses were confounded to the more extreme scenario's. A limitation that should be noted is the location of the focus groups. Since finding the location was part of the task presented to the participants, the location (MF Study Cell F) was an important factor. This location was not described well nor representative for navigation on campus. This influences the answers given by the participants during the focus group.

The choice for focus groups as a method of data gathering was next to a professional one, also a personal one. Where it is rather common to choose for a more structured approach such as structured interviews, surveys and structured observations this does limit the information gathered regarding the wayfinding process to just the questions and/or observations counted. Whilst the environment of a focus group allows for an interactive setup in which new relevant areas to your research can be taken into account on the fly. However, by choosing for focus groups we had to accept that the amount of information gathered from three focus groups would be unknown until the data was actually gathered. Whereas choosing for a more structured approach allows for general insights and sometimes even data analysis to determine the number of participants needed. After focus group number three and transcribing most of our sessions we however guickly found out that three focus groups with three - four participants each was quite enough. We reached a point of data saturation, determining the point in which we encountered the same observations multiple times. The participants gathered for these focus groups proved to be quite diverse, including: cultural differences (Dutch, Indian & Indonesian), age differences (18-57 years, M=26, SD=10.5) and different visitor types (general visitor = five, student = six). Recruiting was done by asking for participants in Facebook groups for first year students, asking international students from the Aurora building and asking friends with no previous history of employment to the university. If, however we needed more participants we should note that these resources of participants are not unlimited and other sources should be considered as well.

When creating a persona, it becomes fairly easy to fall back to your own experiences to use for descriptions. This part of the process proved to be a nice point to create a personality that matched up with the data. By constantly asking ourselves whether the characteristic or personality trait from our persona was actually based on data, we forced ourselves to look deeper at the characteristics that defined the described behaviour during the focus groups. Descriptions such as: wanting to be capable of finding a location by yourself swiftly got transcribed to a desire of self-sufficiency. However, some characteristics took quite a bit more discussion (e.g. the feeling of stupidity when not being capable of finding a location).

Upon completion of our persona: "Rahul", a scenario was next up. After all we needed to find out where exactly it was that we needed to intervene in the wayfinding process. Writing about everything that is or can go wrong during a navigation task on campus was a nice task. However, we found out that by writing a scenario mainly based on everything that went wrong we could not clearly indicate where we would want to improve the process. Therefore, we rewrote the scenario to state not what is currently wrong, but have the focus on how the

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wayfinding process should (within reason) look like. This proved to be really helpful, since along the lines of our scenario requirements for possible prototypes almost naturally followed. Here we found out that to solve all the hurdles that our data showed we would need to divide the prototypes into three sections namely: pre-navigation (planning & informing), navigation on site (outdoor), navigation on site (indoor).

Whilst prototyping we choose to go for the efficient approach. Split up the team into three sub-groups each working on their own prototype design. However, as time constraints catch up quite swiftly, the time to actually build a prototype decreased drastically. An intervention was due, so we met up and discussed the prototyping ideas and tried to see which prototypes matched well with our requirements. We figured that most problems exist because the user needs some form of confirmation which building is the right one. There are already several tools present on the campus to help improve the wayfinding experience which could be validated and improved upon as well. The maximum effect for a user such as Rahul could be gained in providing information on the location of certain rooms and/or buildings. Thus we choose to go for the first stage: pre-navigation (planning & informing) and made a prototype to dynamically provide information regarding buildings and locations on campus. This prototype would be updatable, thus keeping the information at one place. However, the other findings from our research should not go to waste. When our prototype would come into production another iteration of research should be done to see whether challenges in other wayfinding stages still exist. More on this in the following section. The prototype that we eventually build to test with users was a high-fidelity prototype on which a user could follow scenario's which we would user test. Choosing for a high-fidelity prototype is probably not the best choice in this stage since feedback is often withheld when the product looks near-to-finished. However, as this would be the last assignment within our project group we did want to make a well-designed last prototype.

### 8.2 Next Steps/ Future Work

When designing a product based on a human-centred perspective, one should always keep in mind how the user uses the product. In this process designing a product that fits perfectly to the needs of the user in one iteration is near to impossible. Therefore, multiple design iterations are very important and useful for verifying the workings or your prototype. To do so one might consider a wide range of methods, such as: focus groups, failure analysis, extreme scenario's, paper prototyping and many others. After taken the new considerations into the design the final product can be tested with a high fidelity prototype. Typically, one would use these prototypes very closely to the actual build of the product, this since

participants often consider a visually appealing prototype as a finished product. This often lowers the amount of feedback given on the product since either the user feels like it might be too critical for the stage of the product or the focus is transferred to design trivia instead of true interaction problems.

After making such a proof-of-concept the product can go into production after which another iteration should be used to test whether the product is truly used as was planned. If the problems with wayfinding still exist in this phase, the product might need some final adjustments. If the product proofs to work, other stages of the wayfinding process might be addressed with other prototypes as well, however the dynamics of the wayfinding process could be altered quite a bit with the new design. Having a new focus group session after the users tried the new changes in the wayfinding process would therefore be a good idea. Unfortunately, the other side is also possible: the design could in theory work brilliantly whilst in practice it does not work as planned. Adding for example unnecessary confusion to the process. If this happens the flexibility of human-centred designing allows for the designers to take a step back and do another iteration. All these factors combined make that the human-centred design approach is one of the more powerful tools that designers can use nowadays.

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# **Appendices**

### Appendix A: Discussion Guide Focus Group

### A1. Theoretical reasoning

The challenge is to understand the issues that arise when navigating around the TU/e campus. To accomplish this, user research should be conducted to understand the user process and underlying needs.

Wayfinding is a process that can benefit from previous knowledge. When a location has been visited previously, the user can use this knowledge to locate the destination again. Taking this into account, the users that probably face the most issues navigating are users who have no or very limited experience of navigation on the TU/e campus. These users can be, but are not limited to international students, first year students and people without a recurring purpose to be at the TU/e campus.

It can be argued that the process of wayfinding is modified based on experiences. Inconvenient wayfinding can create modifications of the natural process. Most ideally, these modifications should not be included in the working on the optimization of the process. (International) first year students have been here for only a limited time and have no or limited experience of navigating on the TU/e campus. Modifications to their natural process are limited, which is desirable in our research. We want to improve navigation on TU/e campus itself, not improve the modifications that have already been made in an attempt to improve navigation on campus.

As the group members are students are on the TU/e and present at the campus - the natural environment were the issues occur - there is an opportunity to observe participants and create situations in this environment. This increases the ecological validity of the study. The method and materials that are used in the study (detailed description of the study is given in chapter 3) are aimed to approach the real world situation as close as possible. During the study, people can actually get lost which approaches the real world feeling.

In order to get to know what problems the target group encounters, there are several methods that can be used, which will be described below.

Observing the target group during their natural navigation process enables us to see the stages the participant goes through when trying to find a building. However, navigation is not done in one specific building or area which makes it hard to find the people who actually do not know where they have to go. Furthermore, by observing them we will get to know what they do, but their thought processes remain unknown, which is at least as interesting as the things they do.

Conducting interviews might be a better option. By asking the right questions we can get to know the navigation process of the people we interview. One thing to always keep in mind when interviewing is that people may give answers which they think you are looking for, thus conforming to researcher bias. Furthermore, what people say they would do (introspection), may differ from reality. Additionally, the individual role of the researcher is relatively big and he/she may introduce bias.

Focus groups can address some of the issues we find when evaluating the pros and cons of interviewing the target group. Especially the role of the researcher is significantly reduced and thereby less bias is introduced. Focus groups are very useful in the early stage of development to learn more about the user's problems that the product is supposed to solve. The dynamics of a focus group can lead to a good discussion on the topic, providing valuable insights.

### A2. Method

### A2.1 General setup

For our focus group, we aim to conduct three focus groups, each with three participants to ensure that there is enough discussion. Participants are contacted via personal connections. Each focus group will be as diverse as possible with first year international students, first year non-international students, and acquaintances of the observers who never visited the campus before.

Participants will receive an invitation for joining an experiment with a specific time and place. They will also be notified of the fact that there was an issue while reserving the room so they have to keep an eye on their cell phones for updates.

All three participants will receive a different location to make sure that the participants are dispersed over the campus and they have the element of surprise when they have to find the real location. Just a few minutes before the experiment will start, the participants will receive a text message with a new location. The new location will be study cell F in Metaforum as we expect that this is an unfamiliar to the participants so they have to search for it.

During the focus groups, video and audio recordings will be made to save the data and use for analytical purposes in a later stage. The focus group will last approximately one hour.

### A2.2 Discussion guide

### A2.2.1. Introduction and explanation

We welcome the participants to Metaforum study cell F. In this room the participants get the chance to sit down and grab a cup of coffee or tea. One of the researchers will take participants aside and explain the purpose of this study, namely: gathering information on the needs of wayfinding on the university campus. Afterwards the participants will be provided with an informed consent form and will be asked to sign the document. Once signed, the researcher will conduct the individual questions. When all participants have concluded the individual part of the focus group, the group session will start.

Both the individual and group questions are provided below. Since the flow of group will be a great determinant in our group part of the focus group we cannot guarantee that the focus group will go exactly as detailed in our discussion guide.

### A2.2.2. Individual interview questions

The questions below will be asked individually to the participants: Individual Questions Link to online survey: <u>https://goo.gl/forms/UGkZGdUIhLfcEV4L2</u>

Researcher writes down:

- Gender
- Starting location before navigating to focus group.
- 1. What is your nationality?
- 2. Where do you live?
- 3. How old are you?
- 4. What do you do at the TU/e?
  - a. Student
  - b. Lecturer/Teacher
  - c. Staff
  - d. Visitor
  - e. Other (...)
- 5. How often do you visit TU/e?
  - a. Daily (3-5 days/week)
  - b. Weekly (1-2 days/week)
  - c. Monthly (1-2 days/month)
  - d. Yearly (1-5 days/year)
  - e. Other (...)
- 6. How often do you struggle to get around in TU/e?
  - a. Almost never
  - b. Once in a while
  - c. Sometimes
  - d. Frequently
  - e. Almost all the time
- 7. How do you get around at TU/e?
  - a. Walk
  - b. By bike
  - c. By car

d. Other (...)

### NAVIGATION OUTSIDE:

- 1. Did you already know how to get to the second building after the location was changed?
- 2. Did it take you more or less time than you expected to find the building?
  - a. A lot less time
  - b. A little less time
  - c. About what I expected
  - d. A little more time
  - e. A lot more time

### NAVIGATION INSIDE THE BUILDING:

- 1. Did you already know how to get to the room after entering the building?
- 2. Did it take you more or less time than you expected to navigate in the building?
  - a. A lot less time
  - b. A little less time
  - c. About what I expected
  - d. A little more time
  - e. A lot more time

### A2.2.3. Group questions

### Instructions

This focus group will consist of two parts. During the focus group anything you think and / or say is of value for our research. No answers to any of the questions are wrong. So please don't refrain from saying something, because you think this is silly or might not be of value. If you feel that at any time you don't want to answer a question or feel too embarrassed to answer, you can skip the question. It is always allowed to use the bathroom or take a drink during the focus group. If at any moment something is unclear or confuses you, please do not hesitate to ask. These sessions will be recorded, like mentioned in the informed consent, however these sessions will never be published or used for other means than solely this research.

### **Evaluation of experiences**

- 1. What was your experience while navigating to this
  - a. Building?
  - b. Room?
- 2. Could you reconstruct the process you went through when coming here? What aids did you use to navigate (let the participant describe this using a timeline. Try to structure the conversation by using the stages below)
  - At home
  - While traveling
  - While on TU/e campus
  - In the building

The timeline will look like the picture below.



After completing the timeline, discuss what is on there.

Use these type of questions to guide the process of determining the most valuable navigation aids.

- What type of navigation aid do you usually prefer to use?
- How does this aid help you to find your way on campus?
- Is the information given in this aid clear enough for you to find a way in the campus?
- Is there anything that irks you when you use this aid to find your way in the campus?
- How/Where did you know about this navigational aid?
- How/Where did you learn use this navigational aid?
- Was the information (like signs or de building map) sufficient for you to locate the room in the building?

The outcome of the timeline should provide us with the information:

- What aids they used at what moment in time.
- Whether the aids contributed to the user satisfaction.
- Whether the aids contributed to the feeling of 'I know where to go'.
- Whether the aids contributed to getting to the destination.

3. Do you have any other experiences on TU/e campus when you did not know how to reach your destination? Please, elaborate.

### **Suggested solutions**

Scenario: You are running very late for a meeting on campus. The location changed at the last minute and you have trouble finding the location on campus. What kind of aids would you like to have in a moment like this?

- 4. Design your own navigation aid to use on TU/e campus
- What information should be present in your navigation aid?
- Think about where and when you would use your navigation aid.
- Place this design on the timeline and explain how this would influence the process.

5. Design your own navigation aid to use inside the building

- What kind of navigation aid would you prefer?
- What information would you like to have in navigation aid?
- Where would you like to position your aid in the building?
- Place this design on the timeline and explain how this would influence the process.

### A2.2.4 Evaluation

Together with the group and the researchers the results of the design assignment will be discussed. Questions such as the ones mentioned in the assignment above will be used to check whether the assignment is failproof.

Je Technische Universiteit Eindhoven University of Technology

### Appendix B1: Transcripts of focus groups

### B1.1 Focus group 1 - Transcript I

### Experiences navigating to the building and the room .

GUY1: Knew how to get to MF, no signs to get to study cell F. It was difficult finding the room. The room was behind a pillar which made it more difficult to locate.

GUY2: Didn't know the Lab of acoustics. Googled the lab of acoustics. Found a link to the lab of acoustics in the TU/e website. But the map was outdated, and lab of acoustics wasn't mentioned. Also the name of the building is in Dutch. Got confused with the Vertigo building. But found the LVA on a campus map. Knew how to get to MF. Didn't know the Study cell F. Asked the receptionist and found the floor. A senior guided to find the Study cell F.

GUY 3: The building wasn't a problem. But had to look for where to park the bike.

### Are the abbreviations natural? Is it okay to call it MF than Metaforum.

GUY2: Mf is okay, but LvA isn't. Firstly, LVA was missing in the map he had, but was on the campus map. It took a while to figure out that LvA was Lab of acoustics, as the abbreviation is for the Dutch map. Would be better if they provide information about where (the buildings) the labs are present.

The position of the maps are good, but if there is a map outside every building it would be more convenient. The Building maps are absent. No information about how to get to a particular room or lab in the building is present. Navigation inside the building is comparatively more difficult than navigation outside.

# What do you encounter in the process of finding information from the maps and information that TU/e provides that makes the it tricky for you to get to a place

GUY2: New to the campus. In India you don't have to go different buildings for classes. All the classes for a particular department was in the same building. There used to be many people in the campus to guide them to get to a building/room. Doesn't want to be late to class, so time constraints also makes it difficult to navigate. Pavilion building is good, placement of signs to get to lecture halls helps. Gemini building isn't easy to navigate, e.g. lecture hall A308 doesn't make sense, had to search for the room.

### Brief info about navigation from the starting point-first location-MF- study cellF

GUY1: Started from aurora, Guessed Multimedia pavilion must be near pavilion building and found it. The building was locked hence called one of the researcher. Then saw the text about the change of location. Used the sense of direction to get to metaforum. But couldn't find the Study cell F. So asked people about where the Study cell F is at, and got to the room.

### Why do you think asking someone for help is a good approach?

GUY1: It was already getting late, hence didn't want to look into the map or look for signs and find out where the room is at. If it wasn't for the time constraints then would have looked for the signs and would have used other navigation aids and figured it out.

### How did it feel when you knew you were late and still had to find the location?

GUY1: Wouldn't be a big problem if I were late, but it wouldn't be nice to be late to a meeting like this. But had it been an exam or a meeting with a professor then would have been really worried and tensed.

GUY2: If it was an important meeting then would have been really anxious.

GUY3: Yes Would be anxious, but Felt stupid walking past people again and again. Was a student before, so thought would find the room easily. But there were no signs, thus decided to ask the receptionist. Receptionist wasn't familiar either. Has to take out large sheets of the layout of the floor plan. The study cell F wasn't clearly mentioned in the plan. The receptionist guessed that the room might be in the lower floor.

GUY2: People get confused with similar names of labs of different buildings and get confused.

GUY4: Found a campus map when he entered TU/e and found the building on the map. The map was wrongly oriented The map isn't correlated with his position it points north when he is in the south east. The map is covered with Plexiglas, which makes it difficult to read when it is dark.

No name on the building to confirm that it is the right building. Locating the entrance of the building is confusing as it is not present in the place where it was on the campus map. Asked the receptionist for the Study cell F. Illogical placement of study cells. The only sign in the building was "DO NOT EAT HERE".

### NAVIGATION AIDS USED ON CAMPUS:

GUY2: Uses maps provided by TU/e. And 'here maps' to commute on campus.

GUY1: Used google maps to get to pavilion and it was accurate.

GUY3: Visited TU/e website to find the location. Biked fast so couldn't use the navigation on phone. Needs static maps for navigation inside.

GUY4: If you need a phone to find a place on campus, it is a lousy campus. Need a map at the entrance, and signs on campus to know how to get to buildings. Didn't thinking of using his phone.

GUY2: To locate the entrance of the building need some sign that shows the way to the entrance (didn't know the entrance to helix and matrix).

GUY2: Couldn't locate sign boards. In case there's no internet, could download an offline map. If it's an offline map, it consumes lesser battery and is more convenient.

Mentioning the floor number would be helpful.

GUY1: Used Google Maps to find the location. And inside the building, I used LCD screen to make sure it's in the library. The placement of the rooms were not logical. Asked a lot of people wasn't happy to call you guys.

### Why weren't you unhappy to call us or thinking of calling us?

GUY1:Didn't want to disturb you guys and didn't want to sound stupid that I didn't locate the room.

# You were telling us that you kind of felt stupid to ask us. In that moment what kind of aid comes to your mind?

GUY1:I would ask somebody who doesn't know me.

GUY4:You feel stupid? I think it's a stupid building.

# So did the parking fees were for you a reason to park outside the campus? And what effect did you have for the search of the right building?

GUY4:Yes. I think it's very the positive one. Because when I entered by car, I would have never see a map in the entrance of the campus. And then I would have been really lost.

After you entered, you have to park your car somewhere, there are blocks/boards near each parking areas.

Yeah, but then I feel stupid, because I don't know where to park. Because I want to parking lot which close to the building and I don't know which building.

# So, imagine this scenario that you're on campus and just like happened now and you feel lost, we would like you to design your own navigation aid which would help you to get you to your destination accurately. What do you think would have to help you to destination building?

### Different solutions were suggested. [participants didn't agree on one solution]

- 1. An application which provides an offline navigation map on the phone. So it could be used without internet.
- 2. Physical solutions like placing readable maps near the parking, at the start of each street.
- 3. Giving logical names to the buildings. "This is Metaforum building, you have the Matrix building, at the entrance you can just have a sign section N to the left, section K to the right, and then my building is written in the N so I have to go there."
- 4. Visible signs on the streets with the names of buildings and directions to get to them.
- 5. Tablet like devices in front of the buildings. If you type this thing 'Study Hall F' the device shows a clear route from a 3D perspective of the building. so it is easier to find the room.
- 6. Confirmation for the right buildings by having visible building names on the buildings.

# And I really like the point that you were mentioned that the campus itself can be a solution. Could you quickly debrief how would it be?

- 1. You can have sections of buildings with the same starting letter, that what they used in Amsterdam Bijlmer; and all the streets have the name starting with the same letter. The Fazahlaan in section F, and you got, sign post point you to F, or G.
- 2. Second solution obviously is clear sign posts.
- 3. Third solution is a Manhattan street plan.

The time's cue and we would like to wrap it up and coming to the conclusion and it's very clear that frequent users would like to have an offline navigation application and the people who visit once a while or maybe just once would like to have the campus itself as a solution.

### B1.2 Focus group 1 - Transcript II

Inside the building is difficult, but ask the people for directions.

If people don't know where the building is, they look for it at home online.

Outside is doable, with aids like google and maps on campus. Inside is really difficult because every building is different.

Time is an important concern. "I was running late, so I didn't want to waste time looking on a map, but I just asked someone."

Map at the entrance was useful, but the Plexiglas was difficult to read the map. Furthermore the map was orientated North, but I was walking east, so that was difficult.

No name on the building, so no confirmation that it is the building I am looking for. Also where is the entrance: on the map this is building 5, but where the 5 was there was no entrance. When I finally was at the staircase I thought this must be it, in front of this staircase I was looking for a sign of confirmation. No name of the building, inside I asked the receptionist where to go.

### B1.3 Focus group 2 - Transcript I

Learning point for us: messages from different persons, confused them.

Room: I had to ask for the room.

Couldn't find it on google, so I asked and got directions. But following up was quite difficult. Usually I google the location. Also for indoor I looked for the online floor plan. But I made a mistake.

Late: asked people and they explained me where the building would be. And also inside I asked people and they helped me to get there.

There is a small board and I ran into it.

The signs did only tell about the lecture rooms, not for the study cells A-G.

In the library there are letters, but that are the ones for the books. They confused me. Late: so I did not look at a map, but when straight to asking people.

Timeline:

Floor plan did not tell me where I had to take the stairs.

Look up maps, but you need internet. Save it and remember, make a guess of the time I need. If I am at the spot than first I look for signs, and then ask people who are working, then random people. The bigger maps does not say where you currently are. Using my phone is my main navigation tool. No sign boards with buildings, only street names. Building names would be useful. The name of the building you should find more easily. Not only on a small board you could run into, need more clear information on what building it is that you cannot miss. Lectures for me are in different building/departments. I want to get there in time so I need. Very important that I can be there in time so I need to know where I have to go. New to the country and new to the campus. I want to know where to go to, to be able to make a estimation of how many time it will take me. Room numbers are really difficult. Aurora not on map and people did not know there was a building named Aurora, so that was really hard to find. Took us two hours.

The building I found by asking people. At the reception she showed me a map and explained it to me.

I used the ground map that I saw a few days ago. When I was close to the destination I used another one to be sure that I was in the correct place. In the building, the sign boards were not useful. Prior knowledge also not. The reception wasn't there, couldn't tell me. The librarian showed me where to go. Then I saw the bookshelf letters, went there and then I

discovered it was a bookshelf. Then I just saw a study cell, and found it. This last bit I found by luck. Other people were busy, I did not want to interrupt them.

I ask people, especially when you do not have the time. OR when I am really lost/don't know where to go, or when the signs do not tell me what I need. When google didn't give me the right location, I just asked people.

Troubles finding my way out: then I wandered around and tried a bit.

Outside with my bike: did not know what building I had to go. Then parked the bike, and I was close so could try on trial and error. And I ran into a board with the sign on it.

MF - is that Metaforum?

The large space, then you really have to ask because it is quite big so trial and error takes too long.

I expected you to not sent me to the complete other side of the campus, but yeah you did. I hoped to see a group of people.

I expected: small enough to see or signs to navigate.

High: yay I am in the building, Low: lost in the building: ashamed as I felt everyone was looking at me.

High: when I saw you guys. Low: I found the building yaaay, but still where should I go, didn't want to ask again. Embarrassed to have to ask again. 1st time is not that bad, but asking again and again makes me feel stupid, embarrassed for it.

Low: indoor- I could not find the sign board. High: librarian showed me on a map where I had to go.

Design: Signs Map App IPad/tablets around the campus. Campus in google maps – names of the building in google maps Teleportation portals: that bring you wherever you want to go – the room Helpdesk: ANWB pole

IPad

Menu: what do you need help for.

I cannot find the way. Sign in: and say where I am – everyone can find you. But you have to app.

App: as a visitor I don't know there is an app. So there should be information points/poles/tablet with these tablets and a big letters on top: INFROMATION POINT. Search for someone/someplace – name /code and it tells you where it is.

Sign in and sign out. Only on campus – class rooms & offices, buildings.

App – Google Maps with where you are (only if you sign in)

Tablets spread over campus with the app for visitors. Students can download the app on their phones. If you know the name/code of the person you are looking for you can look her/him up. -> personal, you cannot see everyone sitting around. Then use QR to scan and get the navigation directions on your phone. Or otherwise a printed map, or printing the map. Sign in – sign out

To find the lecture room, find the teacher or a fellow student. Not to teachers personal phone, but his/her calendar.

The app can be multifunctional, not only navigation.

The focus is on people, and places. You can enter locations as well, like a classroom. Just like Google.

-use of GPS.

Use a campus card scanner to check in in a room, but then you have the library as one location for example and you are still unable to find it. Need check in point in every room.

To remember the route, use your memory or print it at the tablet poles (at the places), or printed versions of the map there on request.

Sign boards where you enter the campus (bigger entrances), for cars at parking place, for bike, at parking sheds and along the cycling path. So then you can stop, find where to go, where to park the bike. Should be very visible.

Sign at the side of the building. Illuminated floor with symbols guiding you Or maps like HP Navigation in your google glass.

Looking for Aurora:

We asked a lot of people, knew where the building was supposed to be, but didn't know about free Wi-Fi on campus. We knew the building was new, so construction work around made sense and should be it. But no sign that it was aurora, not yet and on the wrong side.

Inside: Extra signs with study cells

When in it dark, there are no people to ask.

Floor plans at the entrance of each floor.

### B1.4 Focus Group 3 - Transcript I

### Explanations by the researcher, background and purpose

From home, go the wrong thing. Message, abbreviation was known.

Guy: Got annoyed because no one was there. Called to ask whether new directions.

### What did you use before navigating?

We looked at the website on a map.

### Was it all clear?

Pretty confusing, terminology (echo room = lab of acoustics) We did know the pavilion. Participant did know the study cells (girl)

Guy: Did not know the study cells, so called the other and searched together. Looked around, got lost.

### Did you find signs?

Numbers and letters yes, but not the word study cell.

### Did it take you more of less time then you expected?

I guess traveling through the campus got quite quickly (map at every intersection). So checked.

### What kind of maps did you use?

The blue poles. It was really helpful and gave all the information.

### Other aids?

Guy: Google maps would have been nice, though the google would note this complex as one section / building. Did not know that it would be separated.

Girl: Checked map before, signs on the campus.

### **Really lost scenario?**

Girl: Vertigo, name of room was not mentioned. Friend tried to help out, but signs were terrible.

### Signs? Other aids?

Hard to find because they are on the other sides.

### Easy to find thus far?

Girl: Yes, especially the auditorium is quite easy

Guy: Only visited campus twice before, normally just the outskirts and sport centre. Quite easy with every cross section having a map.

third. Participant not yet here.

### How do the aids help you normally?

Guy: Google maps is real time, thus having confirmation every time is handy.

Did not think of using google maps. TU/e website on google helped.

Girl: Look it up on the website and then signs.

### Is there sufficient information on campus?

Girl: Buildings are easy, rooms are quite hard.

### Specific incident?

Girl: Vertigo, no floor plan, so ask people (no signs, no map)

### When using google maps as aid, is the info clear enough?

### Girl: Yes there is enough info

### And for the website?

Guy: Pretty annoying, low resolution, no abbreviations just a legend which aren't nicely readable when zooming in.

Drinks for participants.

Information regarding the timeline assignment.

Clarifications are given during the assignment.

third participant comes in, gets informed consent, small survey & explanation regarding the focus group.

### Where do you live?

Girl: Live outside the campus. Reserved it before coming here.

### What do you normally do when you can't find it.

Ask the group, otherwise go to the building and ask at the reception. Not shy. *Extra explanations are given to third participant. Asked to fill out timeline.* 

### What kind of aids you like to use?

third part: Here maps.

### How does this aid help?

third part: Search for Metaforum, here maps will show the building. It is easy to use. First time it was really hard to find, walked around this place.

### **Entrance finding?**

third part: Was ok.

### Room?

third part: Was really hard to find. Had to ask multiple times. Especially since it is covered. Saw the F, which made it very clear.

### First time

third part: Had to ask every day. Almost no street signs to find the route. Came late every day. No signs to Flux.

### Inside navigation?

third part: Hard to find since most of the room descriptions make no sense. 3.03 is logical, since it is floor three and then just find. But Study cell F doesn't mean anything.

Girl: Just wandering around. And eventually found the signs, without signs I asked people. *Experimenter explains highs and lows marking.* 

Guy: When I had the feeling of being lost, I felt defeated and thus had to ask.

### When really lost, what aid is first used?

Guy: Look for signs, can't find them? Ask for help. Signs -> Map -> Ask.

Girl: same

Experimenter explains scenario late location finding.

Guy: An app would be good.

Experimenter explains that indoor should be taken in as well.

Girl: I would ask for clarifications to the person who send the text.

Guy: I would like to have an app that does search phrases. Which can deduce where the location is. Including building platforms instead of only campus maps.

### So in what way?

Guy: On the phone as an app.

3rd part: Clear information on the map.

### So if you can't ask or wait for a reply of the sender? (e.g. lecturer who e-mails)

Guy: So self-sufficient in finding way?

Third part: Ask in an app, to guide within a building.

Guy: When looking at the building. I would like to know where the entrance is. Just a simple sign to the entrance. If [x] wasn't there, I wouldn't have known.

### Did you have trouble finding bike sheds?

Guy: At Acoustics lab, no problem just in front. At Metaforum it is quite big.

Design your aid, maybe even draw a bit and place it on the map where you would need it.

Guy: I really really need a building map. Doesn't need to have a live tracking thing. Just a map would suffice. I would want it as an app to download.

### But you are here only once? Is it then still helpful?

Guy: Good point. I expect TU/e to serve me. I think that TU/e should have a sufficient aids. Should be a service from the TU/e. Is there like an inside building map?

third part: App would be useful, but for once, I wouldn't download it. Just put it on the website.

### When?

Guy: The moment I enter a building. Like directly when entering. That's why I didn't want to look on my phone. I figured that TU/e would be one entity.

Girl: Physical map, I want to have it directly by the bike shed. So when parking my bike I can see it directly.

Guy: It is hard to sketch or draw the solution.

Troubles are discussed.

Guy: We really want signs to guide me. In Holland any sign is with a directional arrow and the name of the building.

### Were street names helpful?

General consensus that these are unusual

### With the building

Guy: Have maps in the building at the entrance.

Guy: Big map to look at and a paper map to take with you.

### Who would use it?

Guy: First time visitors

third part: consensus

### Indoor you just asked someone, would you still need another aid?

Guy: Yes, because I want to be able to do it by myself.

third part: I wouldn't need it.

Guy: I would be really annoyed to the point, I'm not coming anymore.

### What were your thoughts?

Girl: Oh my god I am late.

Guy: Ok, this organization did not really take care of the way finding.

### And when you found it?

third part: glad to have found it.

Girl: Relieved

Guy: Still annoyed and upset that I did not find it that well.

### To conclude.

Big salient signs and floor plans indoor.

### Other things? Maybe the road?

Guy: I was really really annoyed with you guys, knocked the door, did not check my messages. Because I thought I was on time. Different channel, (WhatsApp vs sms).

Guy: One more positive thing: This session itself was really nice. I wasn't annoyed by the camera or sound recorder at all. So thanks for that. :)

### B1.5 Focus group three - Transcript II

### Focus Group Wednesday

Girl: From home -> Multimedia Pavilion. Message -> already knew where MF was. Wanted to know whether other person also had to go to MF.

Boy: Was at lab of acoustics, annoyed nobody was there. Called the girl if something was changed, she mentioned MF. He found a map and navigated to the MF in one try. On beforehand for the first locations, they both used online maps.

Useful maps? Confusing maps because terminology used was hard. 'Echoroom' is 'lab of acoustics'.

Girl: already knew about study cells, so only had to search for the right room when she got into the library.

Boy: Saw the girl and met up at the stairs. He did not know where the study cells were. Did not see any letters (only numbers of rooms). Quite lost, but he saw the girl noticed the study cells. If he did not was with her, he would have asked someone because it was very confusing to him.

He saw a lot of signs, but only to numbered study rooms.

Traveling through TU/e center went quickly, map at every cross section. Really easy.

Kind of maps used: poles with navigation map. Really helpful: gave directions needed.

Usually used: google maps would have been nice. Did not thought google maps would have a detailed map of the place.

Girl: Before she goes to the place she checks maps, but if she is somewhere she looks for signs.

She ones felt lost in Vertigo. As she entered the corridor she needed access, so waited for someone and followed that person. By lecture assistant a route was given, but the name of the room was not provided. She almost found it, but texted a friend. That person gave direction to the room. She thought the room was not that visible or well indicated. There is a sign, but not that visible.

First week on campus: easy to find the way auditorium

Boy: once or twice before on campus only sportscenter, only knew outside paths.

Quite easy experience for navigating because on each cross section there are maps, which helped a lot.

[third participant is still lost]

Google maps pro: real-time navigation instead of confirming along the way through tangible maps. With real-time you get confirmation every time. He did not check google maps, nog even for the first location, so he does not have any idea how this would have helped. He went to google, entered the building and gave the TU/e site with a static map. This was what he used.

Girl: She always search on forehand and otherwise meet up with somebody and search together.

For vertigo, the floor plan was very hard to find and she had to ask people to help her. When she uses google maps, the information given in the app is clear enough to find her way. Abbreviations of buildings aren't a problem.

Boy: resolution of the online map is very low, so legend reading while zoomed in is impossible. Also a pretty old map to use.

Girl: not living on campus, booked the room before she came to the Netherlands. Normally if she has to find a building she doesn't know, she just asks people. Most likely people know. If people don't know go to a building for a receptionist or look for a map.

Boy1: mf doesn't sound like a building, but MF was on a map and easy to find online. MF is pretty big on the map, so easy to find. Entrance was hard to find, thought it was not the entrance for him.

Boy2: experience from the 'decathlon store' to TU/e. Did not use google maps used here maps (navigation aid of Microsoft, provide offline maps). The other people used google maps.

He put in 'Metaforum' at here maps, and this directed hem to the Metaforum directly. The directions were clear. The abbreviation was okay, he knew what MF stands for. It was easy to find the entrance, he has been before in MF. Finding study cell itself was hard to find. Person at entrance was on the phone for 5 minutes, so asked the librarian at the desk. Got direction and found his way. He was okay with asking other people to help him. He saw the "F" for the room, so was not hard to find the right study cell.

Girl: Nothing really disturbs her about the navigation aids on campus.

Boy2: first time he asked every time to other students where it was. Street signing was not useful for finding a building. Sign should say 'MF' instead of 'la place' etc. It was not hard to navigate inside the building. Most of the (lecture)rooms have intuitive numbering (3.132 means third floor room 132).

Girl: in the beginning of being first at campus: just wander around. Later on: find signs to guide her. If that didn't help of wasn't obvious: ask people.

Boy2: just after entering MF he has his 'low' moment of knowing the way.

Boy1: Most annoying moment; felt totally lost when he had to find the room (after entering MF). When he can't find a room using signs, he feels defeated and he really doesn't like to have to ask people where to go. High: when he found Puji so they could travel together.

Puji: still difficult to find the study cell despite the fact that she knows MF.

What is the aid what they want to use when they're lost:

Boy2: ask people if they are familiar he sees around

boy1: Looking for signs always, before doing something else. Second thing is to ask people, but he really wants to locate it by using signs.

Girl: same as for boy2, would ask people.

[design part for designing]

[brainstorm ideas]

Boy1 likes an app on this phone. Displays a map and location where he is.

Girl: ask person who sends the message, in the meantime she would check a map.

Boy1: wants to have a search phrase with knowledge of abbreviations. Not only campsite maps, also inside building maps. The last one is his greatest issue.

Boy1: mobile app if possible

Boy2: the maps are easy to locate buildings, not for inside.

Boy1: he wants to be self sufficient to find his way.

Boy2: Just wants to ask people.

Boy1: really likes when he looks at the building to know where the entrance is. To make it more visible outside the building where people should enter. He felt like using the backentrance instead of using the main entrance (used the stairs below the bridge to Gemini).

Boy1: parking shed at the acoustics lab wasn't hard to find. MF bike shed is big so easy to find (but: came from the right direction).

Boy2: left it at gemini, did not park it at the bike shed. He was running late and did not want to waste more time.

### [design part]

Boy1: Need a building map (inside) to be able to navigate (basic need). Placement would be on the phone as a downloadable application. Was asked if he would be here for one time: judging from the experience, he expects the TU/e to serve him. He doesn't feel like downloading an app because he expects to see it when he enters (customer serve thing). The campus has to guide him.

Boy2: An app is useful if you visit more often; but if you are a one-time visitor, a web application would be useful. Scan and go to a website with the application.

Boy1: want to have a physical map available when he enters the TU/e campus and a physical map at the entrance of each building.

Girl: want to have a map close to the bicycle parking spots because she travels around campus on a bicycle.

Boy2: would be nice to have a sign on each building with its name on it. Especially nice for one-time visitors.

Boy1: want signs to guide them. Need to be the same as each sign you use around Holland for places. (big sign with an arrow in which the different names are stated). Can be several direction on a sign pole.

Street names are not helpful for a first-time visitor. Street names do not resemble the names of the buildings.

Girl: was only a map inside the desk of the librarian, but might be better to take it with you.

Boy1: two things to be nice: 1: big visible floorplan to be recognizable from a big distance. 2: take a map with you so you don't have to memorize the way (like in a museum).

Boy2: walk into the building and be able to get a map right away, instead of remembering the exact way.

Question: you asked many people yourselfs but now want a map, isn't it easier to just ask people?

Boy1: I want to be able to find rooms by myself, otherwise he's really annoyed help me to get there, otherwise I won't be coming.

Boy2: I would just ask people

Girl: thought just "OMG I'm late"

Boy1: annoyed by the organization of change of locations.

Boy2: he felt relief that he found the room eventually.

Girl: also relief that she found it and she won't forget how to get to the study cells

Boy1: still as annoyed as the beginning because it was too difficult to find it by himself.

Conclusion: Want to use proper signs. Want a big floorplan at each buildings and a nice map at the beginning of the campus.

### Appendix B2: Quantitative data focus groups (surveys)

Data was gathered quantitative to keep track of the participants and offer starting points for discussions. Gathered data is shown below.

1. Age 18, 22, 22, 22, 23, 23, 24, 24, 25, 26, 57

2. Count of Starting location before navigating to focus group Lab of Acoustics (3, 27.3%)
Gas Lab (2, 18.2%)
Multimedia Paviljoen (3, 27.3%)
Paviljoen (3, 27.3%)

3. Nationality (What is your nationality?) Indian (5, 45.5%) Dutch (5, 45.5%) Indonesia (1, 9.0%)

4. Current Living location (Where do you live?) Eindhoven (5, 45.5%) Eindhoven, Campus (3, 27.3%) Nuenen (3, 27.3%)

5. Gender (Male or Female?) Female (3, 27.3%) Male (8, 72.7%)

6. What do you do at the TU/e? Visitor (5, 45.5%) Student (6, 54.5%)

7. How often do you visit the TU/e campus? Yearly (3, 27.3%) Monthly (0, 0.0%) Daily (6, 54.5%) Other (2, 18.2%)

8. How often do you struggle getting around?
Almost never (1, 9.0%)
Once in a while (4, 36.4%)
Sometimes (2, 18.2%)
Frequently (3, 27.3%)
Almost all the time (1, 9.0%)

10. How do you get around at the TU/e? Walking (4, 36.4%) By Bike (7, 63.6%) By Car (0, 0.0%) Other (0, 0.0%)

11. Did you already know how to get to the second building after the location was changed? No (4, 36.4%) Yes (7, 63.6%)

12. Did it take you more or less time than you expected to find the building?A lot less time (1, 9.0%)A little less time (3, 27.3%)About what I expected (4, 36.4%)A little more time (2, 18.2%)A lot more time (1, 9.0%)

13. Did you already know how to get to the room after entering the building? No (11, 100%) Yes (0, 0.0%)

14. Did it take you more or less time than you expected to navigate in the building?A lot less time (0, 0.0%)A little less time (1, 9.0%)About what I expected (2, 18.2%)A little more time (4, 36.4%)A lot more time (4, 36.4%)

TUe Technische Universiteit Eindhoven University of Technology

### Appendix C: Informed consent

The Researchers: A.F. Prasetyaningtyas, Sri Harshini Sri Ramulu, Lisette van de Steeg, Maaike Kompier, Eelco Wiechert and Ruud Wijffelaars.

**Information and Purpose**: The focus group for which you are being asked to participate in, is a part of a research study that is focused on examining wayfinding on the campus of Eindhoven University of Technology. This research is in partial fulfilment of the course: 0HM110 - User Experience Design. The researchers are also interested in factors that contribute to location determination on the campus. The purpose of this study is to gain a better understanding of the way people navigate around campus and by extent to that suggest improvements.

Your Participation: Your participation in this study will consist of a focus group lasting approximately one hour. You will be asked a series of questions about your experience in wayfinding on campus. You are not required to answer the questions. You may pass on any question that makes you feel uncomfortable. Furthermore, you will be asked to conduct small exercises such as drawing on maps and open brainstorms. At any time, you may notify the researcher that you would like to stop the interview and your participation in the study. There is no penalty for discontinuing participation.

Benefits and Risks: The benefit of your participation is to contribute information to the Eindhoven University of Technology about your experiences. This may assist the university in improving on navigation along the campus. There are no risks associated with participating in the study.

Confidentiality: The interview will be tape recorded; however, your name will not be recorded on the tape. Your name and identifying information will not be associated with any part of the written report of the research. All of your information and interview responses will be kept confidential. The researchers will not share your individual responses with anyone other than the research supervisor.

If you have any questions or concerns, please contact the researchers or their supervisor: Alina Huldtgren / A.Huldtgren@tue.nl.

By signing below I acknowledge that I have read and understand the above information. I am aware that I can discontinue my participation in the study at any time.

Name

Signature Date - - 16

### Appendix D: Transcript of prototype testing

### D1 User test #1

### So, this is the Metaforum. How do you feel about the interface of this?

What is this in red?

That's the bike parking.

### Okay. And the entrance...

### The entrance is not marked.

When we met last time, with this building, the entrance is somewhere in the centre. With the entrance, it will be improved. And then..., so basically is it interactive system?

It's just a static HTML5 map.

Okay.

So, it just shows you the building and the parking place, and you can search for abbreviations. For Helix, for instance, you have STA as the abbreviation. So, if you put STA, it will show you the Helix building.

Okay.

So, it's just like you type in Google, let's say for MF Zaal 15, so this is the first link which opens up for you, it chooses you a map for TUe. Obviously, this is not the map that we are going to use for final product. So, the map will be a TUe map basically, and it will highlight the building and the nearest parking area, and as for now, we have the detail of the building like the opening hours -people usually struggle with it, and you can click on Read More, and you will get more information about the building.

With all the facilities?

### Yes.

Awesome. And then, we click here, and we'll get floor plan?

This is not a very good floor plan, but we can improve on it.

Okay. Everything is fine, except, if I have a current location in addition to this, this is more than enough for a person whose living within the campus, or for student it's very easy. But, for outsiders, it could be a different. Because students will know which department, as you said before the abbreviations will make confused. So, the thing that you have now is really good, and opening hours is also really useful, and there Read More data is also very useful. Because people, they believe Cosmos but they don't know where the Cosmos is. Even if you search for Cosmos this will come?

### No. At the moment no, but we can work on that.

So, if I search for these facilities and they will come, it will be more useful.

# Any other things we can improve? Like if you want a path to be highlighted from where you are, how do you like it to be?

Basically I'm a student of TUe so it doesn't matter, because I know where comes where. So, I mainly concentrate on the facilities, and the block names, the abbreviations I don't know, that's the only thing I need. For people whose coming from outside, then if you want to highlight the map, you need to include the present current location from where he's navigating. That is one way if you are using your mobile phone or something, if you type in something, it will show you GPS kind of thing. It will be useful for outsiders. Or else, you can keep these pole map all over the place, you can install the pole with this kind of technology. You'll have that particular points. So, from there you can easily...

# But, the major aim of this was to implement it like using search engine optimizer, where the first search in Google will be this particular thing.

Yes, if that is the case then this is more than enough. Because you have many sign boards stating if I want to go to a cafeteria or Cosmos. So, if it highlights Metaforum, then there are sign boards which direct us to Metaforum. So for outsiders is also okay then.

### So this is okay?

This is fine.

### But you just need indication of...

Facilities also. If I want to Department of Mathematics, if I type in Department of Mathematics it will show me the Metaforum building, it will be more useful for us.

### Okay.

If I don't know or the information is not clear, like last time you give me Lab of Acoustics, when I searched it shows Vertigo, but it was different building. If you include the facilities in search, more than enough.

### So, what do you think of this?

Do you have study association mentioned in that?

### As for now, we only have GEWIS.

Most of the parties they organized is going to that place.

Now let's focus on the interface part of this. If you're using this, let's say, the first page of this would be like Google. If you go to Google, and you type in Metaforum, this page opens up for you. And then, you get Metaforum and the parking shed highlighted. Is there something else you need to be added here?

As I said, the entrance should be marked there.

So, if you are given a very high resolution map of this, if you have it on your phone, would you be able to navigate to the particular place? Given like there's no GPS, there's nothing, it's just a static map, could you get to that place with this static map? If the person where was the area, then he can supposed to. If he's new to the area, there would be some difficulties to get to the place.

### So what can be done to include it?

All the localities nearby mentioned, like station?

It's just a map that we got of the TUe website, which we thought very stupid and it didn't help anyone anywhere. So, we thought maybe we could just improved it by adding these facilities, highlighting the building and the nearest parking shed, and all that. So, that's what we did basically. So, for the final product, we will have a better map, with better facilities, and better features obviously, but I don't know like this is just prototype, it's not the end system, so, what else would you need, so you're given this, you use it on your phone, web browser or whatever, and you're using this to get a particular place.

If the nearby localities are mentioned, for example the station, from there you could actually go through to that place. So if he knows I am here, he can get there.

The default map I think you can also highlight all other common places, which is visible and easy for me. If there's no GPS, in case, then something familiar if mentioned there he can go there, and from there he can direct. If you navigate in Google, other than the map you will get this direction also, after 100m take left, after 200m take left, and you can also mention...is there street name there?

### Yes.

Then it's fine. Other than that, the navigation system is fine. And the entrance is mentioned in the map, you can just highlight it.

Or, maybe you can make the address clickable, and then it will direct you to Google maps.

Yes, that is more than enough.

### D2 User test #2

So, basically, what we want you to do is, if you want to find the building, let's say Metaforum and you type in Google, so it will be like...this is the page that will be displayed. So you'll get Metaforum and the thing highlighted in red is the nearest parking shed from Metaforum. And you'll get the address, the opening hours, and then you have all facilities which are available, and then you get the floorplan. This is obviously not very good one, but we include the better one or maybe a higher resolution in the final product. So, is there something that you think of how could we improve the usability of the system, or how could it be more useful to you? Do you find this to be useful? Something like this. For example, Helix has very weird abbreviations, it has STA. So if you put STA in Google, the first page be like, it will highlight Helix building and it displays information for you. So, you get the address.

So you can't type in Helix for Helix?

You can.

So I don't have to type in STA though?

You can type in one of the keywords. So you can type in Helix or STA.

So it's also MF for Metaforum?

Yes, you can type in Metaforum and you'll get Metaforum. In your OASE, sometimes, there's like STA room 3. something... And you want to as STA. So you type it in Google and you just find out, okay, it's STA. So, using this map, for instance. This is not a very good map, but this is the only thing we found on the website, with this help, can you navigate to a place?

From Metaforum?

Not from Metaforum. From wherever you are, say at home.

But my home is not shown.

It's just a prototype, so you could just give your insights to what you need in the system. What else do you need?

I could click more Read More for more information, so you could make that highlighted.

Okay.

Oh, it's already underlined. So I don't think not much you can do by then.

### Okay.

Are you going to show what the red was? Because the red catch your eyes more than the blue, because everything else is more in blue and green. So, make the building red and the parking lot blue, that would be better.

### Okay. And how about any other additional features?

Yes, you can also include the initial codes of the room. Suppose for the reading hall or something, they have separate code right? So you write under opening hours you can say, include these rooms, these types of rooms.

### Oh yes, that's there. But it's not very clear, but it was there on the website.

Okay.

So you wanted the description...

Not the description, suppose you want to book a room right? You need a code of the room with the initial three letters something like that. So you can put down the three letters like you can say Study Hall with bracket of the three letters. So you can relate that to this..

So, given your task is at home typing out say MF and you get this. And you want to get to MF from Aurora, is this map help you to get to the place?

First of all, no, because I don't even know where Aurora is. Second, yes it can I guess.

Imagine this is a very high resolution and good map and you can zoom in.

That would be better.

Or would you like the address to be clickable and which can link you to the Google maps maybe.

Yes I meant it's not such a big place to link to Google maps, it won't be required. Just the high resolution of this map would be good. And suppose pick your location and dotted line that chooses you to take this path.

# So you just want one path or do you want us to show you from Aurora to Metaforum you can take 4 different paths?

No. I just want one path.

Just one shortest path.

Yes.

Okay. So that's it. Anything else?

Are you considering walking or by car? **No.** 

Just walking?

This is something you would do at home.

Okay.

We consider all of the options and, if you have this on a pole or something, they are not going to look at it, they are just going by car, they just pass it like very pass. So, we just wanted to make it in a browser HTML5 program.

But then suppose this person is going by walking, then actually I wouldn't take this route, I would cut cross this building and go straight, right? And it now what we do. So, if that part is shown, that would be better.

### That you can cut the cross building?

Yes. It would make easier.

Okay.