AN EVALUATION METHOD FOR EXHIBITIONS OF THE MARITIME MUSEUM ROTTERDAM

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SUMMARY

This project report describes the process of the development of an evaluation process for family exhibitions in the Maritime Museum Rotterdam. It is focusing on collecting qualitative feedback from families, consisting out of children between 8 and 12 years old and their parent or grandparents.

The Maritime Museum Rotterdam has various interactive exhibitions which learn their visitors about the maritime world. The museum was looking for a way to get qualitative feedback from their visitors about these exhibitions. The museum wants to learn what contributes to or deducts a positive experience of their exhibitions, so they can create even more inspiring exhibitions in the future.

The assignment for this project is to design a tool-box, containing all elements needed to conduct a successful qualitative evaluation of a family exhibition. The Sea monster exhibition in the Maritime Museum was chosen to be a test-case for this project.
During the project, several methods for gaining feedback were explored. It was decided to build an evaluation process around the concept of a heat-map which shows what areas visitors do or don't like.

The method that was chosen to collect the data to create the heat-map is experience sampling. During the exhibition visit, visitors are asked to give a small sample of feedback. They can do this by pressing a smiley that indicates how much they like what they are doing or seeing at that moment on a special developed tracking device. This device also keeps track of the location of the visitors. A line, showing the route of the visitors and the given feedback samples will be created from this information.

For this concept, a framework of the evaluation process was created. In this framework, two tracks were distinguished. One track, called version 1 in this project, collects the route and feedback samples of over a hundred visitors. An interactive stand will ask automated questions based on this data. The other track, called version 2 in this project, only involves five families. A heat-map is created for each family member and based on the heat-map an interview is held. A process poster was developed which shows all steps of both tracks. However, the focus during the project was on this last track, version 2.

The tracking device (the tool), the interview, and the analysis and communication of version 2 were developed further. Several tests were done to find the characteristic the portable tracking device should meet to collect the right data to create a heat-map that can be used to structure the interview. In the final design, a working prototype of the tracking device was created. Besides that, an interview guide was developed containing all information needed to conduct an interview, based on the heat-map. Lastly, all steps of the analysis and communication were distinguished and finding-cards were designed
To validate the concept, various tests were done to evaluate the evaluation process.

BUILD UP OF THE REPORT

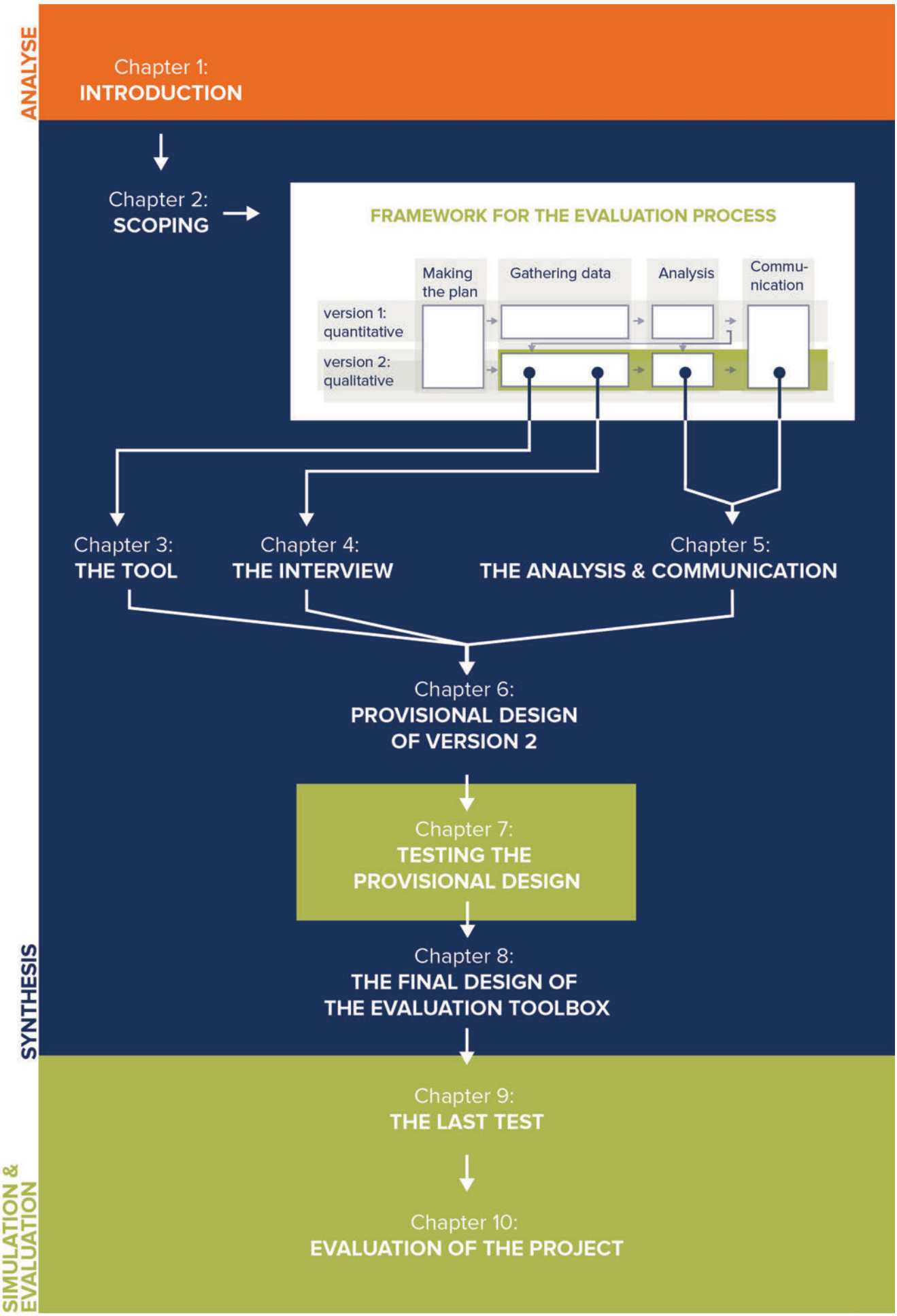

Figure 1: visual representation of the build-up of this report

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A

1.

INTRODUCTION

In this chapter, research was done to attain a better understanding of all the aspects to take in account when designing a way to evaluate the exhibitions of the Maritime Museum Rotterdam (MMR).
In the first paragraph (1.1), the context for this project is researched and the problem definition is given.
Secondly, more information on the MMR is given in paragraph 1.2. Next, the exhibition that is used as a test-case for this project is explained in paragraph 1.3. Thereafter, the goals of the evaluation are considered in paragraph 1.4. In paragraph 1.5 different methods for gathering feedback are discussed. Paragraph 1.6 gives an overview of the things the MMR already does to get feedback from its visitors. In paragraph 1.7, some other interesting projects considering the qualitative evaluation of exhibitions are looked into. Later, in 1.8 few existing tools to review exhibitions are mentioned and finally, in the last paragraph of this chapter (1.9) the assignment for this project is defined.

1.1 CONTEXT AND PROBLEM DEFINITION

THE CHANGING WORLD OF MUSEUMS

Over the past decades, museums' approach towards visitors has changed. Where museums primary were collection centred and mainly focussed on preserving their collection, nowadays more museums become increasingly community centred. In 1998, Kotler and Kotler mentioned that museums curators in the past easily could have asked: "is an audience necessary?"(p. 99). This attitude towards visitors of museums started to change about 20 years ago. Museums shifted from merely showing their collection in a static way, to the creation of interactive learning environments while often making use of modern technologies.

THE CHANGING WORLD OF VISITORS

The motivation of visitors to go to a museum has also changed. This has everything to do with our society that is changing continuously. In the past, when somebody wanted to learn about a specific subject, it was likely that he or she would visit a museum for this. The goal of museums to be learning centres for specific subjects or history did not change. However, people did gain a lot of alternative ways to attain the information they were looking for. Nowadays, people can also learn a lot about a specific topic on the internet and thus not necessarily have to vist a museum for this.
On top of this, the options that people have to spent their free time are getting more diverse.

In a consequence of these changes, museums have to step up their game to keep visitors coming to their museums and inspire them with their expertise ('Experience lab; Reasons why museums should share more experiences less information', 2017).

THE CHANGING APPROACH OF MUSEUMS

Museums try to stay relevant by realising new, digital and interactive exhibitions. These exhibitions cause visitors to be more involved in a meaningful way during their visits, inducing rewarding learning experiences ('Experience lab; Reasons why museums should share more experiences less information', 2017).

To do this in a successful manner, it becomes crucial for museums to get to know their visitors. Only by knowing what visitors consider as meaningful and/or entertaining experiences, a museum is able to create inspiring and entertaining exhibitions which result in visitors (keep) visiting the museum. To keep the visitors as pleased as possible, it is important to know if they experience the exhibitions positively and to understand the factors that contribute or sabotage this. However, to get interesting and truthful feedback from visitors in a museum can be very difficult and as exhibitions get more and more interactive and immersive this becomes even harder.

PROBLEM DEFINITION

The Maritime Museum Rotterdam, hereafter shorted to MMR, is also aware of the changing context in which they operate. Therefore, the museum tries to keep coming up with innovating experiences.
They stated the problem that they did not developed a method yet to evaluate their exhibitions. The museum evolved this into an assignment, which was the starting point for this project. The complete assignment can be found in appendix A. This assignment resulted into the following problem definition for this project:

"How do we get honest and useful feedback from visitors of immersive exhibitions, while influencing the flow of the visit as little as possible?"

This problem will be answered for this project, specified on the visitors of family exhibitions in the MMR.

1.2 THE CLIENT

1.2.1 THE MARITIME MUSEUM ROTTERDAM

For this project, a collaboration came to exist with the Maritime Museum Rotterdam (MMR). The MMR is a museum for young and old persons and shows the influence of the maritime world on our daily lifes.

GOALS AND AMBITIONS

The MMR is aiming to be a centre of expertise in the area of maritime development. Besides the focus on history, they also aim to focus on future developments. The MMR collects knowledge from studies and research and spreads this knowledge by means of their exhibitions, activities and events for families, students and specialists.

THE ENGINE OF THE MUSEUM

A team of sixty employees and nearly two hundred volunteers work at the Maritime Museum. Together they ensure that visitors have an unforgettable experience.

THE MUSEUM

The museum has both indoor and outdoor sections. The outside area shows different historical vessels and cranes. Historically, this is a very special location, since this is the place where the port of Rotterdam started off.
Indoors, the museum shows several simultaneous exhibitions. The MMR typically does not simply exhibits her collection, but brings stories alive by means of various interactive exhibitions.

VISITORS

Looking at the ticket sale of the MMR, it can be concluded that the museum gets about 217.000 visitors a year (Maritiem Museum Rotterdam , n.d.). The museum has some peak moments at which the amount of visitors a day is a lot higher.

The core target group of the MMR are families from Rotterdam and its surroundings, consisting of three generations; the children are 4 years old or up, the parents are about 35 years old and the grand parents are 60 years old or older.
On top of this core target group, maritime specialists and tourists are important target groups for the museum.

1.2.2 THE PROJECT OFFICE

New exhibitions are constantly being developed within the museum. The museum has several exhibitions that will be in place for just a couple of years. Therefore, the museum is constantly developing exhibitions. Within the MMR, the project office department is responsible for leading these design processes.

The project office is concerned with large, interactive exhibitions as well as smaller ones. The request to develop a way for evaluating interactive family exhibitions comes from the project office. Therefore the project office can be seen as the actual client of this project.

RESPONSIBILITIES OF THE PROJECT OFFICE

A project leader leads a team of internal experts (curators, marketing and communication, education, technology) and external designers (3D, interaction and graphic). This team realizes the exhibition. The project leaders themselves often have a creative-organizational background and therefore are able to think along with the designers.

MEMBERS OF THE PROJECT OFFICE

The project office consists of three project leaders and a project supporter. The project leader that is involved in this project is Hanne Marckman. She will be the contact person during this project. Therefore she is called the head client project leader.

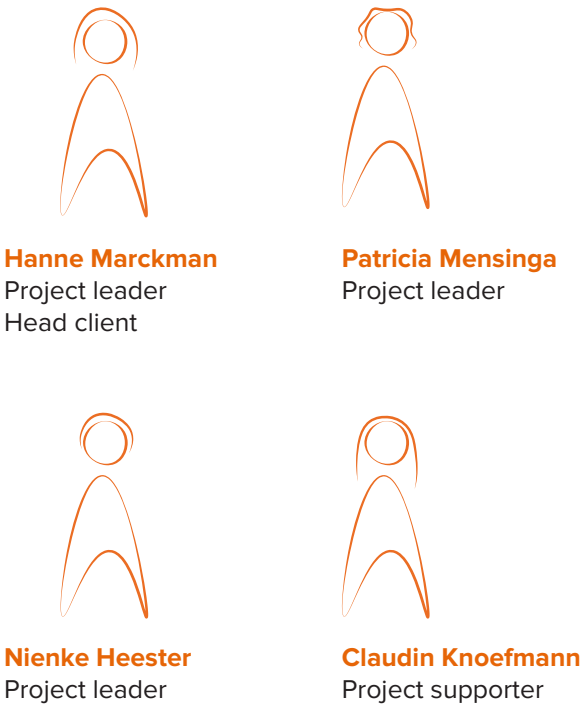


Figure 2: the members of the project office.

1.3 TEST CASE: SEA MONSTER EXHIBITION

As a test case for this project, the Sea Monsters exhibition was used. In this exhibition, you get to discover whether sea monsters really exist.

1.3.1 WHY THIS EXHIBITION?

At the start of this project, the exhibition was the newest exhibition of the MMR. It was opened in March 2019. This is one of the reasons it was chosen as the test case exhibition as the design process is still relatively fresh in the minds of the project office. Furthermore, the main client project leader was intensively involved in the realisation of this exhibition and therefore knows all the ins and outs of the exhibition.

Figure 3. Pictures of the sea monster exhibition

1.3.2 FAMILY EXHIBITION

The Sea Monster exhibition focusses on MMR's core target group: families from Rotterdam and its surroundings, consisting of three generations. Exhibitions that focussed on this core target-group are called family-exhibitions within the MMR.

MOTIVATION OF THE CORE TARGET GROUP

J.H. Falk (Falk, 2009) created a motivation model in which he distinguished five types of visitors, all with their own motivation for visiting the museum (see figure 4). These type of visitors are:

- Explorers: These visitors are motivated by their own interest and curiosity
- Facilitators: Facilitators come to the museum to accompany the person they are visiting the museum with
- Professionals or hobbyists: These visitors go to the museum to gain specific knowledge.
- Experience seekers: These visitors do not go to the museum to become an expert in a specific topic, but just want to have a nice experience.
- Rechargers: Rechargers visit the museum to reload themselves in a physical, emotional and/or intellectual way in a nice environment.

Looking at the families who visit the exhibition, several types of visitors can be recognized.

The parents and grandparents are the facilitators within the family. Their motivation for visiting the museum is to support the children. Meanwhile, both the adults and the children, are experience seekers, who are looking for a fun activity to do together.

1.3.3 THE DEVELOPMENT OF THE EXHIBITION

The idea for the exhibition came from numerous maps of the sea that are part of the collection of the MMR. Lots of these maps contain drawings of sea monsters.

The MMR composed a target group to get inspiration and feedback from during the design of the exhibition. Hundred and seven families were interested, out of which seven families were selected to take part. Furthermore, there were teachers in the target group, selected from the museums own network. During the realization of the exhibition, the families were asked to come to the museum for four times.

The exhibition was made with the idea that different generations will learn from- and interact with each other. The exhibition is based on stories about sea monsters, which were selected with the idea of provoking recognition but also novelty for visitors of different ages.

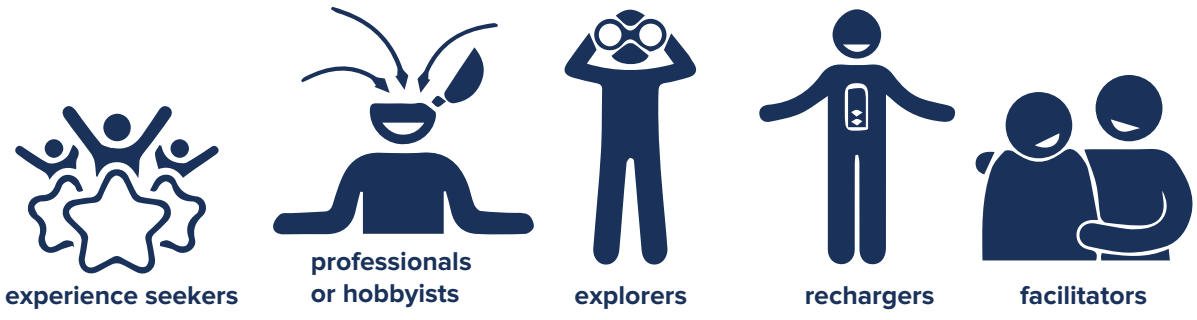


Figure 4: Five types of visitors according to Falk, 2009

1.3.4 THE STORYLINE OF THE EXHIBITION

This exhibition has a family program that was designed for families who visit the exhibition. If a family decides to do the family program, the storyline is as follows:

The exhibition starts with an introduction movie (figure 5). In this movie Professor Lori explains that she is working for a organization that investigates whether sea monsters really exist. Since she is very busy, she asks for their help. The group/ family that visits the museum together, takes one booklet and six wooden fiches. In the booklet, questions are asked about several sea monsters, that can be found in the exhibition (figure 6, 7 and 8). The questions can be answered by tearing the pages of the booklet. At the end of the exhibition there is a answering exhibit (figure 9), where they can answer to the research questions by putting the fiches into a pipe.

Visitors can also decide not to do the family-program and instead visit the exhibition independently and explore all sea monsters by themselves.

Figure 5. The introduction movie

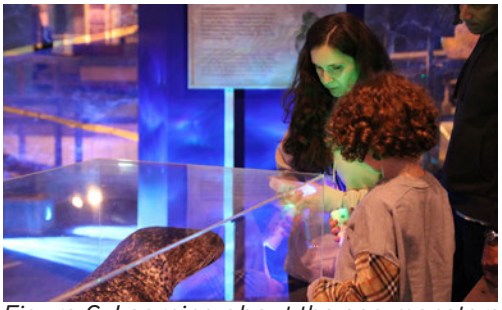


Figure 6. Learning about the sea monsters


Figure 7. Learning about the sea monsters


Figure 8. Discover sea monsters


Figure 9. Giving your answer to professor Lorelei, by using the fishes.

1.3.5 ANALYSING THE GOALS OF THE EXHIBITION

Since the goal of the project is to develop a method to evaluate the exhibition, it is interesting to understand what the goals are that were originally set by the museum during the development of the sea monster exhibition. Measuring whether these goals are achieved could be interesting to include in the evaluation.

LITERATURE ON EXHIBITION GOALS

Research of the Amsterdam University of Applied Sciences (2019) identified different kind of goals a museum could strive for in their exhibitions:

- Knowledge transfer: attain ew information
- Arouse interest: interest visitors in the topics
- Make it personal: make the topic relevant for the visitors
- Story: telling a unique story
- Collection: showing a special collection
- Touch emotionally: touch the visitor with the story and / or the collection
- Inspire: let visitors reflect on the story and encourage them to take action
- Relaxation: offer visitors a relaxed and fun experience
- Social behaviour: invite visitors to talk to each other
- Target group: appropriate to the current target group, but also looking for ways to involve new target groups.
- Connection with current events: the content of the exhibition is in line with a trending topic
- Quality in content and appearance: quality is paramount in terms of both content and appearance.

GOALS OF A FAMILY EXHIBITION

Looking at these goals, there are three goals that are very important to strive for while designing a family exhibition. These goals are:

- Knowledge transfer: The MMR wants to teach children about the maritime world
- Social behaviour: Family exhibitions are always designed in a way that families can explore the exhibitions together and learn from each other. This is called intergenerational learning.
- Relaxation: Most families who visit the MMR are experience seekers. The MMR is aware that families visiting the museum have a lot of options to spend their free time. Therefore, they have to keep coming up with innovating experiences to keep their core target-group coming to their museum.

GOALS IN THE PROJECT-BRIEF OF SEA MONSTERS

During the design process of the exhibition, several educational goals were set. The idea was to measure and evaluate these goals, but so far, this did not happen yet.

Educational goals

The educational goals were set to determine what the museum wants the visitors to teach the visitors with the exhibition.

- For parents and children: transferring knowledge about ancient stories from the adults to the children.
- For children: the goal is that they understand that some sea monsters really exist and some sea monsters are made up. Furthermore, they should be able give reasons why sea monsters are made up.
- Reasons that come back in the stories:
  - we come across unknown animals that we just partly see. We make them into monsters because we cannot place them
  - we invent a monster to attract more tourists
  - we have consciously made up a sea monsters to scare people
  - we are at the sea for months, go crazy, and see things that are not there
  - we also enjoy sea monsters, scary stories and enjoy fantastic stories, because fantasy is also to be enjoyed.
- That they can name parts that make something monstrous:
  - size
  - invisibility / living in the dark
  - unexpected and aggressive behaviour
  - sharp teeth
  - no human / recognizable form (one eye / eight arms).
- A little more for the parents alone: the understanding that the stories that are told in the exhibition are cultural stories. The stories are sometimes hundreds of years old, and they are of all times.

Interaction goals

With regard to physical things in the exhibition, the project team decided that they would like to use them for an educational purpose and not just 'to play'. For example: climb a staircase and discover how big a whale is by sitting on its back.

1.4 GOALS OF THE EVALUATION

The museum attaches great importance to a thorough evaluation of it's services, exhibitions and educational programs. Qualitative feedback helps to identify points of improvement and to learn from previous weaknesses or mistakes. There is no better way to improve the overall museum experience than to carefully listen to what visitors have to say about the museum and to learn from that. In paragraph 1.1. you can find the specific assignment for this project as proposed by the MMR. Although it gave a good overall impression of what the museum is looking for, one specific question remained unanswered; what exactly does the museum want to achieve with (the outcome of) the evaluation process? Without a clear answer to this question, it is impossible to collect the right data and to find the a right way to process them. Therefore, it should first be determined what the museum really wants to achieve with the evaluation of their exhibitions.

1.4.1 POSSIBLE GOALS

A museum could have various reasons to collect qualitative feedback. Three possible goals will be explained in this paragraph (figure 10).

POSSIBLE GOAL NUMBER ONE

As a first possibility, the data received from the research could be useful to present within the organization to proof the success of an exhibition to other organisational departments.

POSSIBLE GOAL NUMBER TWO

Secondly, a goal could be to collect insights to form a database of insights which will be accessible for the whole organisation. This can help project-groups to make better decisions while designing future exhibitions.

POSSIBLE GOAL NUMBER THREE

Furthermore, the feedback could uncover issues within the exhibition that can be tweaked and therefore improve the exhibition.

Of course one goal does not necessarily stand in the way of the other. Nevertheless, it is good to know which goal is the most important one to the project office. Processing feedback is a very time-consuming process and therefore it is impossible to collect and process infinite amounts of feedback. Having a clear goal creates the possibility to ask more specific questions, which result in the most useful feedback from visitors.

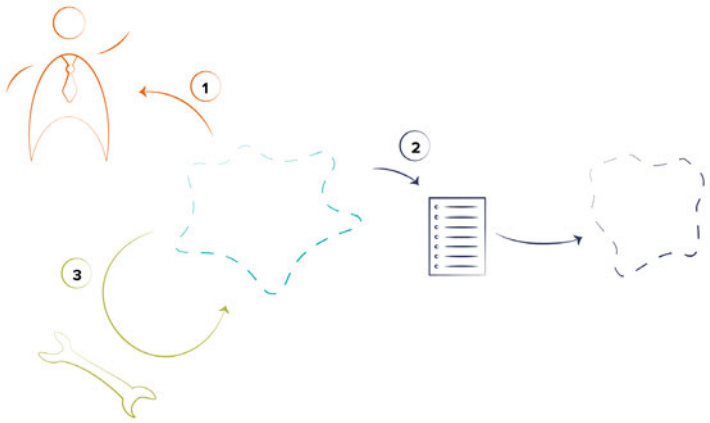


Figure 10. Possible goals for collecting feedback

1. *Proving the success of the exhibition within the organization*
2. *Collecting takeaways for future exhibitions*
3. *Finding weak spots within the exhibition to improve these aspects*

1.4.2 DEFINING THE GOALS OF THE PROJECT OFFICE

To attain a better understanding of what kind of information the project office is looking for, a meeting was held with the complete project office. The project leaders set up a list of questions they would like to have answered. When analysing the questions in the lists, some themes were distinguished. All questions can be found in the list below, sorted into these several themes.

Value of types of information transfers
- What do people think about the methods of transfer; reading, digital, interaction etc.
- Are texts appreciated?
- How long can texts be to be read? And does it matter what form the text is in?
- How long can videos last? And does it matter in which setting? (Perhaps too specific)

Improvements
- Concrete starting points for new exhibitions: what transfer methods make sense, do things really transfer? Which methods do people like?
- What kind of goals are easily measurable and therefore good to include in the project plans?

Learning
- Do people think the exhibition is interesting?
- What do visitors learn?
- Are the educational goals achieved?

Appreciation of collection
- Is the collection presented in the correct way?
- Is collection appreciated? If so, why?
- Which monster is rated the highest and which one the lowest? Why?

Amount and difficulty
- Is the content in the exhibition too easy or too difficult?
- Does the exhibition give too much or too little information?
- Is the exhibition too short or too long?
- How long do the visitors want to be in an exhibition such as the sea monsters?

Aesthetics
- Is “decor” (beautiful setting) appreciated?

Participation
- Is interaction appreciated? Should this be digital or not?
- Should visitors be given a role in the exhibition (so that they can do something themselves) or not?

ANALYSING THE QUESTIONS

When looking at the list of questions, there are some questions that will give different, specific answers to every exhibition. It can be said that these questions can be answered on an individual level. Other questions are more general and are asking for a more general answer; those are questions on a general level.

Individual level

Whether the exhibition has the correct length and difficulty level are examples of questions that have different answers for each exhibition.

General Level

The questions about the value of the types of transfer and the questions about participation are examples of issues on a higher level. Every exhibition that is being researched can contribute a little to the clarification of these questions. By collecting insights from several exhibitions, an increasingly better picture of the answers to these questions will arise.

So, for this project questions at an individual level will be asked. Subsequently, the insights resulting from this will contribute to the answering of the questions on a general level.

CONCLUSION

The questions were discussed with the project leaders. Together two bigger, more general wishes were formulated covering all the questions they had. The following wishes arose:
- A better view on strong and weak aspects of an exhibition (individual level)
- Takeaways for future exhibitions (general level)

When looking at the possible goals as defined in paragraph 1.4.1, this would be goal number 2: ‘Collecting takeaways for future exhibitions’. This does not mean that the other goals are not interesting at all. For this evaluation it is known that the other goals are less important.

1.5 TOOLS AND METHODS FOR GATHERING FEEDBACK

There are several ways to gather feedback. Different kinds of methods result in different kinds of feedback with a different amount of deepness. See figure 11.

1.5.1 SURVEYS: INTERVIEWS & QUESTIONNAIRES

Interviews give a look into what people say and think. The information is quite superficial, but on the other hand it is usually relatively quick and easy to gather and process. Interviews can be taken in real-life or on paper. In case of taken on paper, it is called a survey or questionnaire (Aasbakken, 2011).

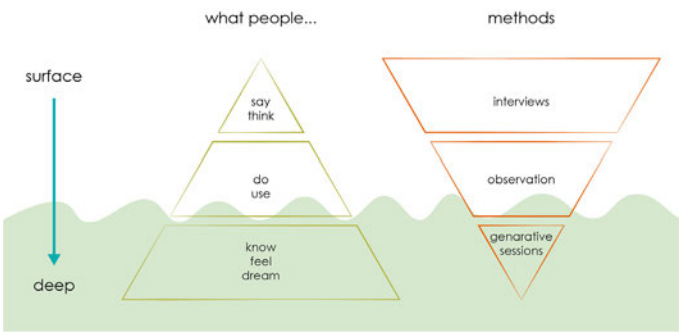


Figure 11. Adjusted from (Sanders & Stappers, 2012)

TYPES OF INTERVIEWS

Structured open-ended interviews

This type of interview contains standardized questions. In this way, all interviewees are getting the same kind of stimulus. It also synchronizes the interviewing between team members.

Interview guide approaches

A guide approach-interview has defined topics, but no concrete questions. This makes the interview more flexible. However, the results are also getting more fuzzy.

Conversational interviews

Conversational interviews are highly interactive. The interviewer is not only leading the interview, but also reacts and shares their own experience during the interview.

Focus groups

The last type of interview is a focus group. A selected group of users is gathered to discuss their experiences. They can react to each other's remarks. The interviewer becomes a facilitator in this group.

TYPES OF QUESTIONNAIRE

A questionnaire often contains closed-ended questions with a set of answers. Nevertheless, a questionnaire can also contain open questions.

1.5.2 OBSERVATION

Observations are used to give deeper insights. It results in knowledge about what visitors do and how they use an exhibit.

STRUCTURED OR UNSTRUCTURED

Observations can be done in a structured or unstructured way.

Unstructured

Observing without a structure can give surprising and rich information. At the downside, the information can be very divers, containing quit some irrelevant information and this can be a lot to process. Besides that, the observatory can influence the outcomes a lot.

Structured

To make the data of the observation better to process, a structure can be set up by following the next steps:

1. Determine the focus of your observation
2. Develop observation guides and forms
3. Recruit and train observers
4. Carry out observation
5. Analyse and interpret findings

CODING SCHEME

To create a certain kind of regularity in the observations, a coding scheme can be used. This scheme defines some codes that can be used while making notes during the observation. In this way, different observers document observations in a similar way, which makes it easier to process the data.

1.5.3 GENERATIVE SESSIONS

During generative sessions, participants are asked to create something to show their opinion and feelings. The gathered information is not about what the participant created, but about the explanation he or she gives about the creation.

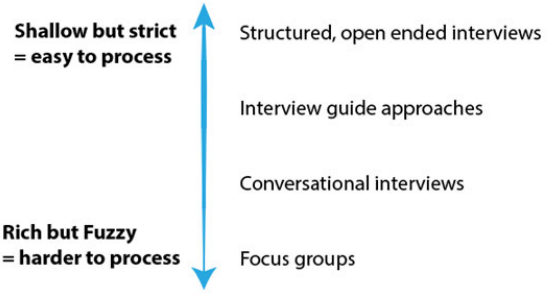


Figure 12. Adjusted from (Aasbakken, 2011)

1.6 CURRENT SITUATION AT THE MMR

The MMR currenly has a good design process, resulting in impressive exhibitions. Despite the fact that they already have some systems to collect feedback from their visitors, they are looking for more ways to evaluate their exhibitions.

OBSERVATION

Now and then, project leaders themselves go sit near an exhibition and observe what happens. However, a plan for this was never made. Problems and reactions are simply remarked. Sometimes this leads to adjustments within the exhibition, such as replacements of chairs or signs.

FOLDER AT THE INFORMATION DESK

At several places in the museum there are information desks (figure 13). There is always a public employee present at these desks, to answer questions of the visitors and supervise the exhibitions. Furthermore, there is a folder at place with a format where the public employee can note remarks.

QUESTIONNAIRE

During one of the exhibitions, namely the offshore experience, visitors are asked to fill in their e-mail address to receive a photo that was made during their visit. At this point they are also asked whether the MMR may send them a questionnaire about their visit. At the end of the small questionnaire they received per email, they are asked whether they also want to fill in a larger questionnaire. This questionnaire is very extensive, but is particularly focussed on the complete museum experience. It does not go into detail about the different exhibitions. The only thing asked about the exhibitions is to grade them. This gives the project office very little insight on what the stronger and weaker parts of the exhibitions are. Besides that, the questionnaire is filled in some time after the visit, which greatly influences the opinion of the visitors. Details might have faded away and only the overall impression remains on which the visitors base their opinion.

Furthermore, only the visitors who have done the offshore experience receive the questionnaire. This means that groups of people who are not interested in the offshore experience are not included in the research. Therefore, the gathered information is not representative for all the museum visitors.

COMPLAINT/TIP CARDS

At several places in the museum, visitors are able to fill in complaint/tip cards (see figure 14). These cards can be handed in at the information desks. The cards are sorted and given to the right department to handle the complaints/tips. After the card is processed, it is often thrown away.

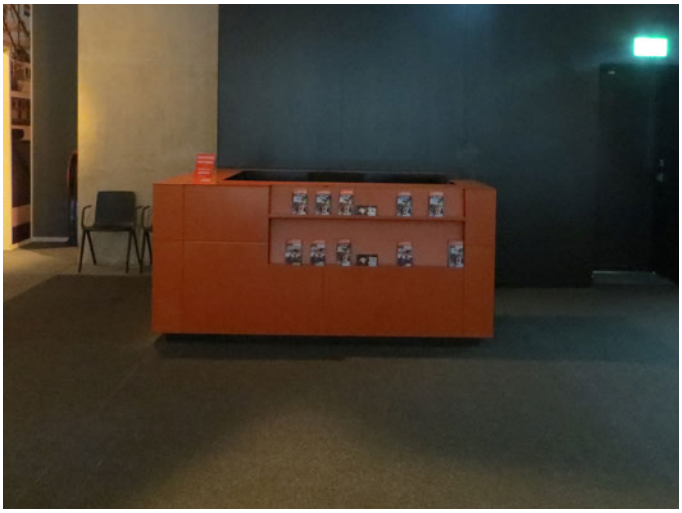


Figure 13. Information desk

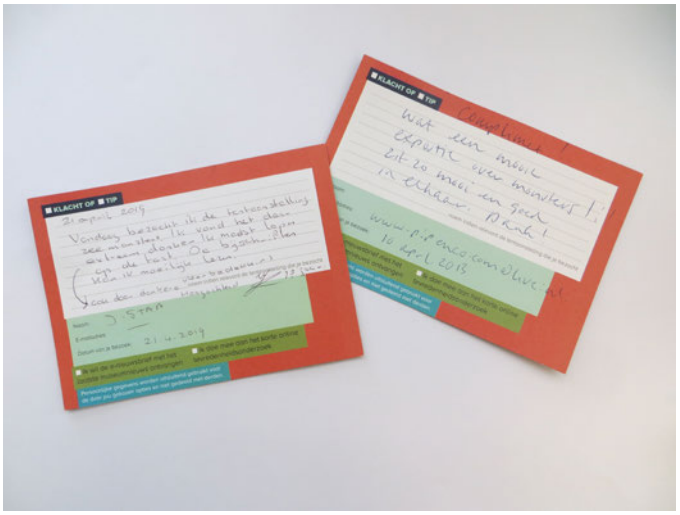


Figure 14. Complaint/tip cards

1.7 OTHER PROJECTS

Some previous projects by other researchers seem to have a great overlap with the goal of this project. It therefore can be used as a great source of inspiration for this project. First, there is the graduation project of Simone de Jong (2018). Secondly, the Amsterdam University of Applied Sciences (2019) did some interesting research concerning designing interactive exhibitions. Lastly, there are some museums who have interactive feedback columns in use in there museum. All of these projects are explained in more detail in this paragraph.

1.7.1 INTERACTIVE FEEDBACK COLUMNS

There are some museums who make use of interactive feedback columns to gather feedback. These columns could be a source of inspiration for this project.

FEEDBACK SMILEY

One of the most well-know systems to gather information about your customers' experiences is the feedback smiley system. A Feedback Smiley unit is always accompanied with a question about the experience of the customer. The customer can choose a smiley matching with their answer to the question. This way, the unit gathers the information about (figure 15).

Figure 15. Feedback Smiley unit. (Feedback Smiley, n.d.)

STAR-RATING COLUMN @ NATIONAAL MILITAIR MUSEUM SOEST

The Nationaal Militair Museum Soest has placed a star-rating column at the end of every exhibition. This column has some similarities with the feedback smiley system, but now the visitors are asked to rate the exhibition with an amount of stars. Interesting to see is that there is a different column for children and adults (figure 16)

Figure 16. Interactive display @ Louwman museum. (Interactive display Louwman museum , n.d.)

INTERACTIVE DISPLAY @ LOUWMAN MUSEUM

In the Louwman museum a display is placed near the entrance and exit. Visitors can receive, give and share information on this digital column. Visitors can easily give a review via the screen that is automatically added to the website. In addition, visitors can also make a recommendation by sharing their experience in real time via social media. Since the interactive column has been added, the number of daily reviews has increased enormously and the museum is collecting important recommendations via social media. Through the daily reviews, the potential visitor is able to read the current opinion of others about the museum. At the same time, the reviews are also used as a quality control. The museum can react on the positive and negative aspects visitors inform them about (figure 17).

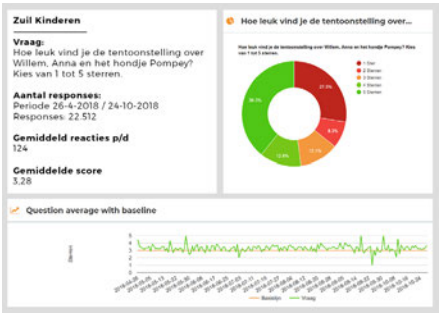


Figure 17. Output of the start-rating column @ Nationaal Militair Museum

1.7.2 THE EXHIBITION DESIGNER OF THE 21ST CENTURY.

ABOUT THE PROJECT

The project "The Exhibition Designer of the 21 century" is a research project conducted by the Amsterdam University of Applied Sciences. The research is published in Dutch and officially is called "Tentoonstellingmakers van de 21ste eeuw". It is therefore shortened as TM21.
The main subject investigated in this project was the impact controlling narrativity, atmosphere, digital media and participation have on the degree to which visitors are touched, inspired and have learned something. During the research there was an active collaboration with thirteen museums and five design agencies on how exhibition makers can make more well-grounded decisions (Amsterdam University of Applied Sciences, 2019c).

The aim of the research was to develop an evaluation and management model that gives exhibition creators more insight in offering a visitor experience so that visitors learn more about the content of the exhibition and are inspired and touched (Amsterdam University of Applied Sciences, 2019c).

USEFUL TOOLS FROM THIS PROJECT

The research resulted in a publication that explains the outcomes of the research and in a tool-kit that helps designers in making more substantiated decisions during the design process.

The tool-kit: Evaluate design decisions

A tool-kit was created to help exhibition makers to be more conscious about the decisions they make while developing a new exhibition (figure 18). It helps in becoming aware of the assumptions exhibition designers have about the impact of specific design decisions on visitors (Amsterdam University of Applied Sciences, 2019b).

Methods: Examining Draft assumptions and visitor's experience

During the project several methods were used to find out what design decisions exhibition designers make and what impact these decisions have on the visitor. Researchers used interviews, questionnaires and observations (Amsterdam University of Applied Sciences, 2019a).

DISCUSSION

The TM21 project might give some useful handles to use during this project. A part of the tool-kit contains a method to determine the goals and assumptions for the exhibition.

Figure 18. The TM21 tool-kit (Amsterdam University of Applied Sciences, 2019c)

1.7.1 GRADUATION PROJECT SIMONE DE JONG

ABOUT THE PROJECT

In 2018, Simone de Jong did a graduation project about letting children give constructive feedback to improve museum experiences. It is important to understand the similarities, but also distinguish the differences between the project of Simone de Jong and this project.

De Jong created an application which visitors install on their own mobile phone. They are asked to make pictures of situations in the museum that they want to give feedback upon. The visitor is asked to match this with a feeling. Next, they can record a voice memo to explain their opinion better (figure 19).

DIFFERENCES

The first difference is that the project of de Jong focusses on children alone, while in this graduation project there is also an interest in the opinion of adults.

Secondly, the project of de Jong resulted in an application which people install on their own phone. For this project, it is not desired that the final result is an application.

Next, the solution of De Jong only gathers feedback about the elements in the museum that stand out. It does not ask any questions about elements that stand out less.

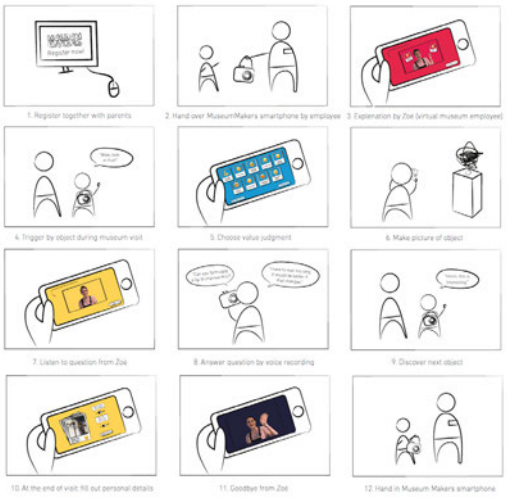


Figure 19. Storyboard of the concept created by De Jong. (de Jong, 2018)

1.8 REVIEWING EXISTING TOOLS

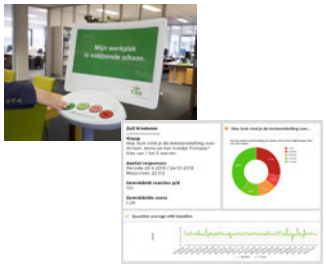
In paragraph 1.5, methods to get feedback are already discussed. For this project, methods are not only researched, but the aim is to also create a tool around these methods. This tool will be part of the complete evaluation process that is designed.

In the previous paragraph, paragraph 1.7, several tools were already mentioned, that are already used by museums or are created in other projects. To attain a better understanding of the wishes and demands tool, these existing tools are analysed in this part.

1.8.1 OVERVIEW OF STRONG AND WEAK POINTS OF EXISTING TOOLS

The analysis of the existing tools resulted in the following overview of the positive and negative elements of the tools from a perspective of this graduation project.

SMILEY COLUMN / FEEDBACK COLUMN NATUURHISTORISCH MUSEUM



(Feedback Smiley, n.d.)

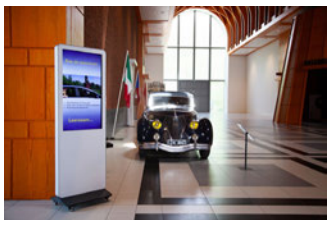
+

- Requires very little effort for the visitor
- Very simple in use

-

- If put at the end of the visit of the exhibition, the information is too general. Placing the column within the exhibition takes up too much space and would influence the flow of the exhibition experience.
- Children will push the buttons randomly for fun. This will make the results less representative.
- Collects quantitative data, while for this project, qualitative data is desired.

FEEDBACK COLUMN LOUWMANS MUSEUM



(Interactivezuil Louwman museum, n.d.)

+

- Does not influence the visit
- The social media part is good marketing for the museum.
- Very transparent to all visitors
- Very qualitative

-

- The opinion of visitors is about the total experience of the museum and the goal is to gather information on one specific experience. (Although, when being placed right after the exhibition visit, visitors might fill in feedback more focussed on the exhibition)
- It is expected that mostly parents will give the feedback and not the children.

PROJECT SIMONE DE JONG

(de Jong)

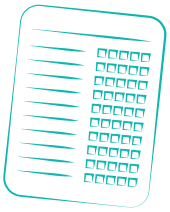
+

- Making use of emotions
- Qualitative feedback

-

- It is an app that makes use of the visitor's own device. The MMR is not a big fan of this.
- It only gives feedback about things that stand out.

QUESTIONNAIRE HVA TM21



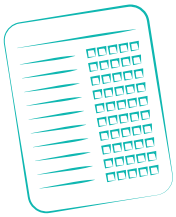
+

- Extensive information
- Very straight forward to conduct
- Low tech, so it is quickly to implement and has low costs

-

- It takes very long for visitors to fill in
- It is quite boring to carry out for the project office
- There is no space for open answers
- A lot of data only gets interesting when the data is collected from a numerous amount of visitors.
- It is complicated for children

OBSERVATION FORM HVA TM21



+

- Extensive information
- Very straight forward to conduct
- Low tech, so it is quickly to implement and has low costs

-

- It takes a lot of time for the project office to conduct
- It is quite boring to carry out for the project office
- The visitors will behave differently when they are followed with a form. Exhibitions in the MMR often have lots of corners, so following them can not be done unnoticed.

1.8.2 CONCLUSION

From the positive and negative points of the existing tools it can be determined what elements are desired to be reflected in the tool designed for this project.

A first point that stands out, is that the project office is looking for a tool that is really fun to use. This refers not only to pleasure for the visitor, but also for the person from the project office who carries out the research. Evaluating is often seen as a boring process. The tool that will be developed must break this idea. Furthermore, it is preferred that the visitor and the project leader who is involved, enjoy the process.

Additionally, it was already known that the project office is looking for qualitative information. Only the feedback column from the Louwmans museum and the design by Simone de Jong provide qualitative information. It is clear that in the final design, visitors will be asked open questions, making it able for them to explain the ‘why’ behind their opinion.

1.9 CONCLUSION: THE ASSIGNMENT

In this paragraph I will take in account all the information I gathered in this chapter and combine it to one assignment

PROJECT GOAL

To design a method to qualitatively evaluate family exhibitions at the MMR. Supported by a tool that helps the project office to evaluate interactive family exhibitions.

USERS

In this project there are two groups of users:

- The process should be conductable by one project manager and a project supporter.
- Families who visit the sea monsters exhibition.

WISHES AND DEMANDS

- The method has to give insight into the strengths and weaknesses of the exhibition
- The method collects takeaways for future exhibitions
- The method will make use of a fun, interactive tool
- The MMR will need no more than three days with two people to execute the complete process. (The presentation of the outcomes do not have to be included in this time)
- The method has to be suitable for various family exhibitions
- The method has to be applicable for visitors of 6 to 80 years years old

TESTCASE

The sea monster exhibition is used as a test-case for this project. Tools which are made have to be able to be transformed to be applicable to evaluate other family exhibitions as well.

Figure 20. Pictures of the sea monster exhibition

OUTCOMES

This project will work towards a tool-box which contains all things that are necessary to conduct the method.

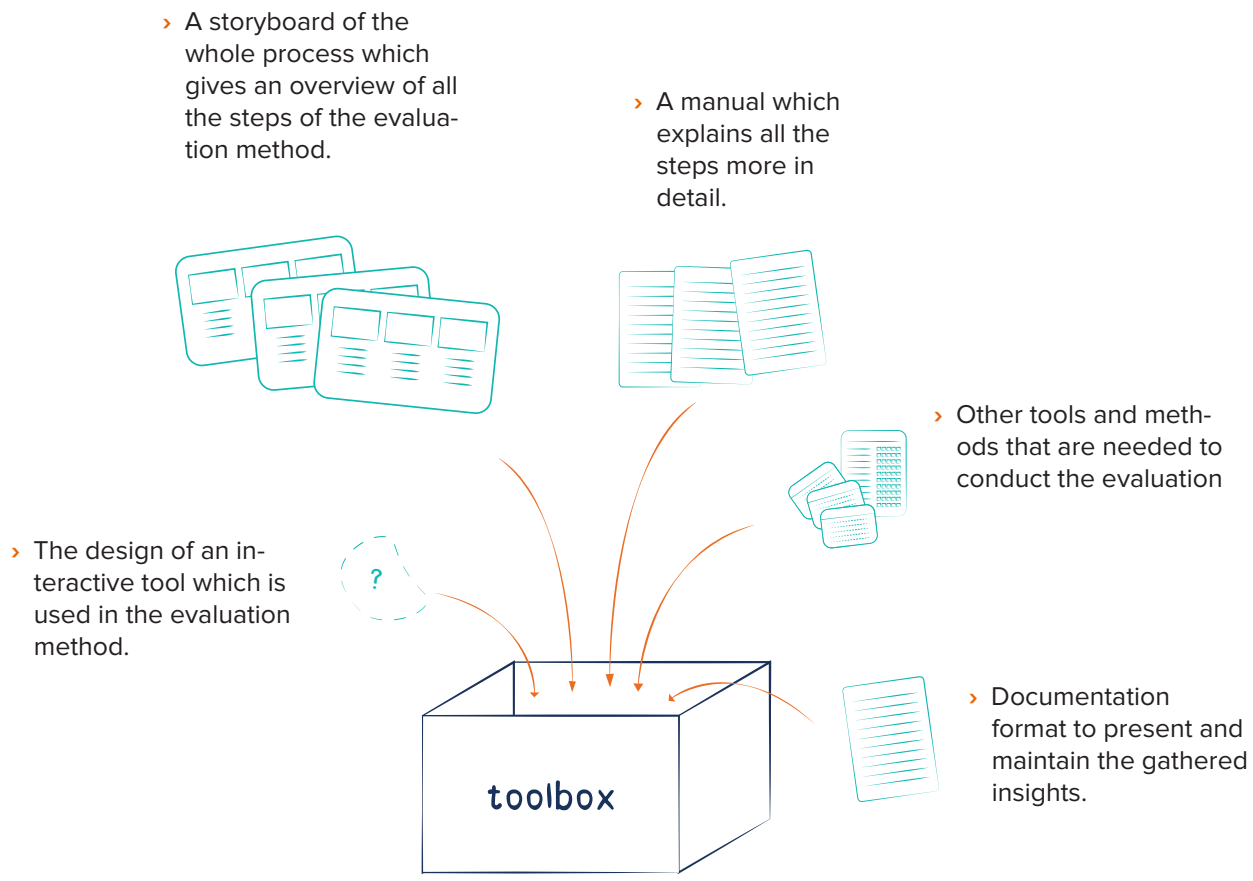


Figure 21. Elements of the tool-box

APPROACH

In the following chapter (2), a framework for the storyboard of the evaluation process is set up.
The tools that can be used in the evaluation method are explained more extensively. Existing tools and methods will be used as a source of inspiration to come up with a fun and interactive tool to use during the evaluation process. Thereafter, the scope is set by deciding on what parts of the evaluation process to focus on.

2.

SCOPING

In the last paragraph of chapter 1, paragraph 1.9, the elements that will form a tool-box that can be used by the project-office to set up the evaluation of an exhibition are defined. A framework containing all basic steps of the evaluation process will be created and the most crucial steps of the evaluation are selected to explain in more detail. This is used to narrow down the scope of the project.

2.1 FORMULATING EVALUATION QUESTIONS

To create a tool thatl helps to collect the right data in the evaluation process, a better understanding of what kind of answers the project office is looking for is needed. This paragraph will be devoted to this issue.

2.1.1 OUTPUT OF THE TOOL

In this paragraph, the aim is to get a better feeling for what the project office wants to know, by looking at the data which the tool will collect. What kind of output is desired as a result from the tool? Several graphics are designed for this, to see what graphics would create enthusiasm among the project leaders. If one of the graphics stands out, it is known what data should be gathered in the evaluation process.

In chapter one the following goals were formulated:
› Attain a better view on strong and weak aspects of an exhibition
› Gather takeaways for future exhibitions

With these goals in mind, different options of output were designed.

DIFFERENT OPTIONS FOR OUTPUT

Scaling your feeling

Figure 22 and figure 23 show graphs that could be a starting point to ask further upon. By making the emotional journey of visitors visible, they become more aware of their moods-wings and are able to explain what caused them.
This collection of data to create these visualisations could be done during the visit of the exhibition or afterwards.

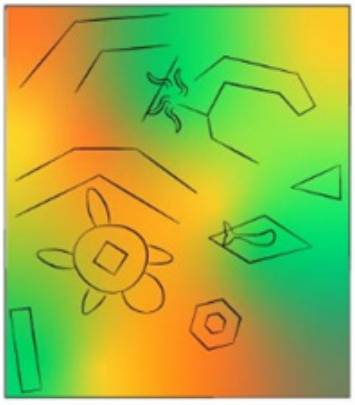


FIgure 22. emotion heatmap

Regarding place

The emotion heat-map as shown in figure 22 indicates which areas within the exhibition are rated with a high score and which areas are less appreciated. This is shown by using green colours for positive scores and red for negative scores.

Figure 23 shows the data of one person. It shows the places where the feedback is given, to make the information more specific. The size of the circles differ in size, according to how much time someone spents at a certain location.

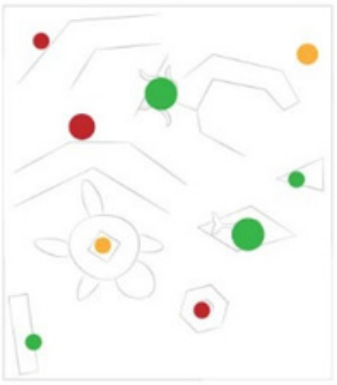


FIgure 23. emotion heatmap of one person

The graph could also show the data of several persons. In this case the size could indicate the amount of people who gave input about this place.

Regarding time

Another output form could be the emotional journey. This graph is filled in by the visitor. This graph shows the moodswings the visitor experiences during the visit of the exhibition. An example is shown in figure 24.

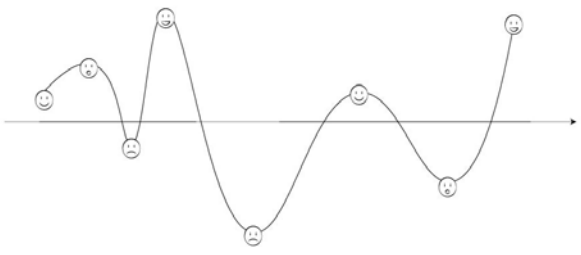


FIgure 24. emotional journey

Rating on enjoyment & showing distrubution

The graph in figure 25 shows how much the different age groups value different exhibits. It is also visible how the data is distributed.

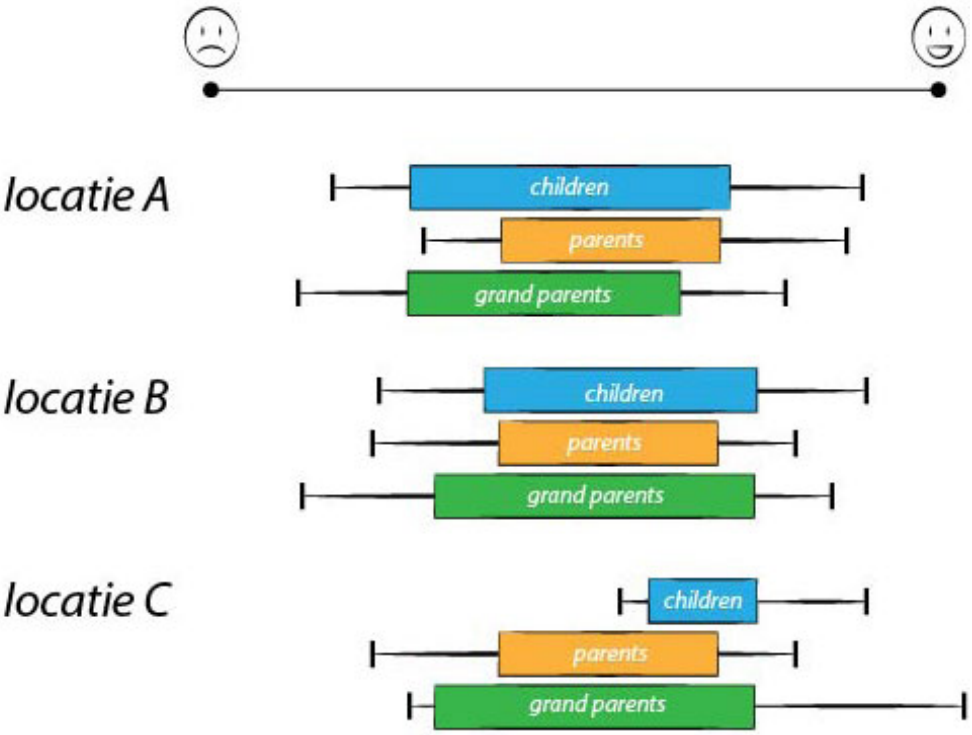


Figure 25. Rating enjoyment & showing distribution

Rating exhibits on different aspects

Perhaps the degree in how much visitors like something is not what the museum is looking for. The graph in figure 26 shows the different exhibits evaluated on different factors. In this specific example, the choice was made for how educational, fun and important the component is found in the exhibition. Of course, this rating of different factors could also be applied in some of the previous options.

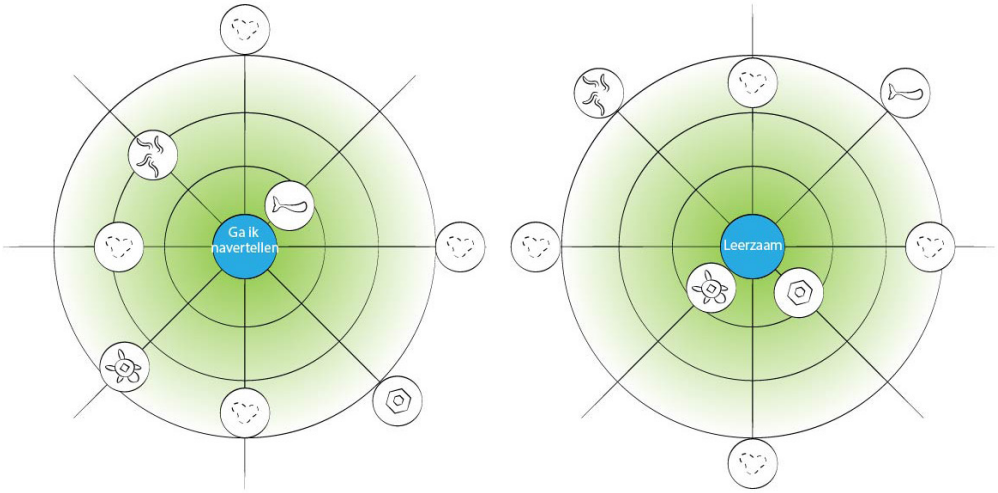


FIgure 26. Rating exhibits on different aspects

The relationship between elements

The pie chart in figure 27 shows how important the various factors are for the total visitor experience. Important to realise here is that this graph would help a lot, but that compiling it will probably become be very subjective.

FIgure 27. The relation between elements

Labelling the exhibits

The overview in figure 28 shows which words visitors often mention for each exhibit. They are asked to classify the different pre-set labels to the different exhibits. Which one did they find exciting, funny or boring? The darker the label, the more often the label is assigned to this exhibit.
This overview can be made for all data that has been collected, but could also be made per age category.

Insight cards

The positive and negative results of the study can be recorded on insight cards (figure 29). These cards can help to make better design decisions during the development of new exhibitions.

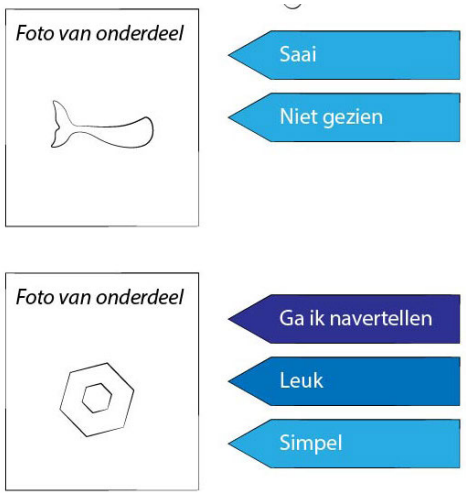


FIgure 28. Labelling the exhibits option 1

FIgure 29. Insight cards

DISCUSSION

To determine what forms of output are interesting, the various options were discussed with the main client project leader.

Unexpected outcome

As stated before, the visuals were expected to be useful to help defining more concrete goals for the evaluation. However, it appears that the visuals were not particularly helpful to define the goals, but were mainly helpful on a subsidiary level.

First of all, an important thing that came up was that none of the options provided sufficient qualitative feedback on itself. It was noted several times that the visualisations are a good way to get an indication of the stronger and weaker elements of the exhibition, but they do not explain the reasoning behind peoples' thoughts and feelings about an exhibition, while this is precisely what should be detemined.

From the discussion it was realised that the visualization should:

- Visualize data collected by a specially designed tool.
- Help the project leaders to ask interesting questions during an interview.
- Create enthusiasm among the project leaders to work with.

The heat-map

During the meeting, the heat-map drew attention to it right away. The main client project leader indicated that it gave a strong visual impression of the appreciation of the exhibition. As a result, it immediately arose more "why" questions. Therefore, the visualization seems to be very suitable for this project. The heat-map seems to be able to help the project office by finding unexpected reactions within the exhibition and with formulating questions about this. Furthermore, it was noticeable during the meeting that this visualisation had a certain fun factor and aroused curiosity.

Critical view

A point of discussion which arose from looking at the heat-map, was the unclarity about what people base their opinion on when asked to rate several places with a smiley (:(, :), :/, or *). Will they rate how much they enjoy themselves or do they consider the overall opinion of the group they are visiting the museum with? Is it really desired to understand how much they like a certain element or is it rather desired to sample a specific emotion?

CONCLUSION

The different kinds of output were originally designed to create a better view on the evaluation questions. Surprisingly, talking about the design of the heat-map created other insights, which resulted in the decision to create a tool that collects data which can be visualized into a heat-map. The heat-map will be used to create structure in an interview.
It is still needed to clarify the evaluation questions better. The next paragraph will explain this further.

2.1.2 AN EXISTING TOOL TO FORMULATE EVALUATION QUESTIONS

In paragraph 2.1.1 it was decided to continue with the heat-map. However, a clarification of the museum's evaluation questions was not found yet. The TM21 tool-kit, created by the Amsterdam University of Applied Sciences, might help with this.

THE TM21 TOOL-KIT

In paragraph 1.7.2, the TM21 tool-kit was already discussed. This tool-kit is used during the design process of an exhibition and helps to define assumptions and goals for exhibitions, which can be reflected on later. Although the design process of Sea Monsters is already finished, we could try to remember what assumptions could have been formulates when we would have used this tool-kit in an earlier stage. By doing this, it can be defined whether the tool-kit is useful to determine the evaluation-questions for a future evaluation.

REFLECTING ON THE TM21 TOOL-KIT

The tool-kit claims to be useful during all four stages of the design process. Namely the concept & strategy phase, the design phase, the exhibition phase and the evaluation phase.

Assumption cards

The tool-kit contains assumption cards. These cards are filled in during the design phase. During the exhibition phase, some of these assumption cards are selected to test. During the evaluation phase, conclusions are made and useful assumption cards are selected and preserved. These insights can be used during the design of future exhibitions.

If the tool-kit would be used during a project-group meeting, formed assumptions and success factors would be formulated as follows:

Example of an assumption

- As [fill in role] I expect that [name of part] will have an effect on[name role, e.g. the visitor], so that [goal].
- As a designer [role] I expect the use of colour on the floor [part] can contribute to a clearer routing of the exhibition [effect], so that visitors know better what to find where[goal].

Examples of success factors

The expectation is a success if:

- observations show that visitors follow the routing;
- the survey shows that visitors provide at least a 7 for the routing.
- interviews show that the routing contributes to a better understanding of the exhibition.

Let's give it a try!

The tool-kit was printed out and prepared and explained to the main client project leader in a meeting. It was imagined to be in the middle of the design phase and played the game.

Discussion

The main client project leader was positive about the TM21 tool-kit. She would see herself using it together with her project group. Especially after the provisional design was delivered by the designer, it would be a fun way to gather feedback to give to the designer. It was also discovered that it is difficult to fill in the assumption-cards afterwards. This means that, in the future, it is important to define the things to test already during the design process.
With this experience in mind, the knowledge that a heat-map wil be used, the previous set goals of the evaluation and the experience of imagining to be in the middle of the design process, three evaluation questions were defined.

Evaluation questions

1. At which places in the exhibition does interaction take place between the child and a parent?
2. What are the weak and strong aspects of the exhibition and is there enough to do for all ages of the target group?
3. Do children think the exhibition is exiting or maybe even too exiting ?

Interesting to notice is that evaluation question 1 and 2 are questions that will be the same for all family exhibitions. Every family exhibition has the goal to let visitors of different ages learn from each-other and at the same time make the exhibition enjoyable for all age groups. Evaluation question number 3 is more specific for the sea monsters exhibition.

FIgure 30. The TM 21 tool-kit

2.1.3 LEAVING SOME THING BEHIND

In paragraph 1.3.2, the motivations of families who visit the Sea Monster exhibition were investigated. Three goals were identified, which are very important to strive for while designing a family exhibition. These goals are:

- Knowledge transfer: The MMR wants to teach children about the maritime world
- Social behaviour: Family exhibitions are always designed so that families can explore the exhibitions together and learn from each-other. This is called intergenerational learning.
- Relaxation: Most families who visit the MMR are experience seekers. The MMR is aware that families who visit the museum have a big amount of options to spend their free-time. Therefore, they have to keep coming up with innovating experiences to keep their core target-group, families from Rotterdam, coming to their museum.

It is interesting to see that the evaluation questions that were formulated are covering two of these goals, namely social behaviour and relaxation. The other goal, knowledge transfer, could be interesting to dive into as well. A possible way to find out what the visitors learned from the exhibition could be by making use of personal meaning mapping. Some research was done on this method. The findings can be found in appendix X.

2.1.4 CONCLUSION

In the search for the research questions, three specific research questions were determined. In addition It was found that there was a shared desire to further develop the heat-mapas a catchy visual to display the data collected with an interactive tool.

This heat-map will be used as a starting-point for a semi-stuctured interview with the visitor. The qualitative information to answer the evaluation questions will be obtained during this interview.

Three evaluation questions were formulated. Two of which are general evaluation questions, which means these questions are questions which will return after every realisation of a family exhibition. The third question is specific for the sea monster exhibition

General evaluation questions:

1. At which places in the exhibition does interaction take place between child and parent?
2. What are the weak and strong aspects of the exhibition and is there enough to do for all ages of the target group?

Specific evaluation question:

3. Do children think the exhibition is exciting or maybe even too exciting ?

The TM21 tool-kit appeared to be a valuable tool in the future for determining the evaluation questions earlier in the process. It was decided that the focus of this project will be on the next steps of the evaluation process and not on the further details on how to use the evaluation tools correctly.

The next chapter focusses on the design of a tool that can be used to collect the data to create an emotion heat-map.

2.2 A DESIGN DIRECTION FOR THE TOOL

To design the tool that will help to create the heat-map, it is needed to know what conditions the tool has to meet. In the previous chapters quite a few of these conditions were discovered. To get an better sight on these wishes and demands, an overview of these demands in paragraph 2.2.1 can be found.

2.2.1 THE DEMANDS FOR THE TOOL

OVERVIEW OF WISHES AND DEMANDS FOR THE TOOL SO FAR

The overview shown below contains all wishes and demands which arose from the previous chapters. The overview also includes some 'open decisions'. These are decisions which not have been made yet, but the outcome of them will result into demands for the tool that will be very determinative for the design. More explanation on these decisions will be given in the next paragraph.

GATHERING DATA

demands
- The tool helps the visitor to match an emotion or the degree of an emotion to a location in the exposition.
  - The tool saves this data.
- The collected data by the tool will be processed to a heat-map.
- The tool is self-resetting: In case the visitor is giving no input, the device will not take the previous input as data.

wishes
- The tool helps the visitor to match an emotion, or the degree of an emotion to the time being in the exposition.
  - The tool saves this data.

open decisions
- What emotion is asked to the visitors to rate?
- At what moment this data is gathered?
- How much data-points should the tool collect per visitor?

USERS

demands
- The tool is used by families who visit the exhibition. Therefore, the tool should be usable for visitors in the age range of 8 to 80 years old.
- All family members will be able to give feedback separately.
- The tool will require guidance of maximum two members of the project office during the testing day. At other moments it should run on its own.

open decisions
- How many visitors will use the tool?
- Will the research be done among preselected visitors or regular visitors?

USER EXPERIENCE

demands
- The tool is considered to be fun to use.
- The tool may intrigue other visitors, but should not distract them too much from their own visit.

wishes
- The tool influences the flow of the actual visit of the exhibition as little as possible.

DECISIONS TO BE MADE

As you can see, the list of wishes and demands in the previous paragraph contains some 'open decisions'. To attain a better insight on these dilemmas, the decisions to be made are explained in this paragraph.

What emotion to ask for?

So far, it was assumed that people will be asked to indicate how much they like the activity or exhibit at a certain location. This would mean they are asked to rate a location on a scale from a happy face to a sad face. However, it is not decided yet what emotion will be asked the visitors to rate. Could it be more useful to rate more specific and sophisticated emotions? For the evaluation question "Do young children feel like the exhibitions is exciting", it could for example be interesting to ask how exited they think the exhibition is at a certain moment. However, this also might make the tool a lot more complicated.

Moment of asking

There are several moments when the visitors can be asked for their feedback. This moment of asking has quite some impact on the feedback and therefore it is important to consider the effect of asking for feedback at the optional moment. Possible feedback moments are:

- In real time
- Right after visiting the exhibition
- At the end of their visit
- After the visit, when they are back home

At the end of the visit or after the visit, details in the opinion of visitors are faded away. These details are precisely what the project aims to discover. Therefore, these two options are dropped. This means asking in real-time and right after visiting the exhibition remain.

The first option is to ask for visitors' feedback in real time, during the visit of the exhibition. The upside of asking visitors about their experiences while visiting the exhibition is that it is the easiest moment for them to reflect on their experience. Especially for kids, it is hard to reflect on situations sometime after it happens.

A big downside is that it has a big chance on influencing the experience, which might affect the feedback they are giving. Especially when you want to ask visitors to give feedback several times, this influence can become quite big. When we choose to work with a tool that collects data in real-time, this is an important effect to pay attention to.

To interfere less with the flow of the exhibition experience, the moment of asking for feedback could be moved to right after visiting the exhibition. Although details might be faded away a little bit, the experience is still fresh in the memory.

Amount of data points

With data-points the amount of locations that are rated with a certain emotion are intended. The heat-map is created by these data-points. Therefore the look and richness of the heat-map is very dependent on the amount of data-points.
How many data points are needed to create a heat-mapthat is useful to structure the interview upon? Is it enough to have one positive and one negative place mentioned for every visitor or are more feedback points desired? In the latter case; are we satisfied when we gather five points of feedback or would we rather have 50 places to be rated?

Amount of visitors

How many visitors should be included in the research to get sufficient feedback to answer the evaluation questions? Do we want 100 visitors to use the tool and thus deliver data, or is data of about ten visitors enough?

The whole research should take not more than three full days of processing with two members of the project office. Interviewing visitors and processing the data that comes from this is a time-consuming job. This means that not all visitors who use the tool can be interviewed when the amount of visitors use the tool is more than 10 to 20 persons, depending on the extensiveness of the interview.

Nevertheless, it can still be very useful to have data collected to create a heat-map from more than these 10 to 20 visitors. By collecting the data-points of more people, it can be seen whether patterns arise from the heat-maps. These patterns can be used to create focus points for the project office to ask further upon during the interviews.

Preselected visitors or regular visitors

The last weighty decision is whether the research will be conducted with preselected visitors who are specially asked to come to the museum to take part in the research, or whether regular visitors are asked to join the research.

Preselected visitors are motivated to take part in the research and know it will take some time and effort. Therefore more of their time can be asked more easily. However, the fact that they signed up for the event also means that they probably are very enthusiastic about the museum. This means that there is a chance that the feedback they give is not representative for all visitors. Furthermore, the amount of people that can be invited to come to the museum for the research specifically is limited.

When making use of regular visitors, there is still a big chance that mostly enthusiastic visitors will take part into the research. The upside is that the amount of people that can take part is not limited in this case.

LET'S CUT SOME KNOTS!

Now that it is known what decisions still have to be made, it is time to decide!

Dilemmas which will stay unsolved for now

The amount of data-points and the moment of asking are aspects with not enough feeling yet to decide on and what emotion to ask for is very depending on the format of the tool. Therefore, these decisions are left open for now and there will first be looked into what ideas emerge in paragraph 2.2.2 Nevertheless, the other issues, the amount and kind of visitors, can be decided right now.

Solved dilemma: Amount and kind of visitors

Looking back at the goal of the assignment as stated in the refined assignment in paragraph 1.9, the goal is to gather qualitative feedback; the why behind the feelings of visitors. That is why it was decided to not only create a heat-map, but that also conduct an interview based on the heat-map. Together with the project office, it was therefore decided that it is desired to talk to the visitors in real life. That is why now there will always be a face to face interview held with five families. These families consist out of one or two children in the age-range of six to twelve and one or two adults. More specific criteria could be decided on, depending on the exhibition that is being researched.

Next to this, the tool can be used by regular visitors, which will also generate heat-maps or other quantitative data, that can be used to detect patterns. These patterns might create focus-points for the project office to ask further upon during the interviews with the preselected visitors. These two versions of using the tool are visualised and is shown in figure 31.

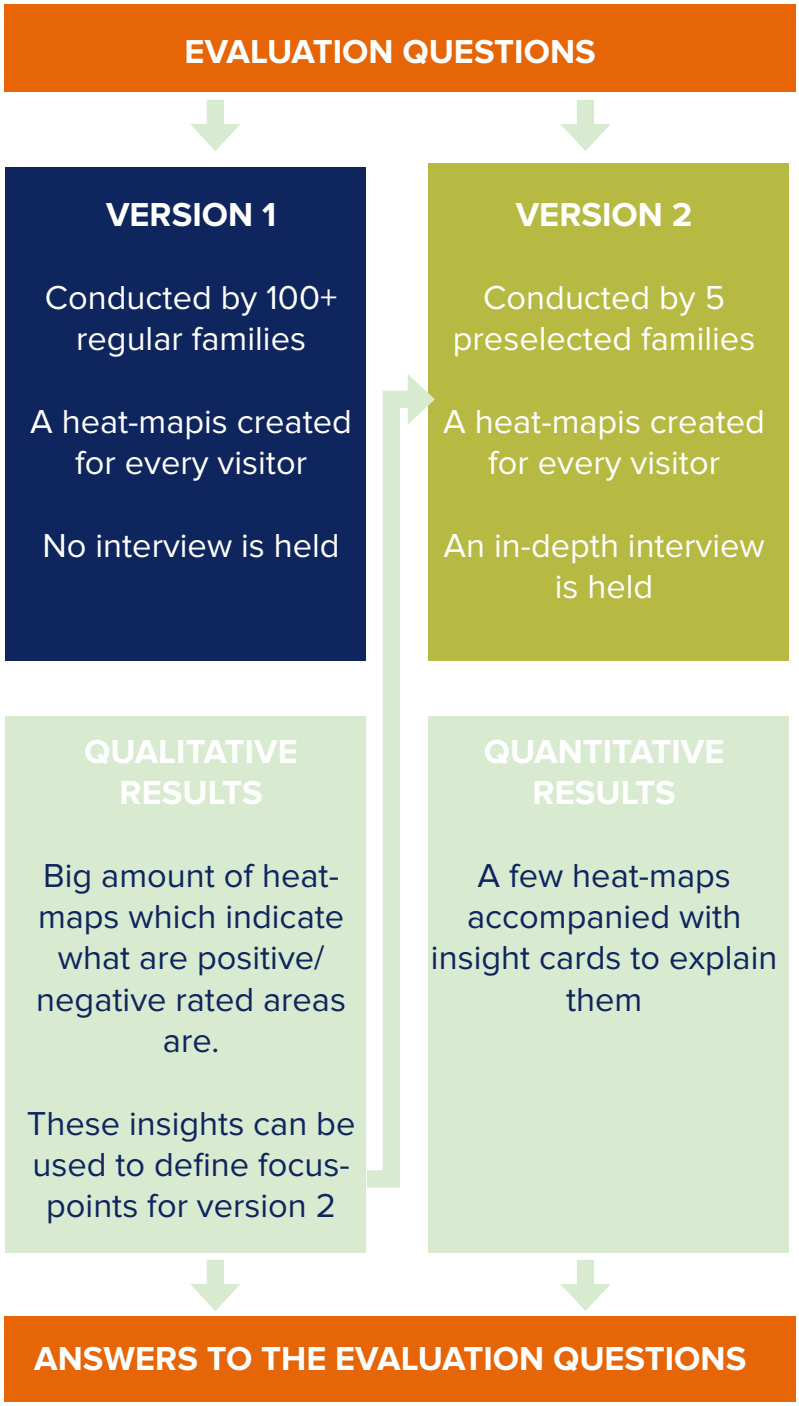


Figure 31. A schematic overview of the evaluation process.

OVERVIEW OF SOLVED AND OPEN DECISIONS

In the overview below an overview of what decisions have been solved and what decisions are still open can be found. In the next paragraph some design directions, who variate on the open decisions are given. By choosing a design direction in paragraph 2.2.3, more open decisions will be set.

SOLVED

AMOUNT AND KIND OF VISITORS

The tool will be used by:

- Five preselected families containing about 4 members each, who will not only use the tool but are also interviewed
- About 100 or more regular visitors will use the tool without being interviewed.

OPEN

AMOUNT OF DATA POINTS

This will be explored further in the next paragraph.

MOMENT OF ASKING

This will be explored further in the next paragraph.

Options

- In real time
- Right after the visit

WHAT EMOTION TO ASK FOR?

This will be explored further in the next paragraph.

Options

- Rating a specific emotion
  - This can be enjoyment :) ---- :(, but also for example excitement
- Choosing matching emotions/ situations from several options. For example:
  - Exited
  - Moment of recognition
  - Learning moment

2.2.2 DESIGN DIRECTIONS

With this list of wishes and demands in mind, an open brainstorm was done about possible tools that can be developed for gathering data to create the heat-map. Various ideas have emerged from this and brought back into three directions:

1. gamified questionnaire
2. labelling floor plan
3. portable tracking device

This paragraph will explain each of these directions by showing a basic example of what the tool could look like if it is decided to go further into that specific direction.

DIRECTION 1: GAMIFIED QUESTIONNAIRE

The first direction is a gamified questionnaire. This questionnaire contains questions similar to the questions as asked in the TM21 research. The questionnaire used in that research was very long and traditional. The core idea of this design direction is making filling in the questionnaire feel like a game or a fun activity on its own. This way, visitors will be motivated to fill in the questionnaire. Questions that will be asked are for example:

› What feelings did you experience in this space?
  - Followed by several options to choose from

› Which sea monster appealed to you the most?
  - Followed by all sea monsters to choose from

› I think this space is...
  - Followed by two opposites, where the visitor has to position a slider in between. For example: unattractive - attractive

variation 1: 3d tactile questionnaire

In this variation, the questionnaire is made tactile. You can give the answers to the questions by moving physical things, for example turning turntables.

In this variations, there is a big surface. This can be a horizontal table or a vertical wall. Questions are written on this surface. Next to questions there is a tactile way to answer the questions. For example, questions are written next to turntables. These turntables are disks with holes in it, through which possible answers to the questions are visible. You can rotate these discs so that the answer you want to give to the question is shown. Did you position all turntables in the right way? Press send to send your data. The turntables can of course be replaced by other tactile ways to give answers, such as sliders.

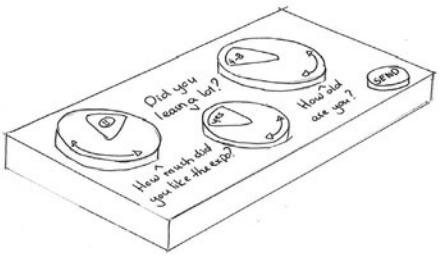


Figure 32. Tactile questionnaire

DIRECTION 2: LABELLING THE FLOOR-PLAN

The second direction has a floor-plan as central element. This map is shown after the visit of the exhibition. The map contains recognizable elements that helps the visitors to read the map. The visitor is asked to place certain labels on the map.

Basic concept: Pinning flags

The family members all get their own set of flags. Every set of flags has its own specific colour. This way it can be seen which flags belong to which family member. The flags themselves have smileys on them.

Figure 33. Pinning flags

The family is asked to pin the flags on the map at the places they did/did not like. Since all family members are doing this at the same time, there will be interaction between them. It is likely that the family members will talk during the placement of the flags and ask each other why they placed the flags at a certain place. This might influence their input, but, on the other hand, this conversation is already very interesting to observe.

The conversation that will take place will give lots of insights in why the visitors decide to pin the flags on certain places and therefore why they did or did not like that part of the exhibition.

Scaling it up!

To automate this process, the concept can be made digital. The question in this case will be shown on a display. A camera placed above the table will be able to localize which tag is placed on what location on the map. It could also be that the complete floor map is a digital screen that detects special tags which are placed on it.

The conversation could be recorded to analyse the conversation afterwards, but this will result in a large amount of data. This is very time-consuming to process, so it is questionable whether this is a good idea.

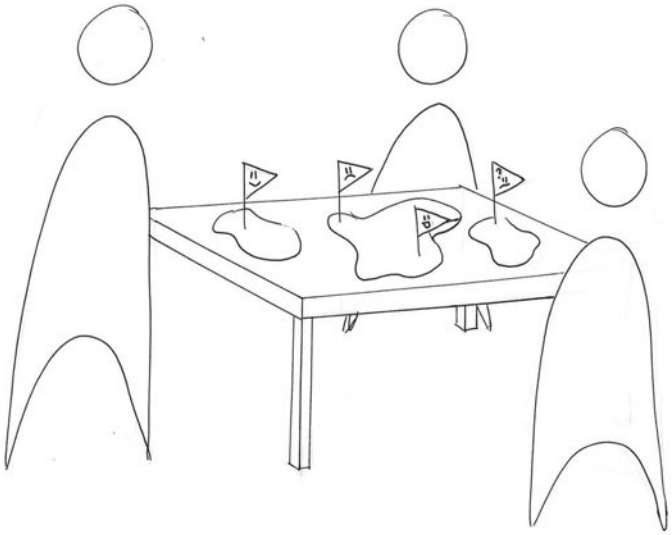


Figure 34. Pinning flags on a floor-plan

Highlights

- About 3 to 10 data-point per individual visitor
- Interview & creation of heat-map blends into each other

DIRECTION 3: PORTABLE TRACKING DEVICE

The last design direction makes use of a portable device that the visitor takes with him/her during the visit of the exhibition. This devices tracks how the visitor moves through the exhibition, creating a visualization of his or her route. The visitor is asked to rate a specific emotion several times during the exhibition, which can be linked to the location.

Basic concept: Tracking bracelet

The visitor gets to wear a bracelet with three buttons on it. On this buttons, smiley's are pictured. The bracelet is vibrating every two minutes. At those moments, the visitor presses the button according to how he or she feels about the activity he or she is doing or the exhibit he or she is watching at that specific moment.
At the end of the visit, the bracelet is put into a docking station and the heat-map is automatically created from the data which the bracelet collected.
The heat-map could be used to conduct an interview to discover the 'why' behind the given scores.

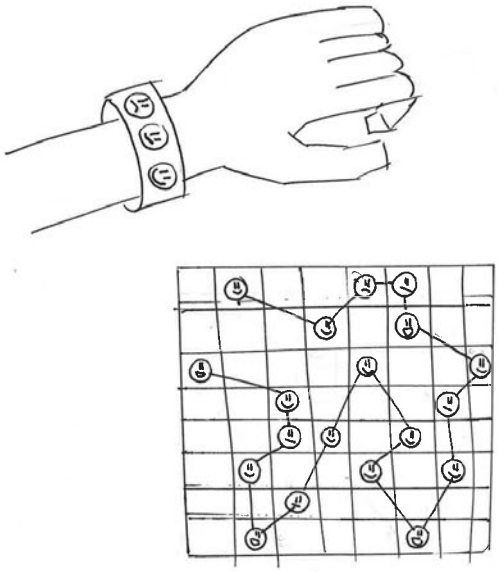


Figure 35. Portable tracking device

Scaling it up!

The bracelet could work together with a home base that shows similarities to the feedback columns discussed in paragraph 1.7.1. In this case, the visitor can take a bracelet from the home base him/herself. He or she will bring back the device after the visit and plugs it in to see the route he or she walked and the input he or she gave; the heat-map.

The column will generate questions. These question can be about the given input at locations the project office is interested in, at random locations, or at locations where the visitors showed particular behaviour, such as staying at one place for a longer time than general or giving a really negative rating.

Figure 36. A heatline, created by the data of one visitor

Highlights

- Large amount of feedback points
- Shows how the visitor moves through the exhibition, which gives rich extra information
- Information in real-time, while disturbing the flow as minimal as possible.

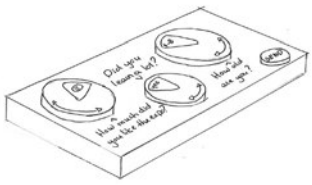
2.2.3 CHOOSING A DESIGN DIRECTION

Now that some design direction were created in the previous paragraph, it can be decided in what direction to go from now on.

UP- AND DOWNSIDES OF THE DIRECTIONS

To make a decision among these directions, the up and down sides are written down in the overview below.

Interactive questionnaire



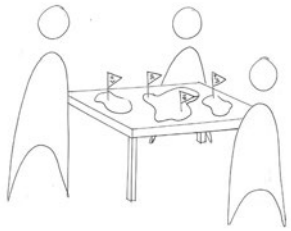
upsides

- Ability to ask many kinds of questions

downsides

- This option is not focusing on the heat-map. However, it was decided to make this the leading element of the interview.
- It is not making it easier for the visitor to give data to set up the heat-map than a normal questionnaire would do.
- The fun factor in this design direction has a high risk for visitors to send random data, just because the process is fun.

labelling floor plan



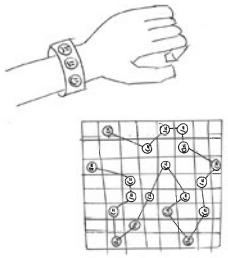
upsides

- The conversation between family members already gives insights.
- All family members can give feedback at the same time with one 'tool'

downsides

- The conversation between family members could influence the opinions
- It might be hard for children to understand the floor-plan
- It is more difficult for children to review on the experience some time afterwards than at the moment itself
- The tool only collects a few data-points. Therefore the points might stand out more, but a heat-map from an individual visitor is not very interesting.

Portable tracking device



upsides

- Family members will influence each-other less
- The heat-mapis very extensive
- The tracking of the location gives extra, valuable information
- People will give the input in real time, making it easier for them to give the right input. Also, they will be more aware of this emotion during the visit which makes it easier to talk about later in the interview.
- Children will probably like having this special gadget and therefore are motivated to give their own feedback.

downsides

- Several devices are needed to let all family members give separate feedback
- The technique to realize this idea is more complicated

2.2.4 FINAL DESIGN DIRECTION

After taking all these factors into account, it was chosen to continue with the portable tracking device. The most important reason for this is the combination of real-time feedback and asking further upon this data afterwards. Moreover, the concept just really created enthusiasm among the project office and researcher. It matches the personal desire to prototype an interactive product, which can be realized very well with the portable tracking device.

RESULTING CHOICES

Paragraph XX ended with some open decisions. By continuing with the portable tracking device, these open decisions are now decided on. Below an overview of the open decisions can be found and the outcomes that come with choosing for the portable tracking device.

UNSOLVED DILEMMAS FROM PARAGRAPH 5.1

AMOUNT OF DATA-POINTS

UNSOLVED
Still depending on the amount of time the device will ask for feedback.

MOMENT OF ASKING
- In real time
- Right after the visit

SOLVED
The portable tracking device will ask for feedback in real time.

WHAT EMOTION TO ASK FOR?
- Rating a specific emotion
  - This can be enjoyment :) ---- :(, but also for example excitement
- Choosing a matching emotions/ situations from several options. For example:
  - Exited
  - Moment of recognition
  - Learning moment

SOLVED
The portable tracking device asks to rate enjoyment on a scale of happy-face to sad-face. More emotions would make it too complicated for visitors to respond quickly.

2.3 FRAMEWORK FOR THE EVALUATION PROCESS

Now that it is known what kind of tool will be used to create an evaluation process with, the schematic overview of the evaluation process, which was created in paragraph 2.2.1 can be detailed further.

BASIC FRAMEWORK

Sanders and Stappers indentified the folowing steps out of which an evaluation process consists: making a plan, gathering data, analysis and communication (Sanders & Stappers, 2012). These steps are now combined with the overview of the process as created in paragraph 2.2.1. This results in the framework as shown in figure 39. This framework is also pictured in the visual of the structure of this report.

Next, the steps in the evaluation process that result from the choice for the design-direction of the portable tracking device are identified and are put into the schedule. The result is shown in figure 37.

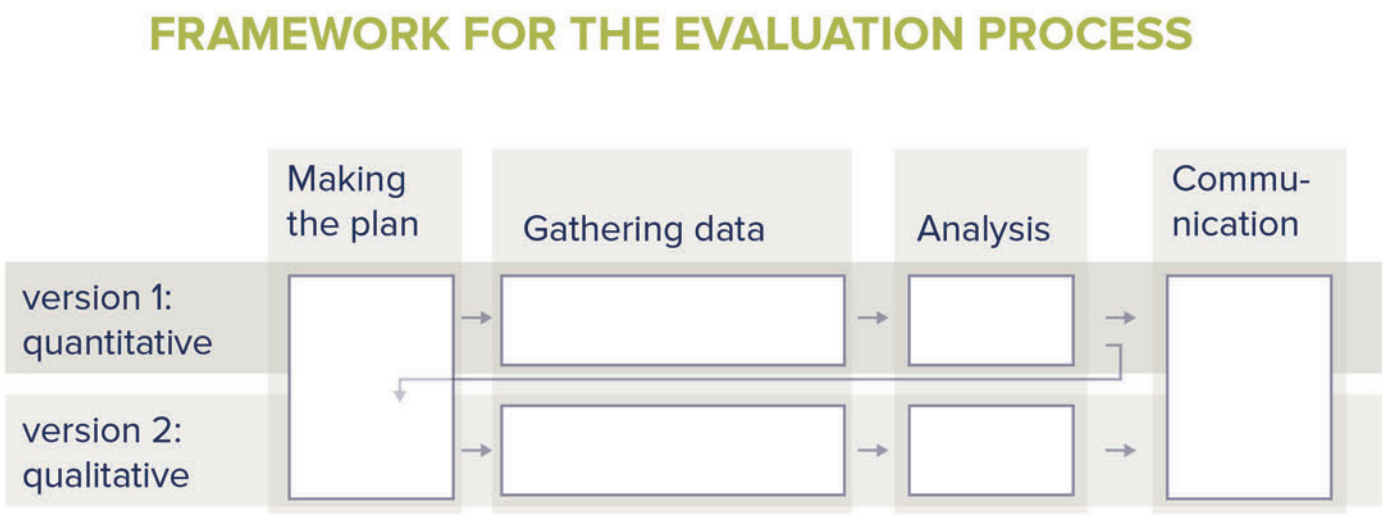


Figure 37. A schematic overview of the evaluation process.

Within this project, some decisions had to be made about what to focus on. Version 2 of the evaluation process is focussing on gathering qualitative data. The gathering of qualitative feedback was one of the core goals of this project. This is why it was decided to focus on version 2.
In paragraph 2.1.2 a way to define the evaluation questions was found. This is why there is no focus on the 'making the plan' step. The other steps of version 2 will be designed further in this project. The part of the evaluation process that is focussed on, is indicated by the green area in figure 38.
The tool will be developed in chapter 3. Chapter 4 explains the designing phase of the interview. In chapter 5, the analysis will be developed and the communication is designed in chapter 6.

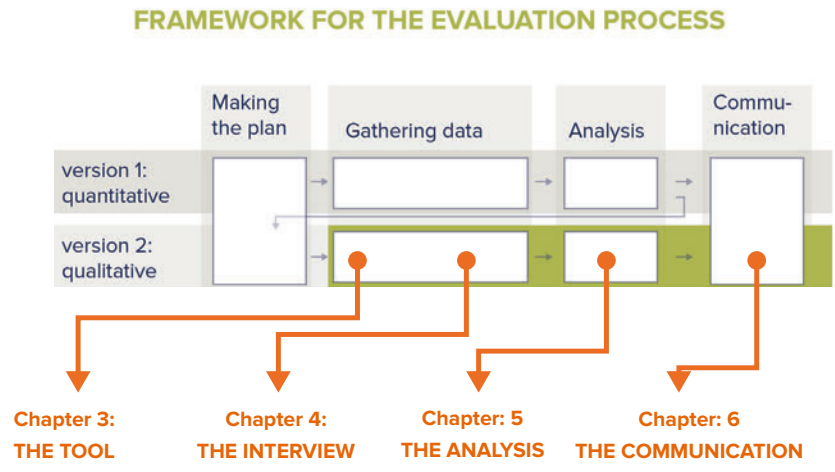


Figure 38. Focus of the project

version 1: quantitative

Conducted by 100+ regular families
A heat map is created for every visitor
No interview is held

version 2: qualitative

Conducted by 5 preselected families
A heat map is created for every visitor
An in-depth interview is held

Making the plan

Gathering data

Random family arrives at the museum.

They get Intrigued by stand.

They fill in their age, get instructions on the screen and take a device.

They visit the expo, while the device records their route and pressed buttons.

They return the device to the stand. A heatline is shown on the screen. The stand asks them questi-ons about specific points.

A family that was selected before arrives at the museum.

On the testday, the family is welcomed at the interview-room. They get information about the plan.

They get a device and instructions about it.

They visit the expo, while the device records their route and pressed buttons.

The family goes back to interview room. The heatmap is shown to the visitor and they are interviewed.

Analysis

Interviewers discuss the data. They fill in findingcards and decide on focuss points for version 2.

The interviewers discuss the interviews and fill in findingcards.

Commu-nication

Figure 39. A schematic overview of the evaluation process.

3.

DESIGNING THE TRACKING DEVICE

In this chapter, we will develop the tracking device further. The basic principle of the concept is to ask visitors to give a short, quick feedback in-situ and using this data later on in an interview with them. This concept is previously described in literature as experience sampling.

The tracking device does not stand on its own. It's functionalities is highly connected with the design of the heat-map. The data that the device will collect is dependent on the data that we need to create the heat-map. The design of the heat-map will be explained in paragraph 3.1. Afterwards, the design of the tracking device will be clarified.

3.1 THE DESIGN OF THE HEAT-MAP

The most important factor that influences the tool and the heat-map is the technique that will be used to track the route of the device. In the following paragraph several options for this will be considered.

3.1.1 POSSIBLE POSITION TRACKING TECHNIQUES

To visualize the route which the visitors take, it is necesarry that data about their location during the visit is monitored. There are several ways to locate the device. All of them have up- and down sides. Below, each option will be explained with its advantages and disadvantages.

GPS tracker

A GPS tracking unit uses the Global Positioning System to locate the device based on the coordinates the signal sends.
From the GPS signal it receives it calculates the coordinates from this data. This technique is relatively cheap as a Arduino GPS tracker can be bought for a few Euros. However, it has a precision of about 10 meters. Therefore, it isn't suitable for this project. (Instructables, 2017)

Bluetooth Low Energy (BLE) signals

Beacons sense a BLE signal and are often used in projects to localize sensors and are placed throughout the area. The device receives a signal from the beacon and is able to calculate it's distance from it. It is not very precise in doing this. The accuracy varies due to the circumstances, but can be as good as 1,5 meters ('Custom developed Ultra Wideband positioning applications', 2019). However, an advantage of beacons is that their batteries use little energy and can be used for multiple years.

Wi-Fi

Wi-fi can be used in a similar way as BLE beacons. It can cover a bigger area, sinces the signal is stronger. However, it requires an external power source and the equipment is more expensive to purchase. Consequenlty, this options is less preferable than using the BLE signals. ('Technology', 2019)

Magnetic field detection

Another way to determine the position is by using magnetic field detection. This technology is only usable when the magnetic fields indoor are stable. Since a museum contains lots of digital interactives and collection, this can not be guaranteed.

Near Field Communication (NFC)

The NFC technique uses a small chip. When this chip is less then 30 cm from the scanner, the scanner notices this. This technology is used for paying with a credit or debit card. For this goal it is set on a smaller range. The newest phones contain a NFC chip. ('Nfc-tracker - nfc tracker', n.d.)

Ultra-Wideband (UWB)

This technique is the most precise one. It uses UWB achors which are placed in the corners of the room. The device will contain a tag which sends a radio signal pulse. The anchors receive this signal and can locate the tag to 30 cm precise. Moreover, it will present 3D data of the area and only four anchors are able to cover places of 25 meters (Technology, 2019).

Usable tracking techniques

From these options, the BLE and the UWB techniques are the most interesting. The BLE technique is less complicated to apply and cheaper to purchase. The UWB technique is more accurate and will give richer information. The question is, how accurate does the location-tracking has to be to give us data which is rich enough for this project?
To get the exact route that visitor walked, UWB will have to be used. What will the data look like if the BLE technique will be used? In the next paragraph, both heat-maps of the two different techniques will be shown.

3.1.2 THE VISUAL OPTIONS WHEN USING UWB TECHNIQUE

When using the UWB Technique, the route of the vistor can be indicated up to 30 cm precise. This gives the possiblity to draw the exact route of the visitor.

In image 40, the colour of the line indicates the pressed buttons by the visitor. These buttons are connected to each of the four colours which are red, orange yellow, green and blue. The data of test 4 is used for this visualisation. This test will be explained more in paragraph 3.3.3. What I miss in this visualisation, are the extremes. Three times green and three times red turns to orange, just as six times orange would do. Therefore, an other visualisation was made that is shown in image 41. In this visualisation, the pressed buttons are indicated with a coloured circle. To make the visualisation more visually speaking at a glance, a diffusing spot is placed behind every coloured circle in image 42.

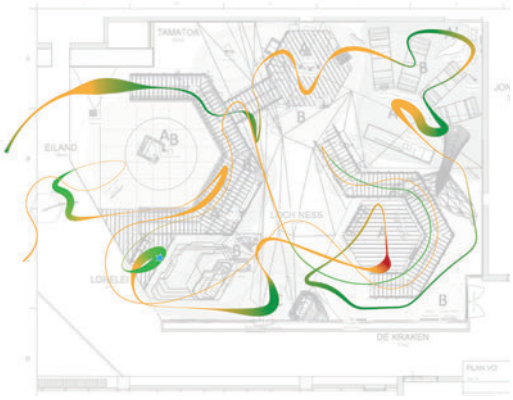


Figure 40. Heat-line design v.1

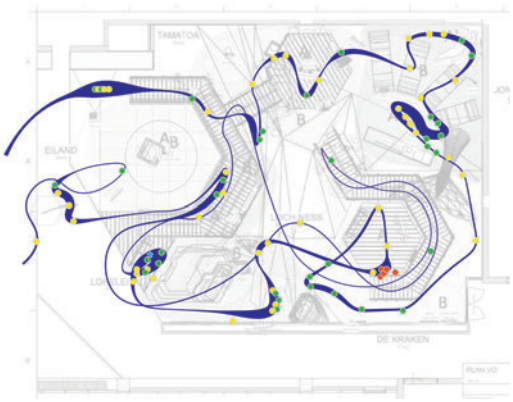


Figure 41. Heat-line design v.2

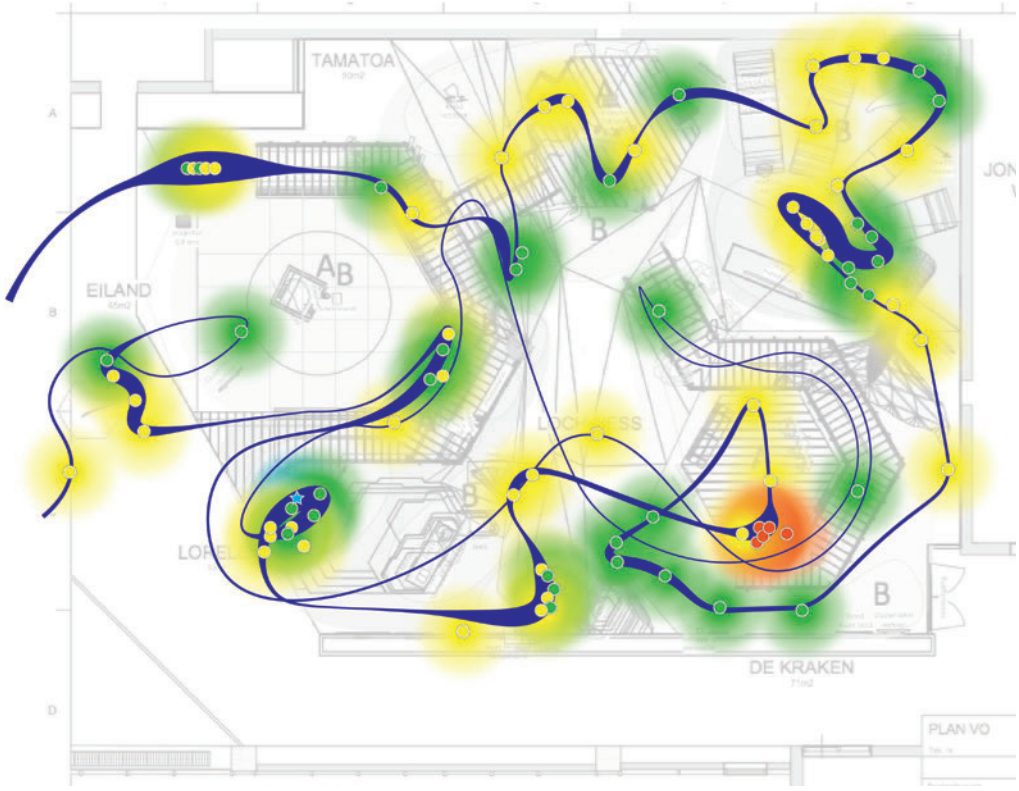


Figure 42. Heat-line design v.3

3.1.3 THE VISUAL OPTIONS WHEN USING BLE TECHNIQUE

When using the BLE technique, several beacons would be placed throughout the exhibitions, in such a way that they cover the most interesting spots. Just as in paragraph 3.1.2, the data of test 4 is used for this visualisation. This test will be explained more in paragraph 3.3.3.

When looking at image 43, the circles indicate the range of the beacons. When the device triggers, the visitor presses one of the buttons to indicate how much they like it. From each trigger with feedback the system receives an area and a number indicating a colour. Red = 1. Yellow = 2. Green = 3. Star = 4. From this, an average score can be calculated for each area. Also, it can be tracked from what area to what area a visitor walks. The size of the coloured circles indicates the amount of time a visitor spends in that area.

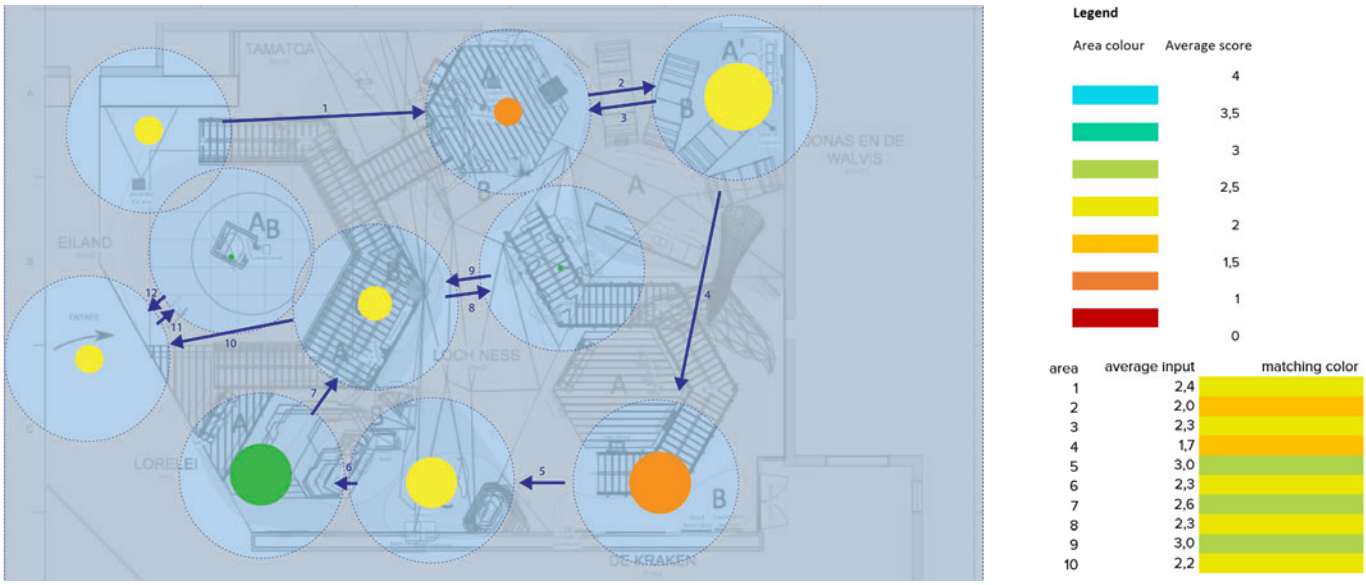


Figure 43. Visualisation using BLE technique v.1

Again, the visualisation in image 44 does not capture the extremes. Therefore, an other visualisation was made that is shown in image 46. When a visitor enters an area, the circle in that area grows with a white filling. When the visitor presses a button, a coloured ring appears. A purple line means they left the area and re-entered it later.

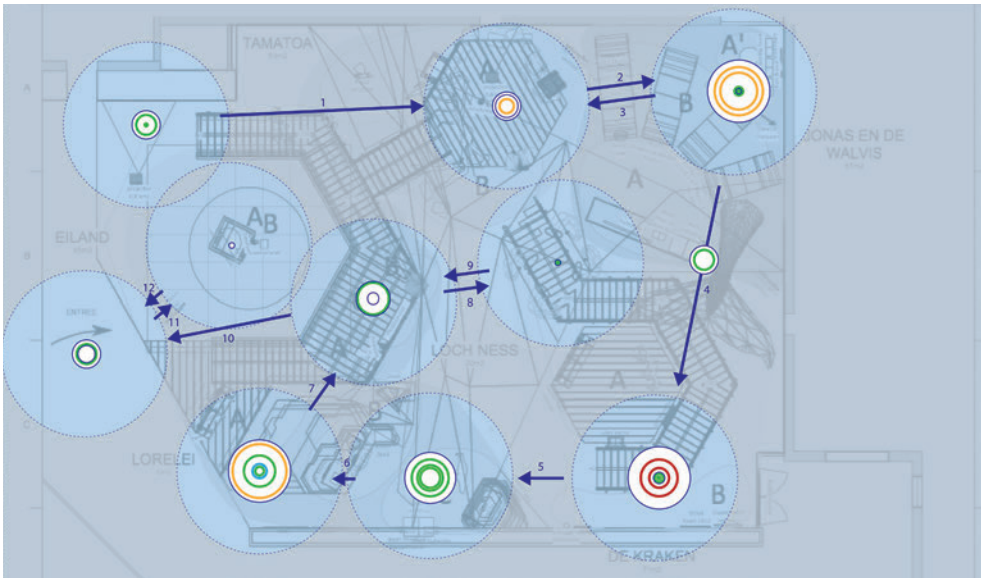


Figure 44. Visualisation using BLE technique v.2

3.1.4 CHOOSING A POSITION TRACKING TECHNIQUE

When the visualisations are compared of both the BLE and UWB technique, it can be seen that the UWB provides richer information that is easier to read. Moreover, it has the advantage of keeping track of the time a person is in that specific area. This technique might be more expensive, but the extra information it gives us is crucial to communicate a powerful visual. Both visualisations have been discussed with the main client project leader and it has been decided that the UWB technique fits best to the needs of the client.

3.2 THE CHALLENGE FOR THE DESIGN OF THE TRACKING DEVICE

Typically, participants get a device which will send the participant a signal on set times. On this moments, the participants give their feedback. In this project, these moments of feedback are called 'trigger moment'. Later, an interview will be held to get more clarification about the given feedback.

Looking at examples of experience sampling in literature, the moments on which participants are asked for feedback, are usually at least about an hour apart. Visitors of the Sea Monsters exhibition usually only spend about 40 minutes in the exhibition. To get a sufficient amount of data-points, the triggering moments therefore will be way closer to each other than can be found in literature. When the trigger moments take place too frequent, it can become possible that visitors get annoyed by it. It could also counter-work the immersiveness of the exhibition. Therefore, it is necessary to conduct several tests to find out what works best for this specific project.

3.3 THE PROCEDURE

The participants of the tests, five in total, were asked to visit the exhibition. They needed to rate the exhibition based on how much they enjoyed the activity or how much they liked the exhibit they saw. During this, the path they walked was drawn and feedback given to the device was noted. Afterwards, if possible, they were asked how the use of the device felt for them and why they handled the device in the way they did.

3.4 THE PROTOTYPES

After each test, the new insights were used to adjust the prototype to a new prototype for the next test. That is why several prototypes were developed.

3.4.1 TEST 1

Device: Paper prototype wristband
The first test was done with a paper band with three smileys on it: :) , :/ and :(. This band was put around the arm of the participants. A timer was set on a mobile phone to indicate a trigger moment on which the participants were asked to give feedback by pressing on one of the smilies.

Route: clipboard
The route of the visitor was recorded with a pen on a printed floor-plan (see figure 45). The given input is written down in a table. The corresponding number in the table is written down at the right place on the floor-plan.

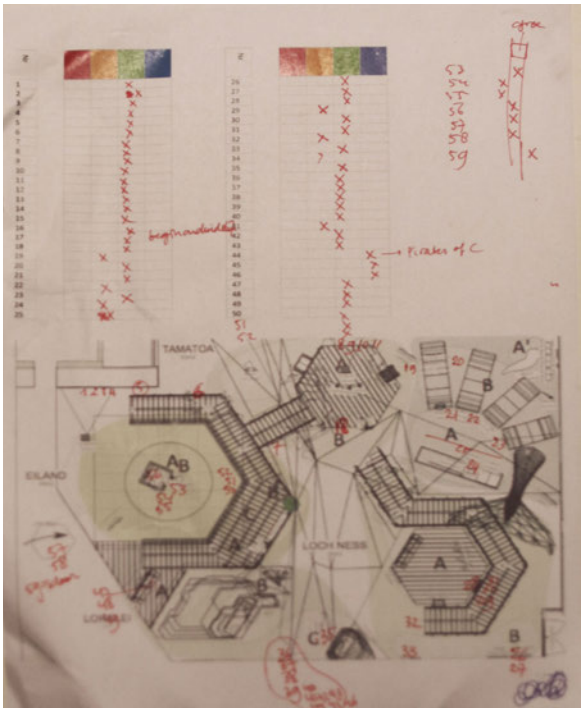


Figure 45. Route: clipboard

3.4.2 TEST 2 AND 3

Device: Electronic paper prototype v1, 3 buttons

After the first test, we found out that wearing the device as a wristband requires participants to look at the device when they want to give feedback, and this was experienced as disturbing during their visit. Therefore, the second prototype was made as a device that can be held. (see figure 46)

The second prototype is making use of electronics. It was made by making use of Arduino Grove. The prototype is powered by a battery, and therefore not connected with a data cable to the computer. Every 30 seconds a high signal is sent to a vibration motor in the prototype, at the same time the prototype also makes a beep sound, so that the signal is not to be missed, even when the test person is not holding the device. This is the signal for the participant that he or she should press one of the buttons with :), :/ or :(.

When one of the buttons is pressed, the prototype vibrates so that the participant knows that input has been given. It also sends out a sound, to communicate to the facilitator (me) what input is given. (:) = 3 short beeps, :/ = 2 short beeps, :(= 1 short beep). This way, no interaction between the facilitator (me) and the participant was needed during the test.

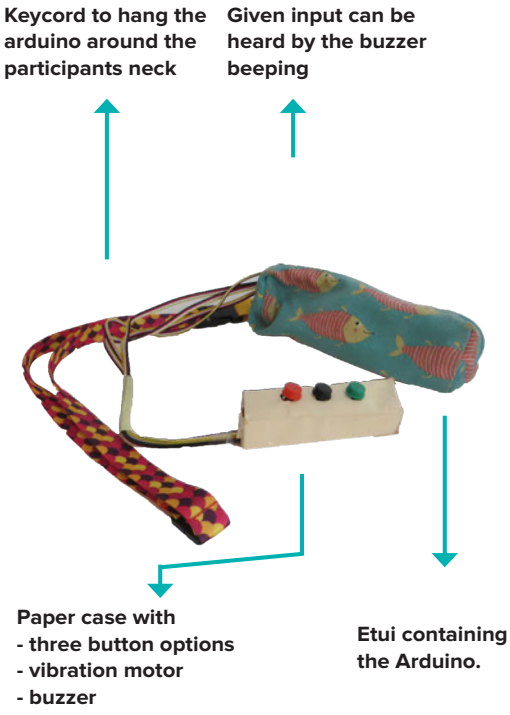


Figure 46. Electronic paper prototype v1

Route: clipboard

The route of the visitor was recorded in the same way as in test 1 (see figure 47).

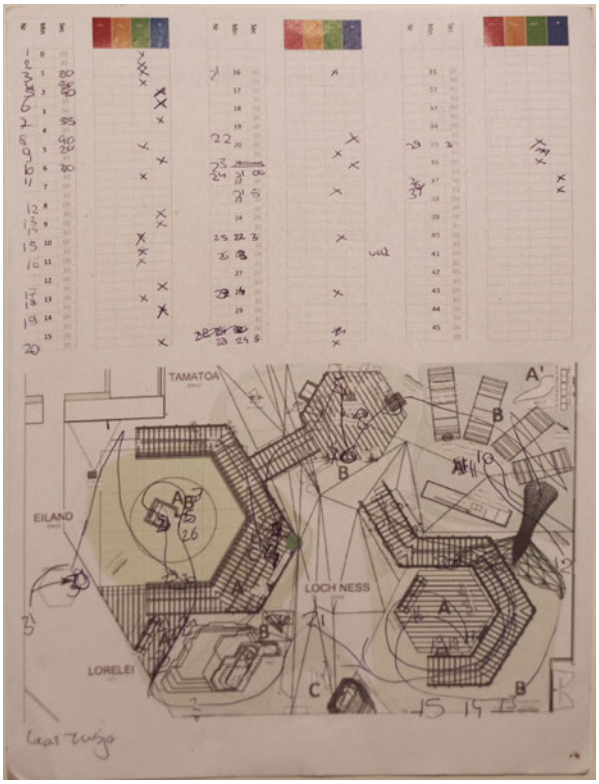


Figure 47. Route: clipboard

3.4.3 TEST 4

Device: Electronic paper prototype v2

After the next test, we found out that the participants were likely to give the :) score pretty soon. I added an extra option, the star. Participants can press this button when they think something is extraordinary. Furthermore, the beeping sound was taken out, since this was distracting other visitors. Instead of this, the input is sent to a tablet by a data cable. This means that the facilitator (me) had to walk along with the participant to carry the tablet. This limited the visitor's freedom of movement. The tablet receives the number of the input and button which was pressed.

To prevent that the participant misses the trigger moment, the device would vibrate every 10 seconds, as long as no input was given after a trigger moment. (see figure 48)

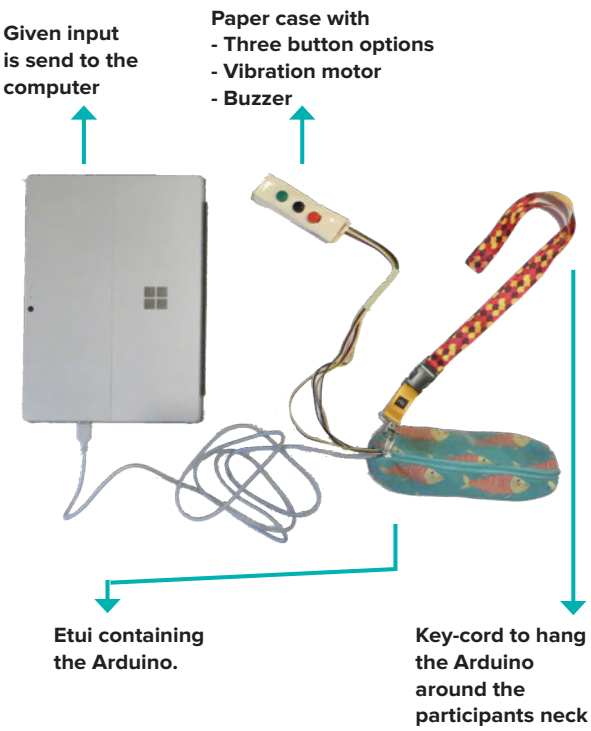
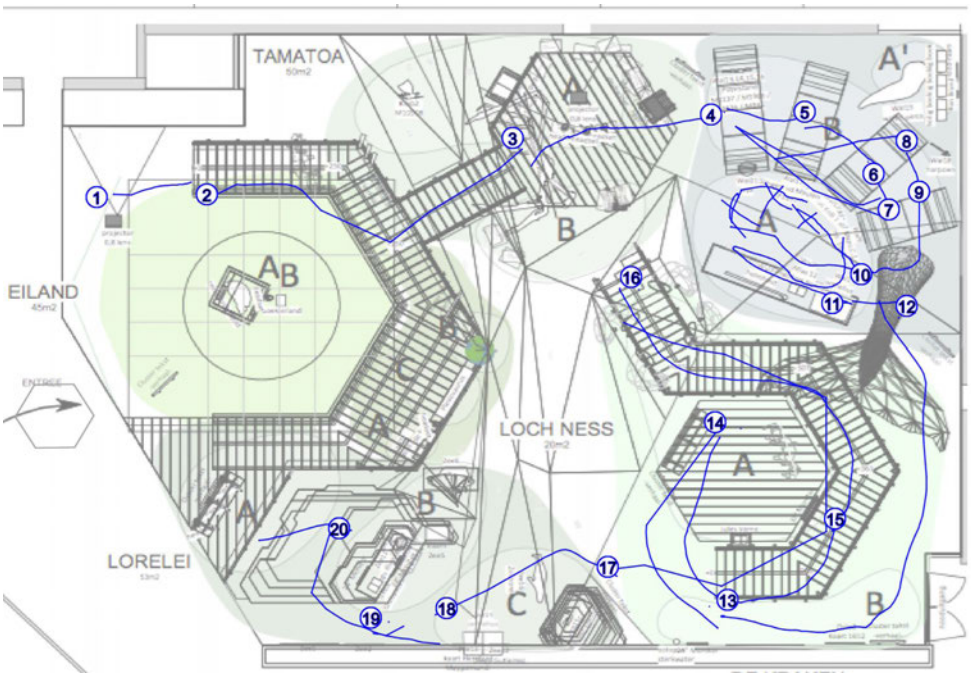


Figure 48. Electronic paper prototype v2

Route: P5.JS v1

A digital program in p5.js was created which helps recording the route of the participant, The program was opened on the tablet next to the serial monitor of the Arduino which shows the given feedback. The route is still recorded manually, but no paper is needed during the test which saves a lot of hassle. (see figure 49)



- Press the screen and drag to draw a line.
- Tap twice to place a circle with a number to indicate that feedback was given at this place

Figure 49. p5.js v1
The sketch can used via: https://editor.p5js.org/ellis/present/b0o7_Jutj
The sketch can be edited via: https://editor.p5js.org/ellis/sketches/b0o7_Jutj

3.4.4 TEST 5 & 6

Device: Wooden prototype

The third prototype functioned well, but so far the tests were only done by adults. To test the use by children, the prototype had to be a lot more child-friendly. I want the child participants to not hold back, and visit the exhibition just as they would normally do. That's why the paper case of the prototype was changed for a wooden variation. Furthermore, the children should be able to walk without being attached to the computer. Also, lights were added to the prototype which light up into the specific colour as the input that was given. This way, the input is visible from a distance. (see figure 50)

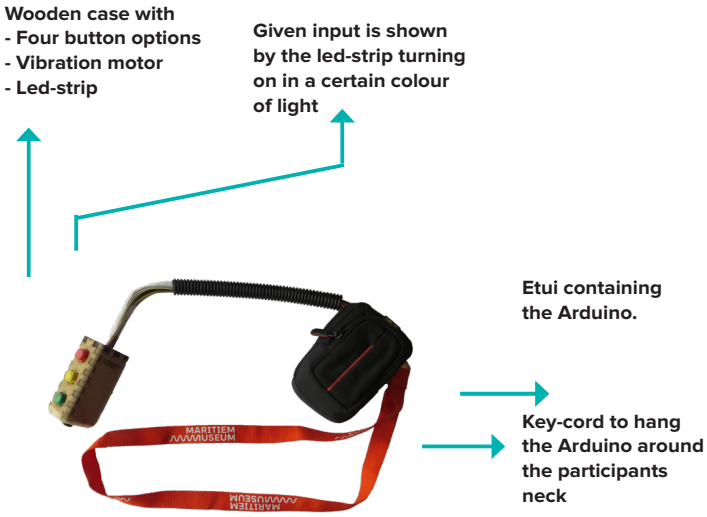


Figure 50. Wooden prototype

Device: p5.js prototype v2

The system made in p5.js was updated so that the time someone stands still at a certain place became visible.

First, a prototype was constructed in which it was necessary to drag the end of the line to new location whenever the visitor would move. The thickness of the line was depending on the distance between the newest location and the previous location and the time. However, when the visitor would stand still at one location, this would not result in a thicker line at that location, but in a thicker line to the next location. This did not represent the time where they spend the most time right. Therefore, the sketch needed to be changed.
In the new sketch, every 5 seconds the program asks you to indicate the location of the visitor. At that moment, it was necessary to tap the place of the visitor on the map. If this location is with a certain radius from the previous location, the previous drawn line becomes thicker. If the new location is outside of this radius, the program will draw a new line from the previous indicated location to the newest indicated location.

Furthermore, smileys buttons are added. When the visitor presses one of the buttons on the device, and the lights on the device light up, it was necessary to press a smiley in the top to add a coloured dot at the last indicated location. (see figure 51)

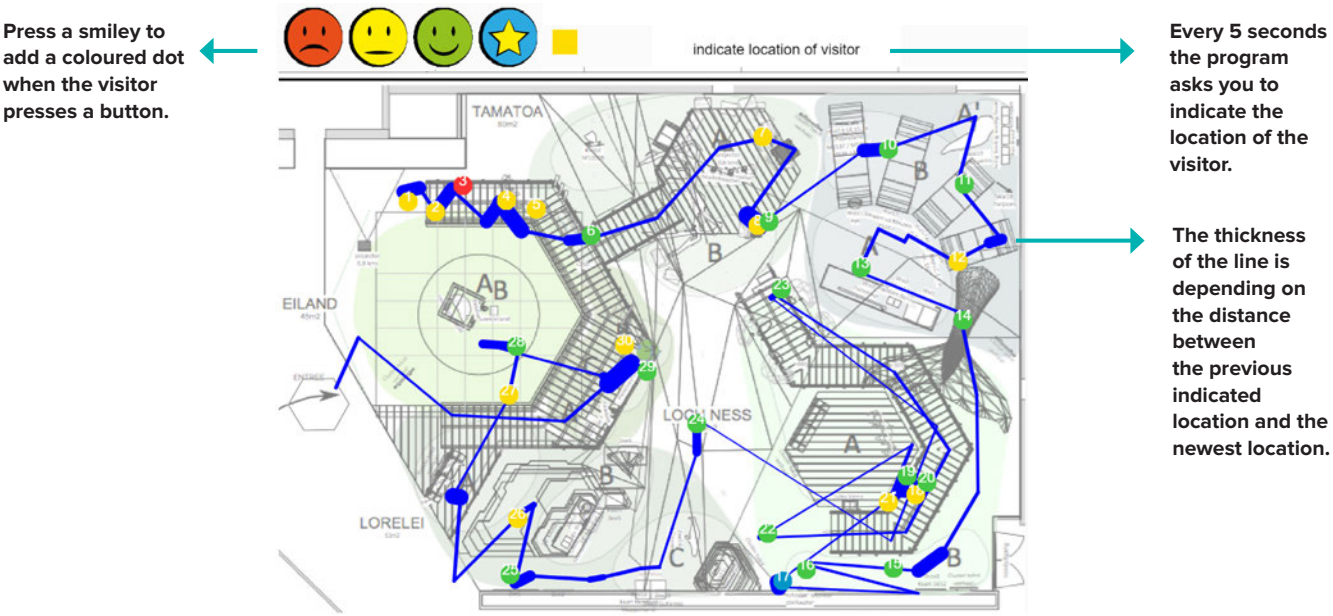


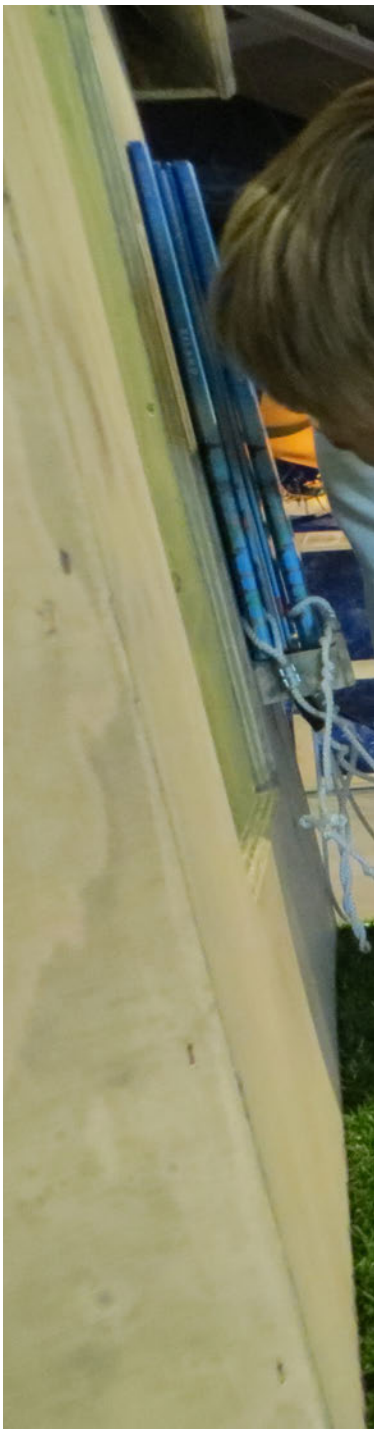
Figure 51. p5.js prototype v2
The sketch can used via: https://editor.p5js.org/ellis/present/CCtvV0Z6j
The sketch can be edited via: https://editor.p5js.org/ellis/sketches/CCtvV0Z6j

3.5 PICTURES OF THE TESTS

A child is holding the device while watching a movie in the exhibition

The lights light up in the colour of the pressed button

An adult is holding the device



A girl is holding the device while reading a book together with her mother

The ledstip is turning white when a trigger is given

3.6 THE RESULTS

The tests made clear what factors make an influence on whether people do or do not feel disturbed by the trigger moments. These factors also have an influence on the meaning of the given feedback. The most important factors are listed below and explained beneath the list.

- The way of wearing the device
- Timing of the trigger moments
- The interval between trigger moments
- The reason for triggering
- How urgent is it to answer on the trigger moments

3.6.1 THE WAY OF WEARING THE DEVICE

After the test with the paper prototype, it was noticed that it is way less interrupting when a participant is able to answer to the trigger without having to look at the device. This is why the next prototypes were designed to hold in your hand. This being said, it is still possible to let go of the device and hang it around the neck when both hands are needed.

3.6.2 THE TIMING OF TRIGGER MOMENTS

Time interval between trigger moments

In all tests, the trigger moments have been created with timeslots and an interval was programmed. An interval was programmed. After this interval, the device would vibrate (and in some cases beep) to indicate that the participant should give feedback. The first experiment used an time interval of 30 seconds, which was not experienced as pleasant by the participants. This was changed to 60 seconds in the next test and was experienced more favourable. However, when people needed their attention, like watching a movie of reading a sign, this timeslot was still disturbing. A downside of making the interval between the trigger moments larger, is that important moments might be missed. Therefore, it could be a good idea to not trigger on time, but on other factors.

The reason for triggering

As explained in the paragraph above, in these tests we only tested on triggering with making use of a time interval. However, only the time interval was used to trigger. Other parameters could also be used to define whether a trigger should be sent. This way, it could be prevented to sent visitors a trigger while they are taking part in an activity, like watching a movie or reading a sign. Furthermore, this can make sure that participants receive a trigger on interesting moments which can be missed when making use of a time interval.

Options for this are for example when the visitor...
- stayed at a one place for a certain time and then move again
- is speeding up
- is slowing down
- changes direction
- arrives at a certain place
- leaves a certain place

However it would be very interesting to explore the options above, for the scope of this project I decided to continue with the time interval.

3.6.3 URGENCY

When the visitor did not react on the trigger right away, a system was installed that repeated the trigger. When the visitor does not give feedback right after a trigger moment, the trigger will repeat after 10 seconds. One of the participants indicated that this gave him the feeling that he could wait some time before answering, which made him decide to first finish what he was doing, before answering to the trigger. One participant even explained that he consciously did not give any input, since he felt like his opinion did not change since the last time he gave feedback.

3.7 CONCLUSION

After these tests, it was clear that experience sampling could be used in an exhibition environment. However, it is needed to develop a device which takes a little attention from the visitor as possible.

Consequently, the following characteristics should be given to the device:
- The visitor should not have to look at the device to answer
- When a time interval is used to define the moments of triggering, this interval should not be less than 60 seconds
- Visitors should be able to postpone the moment of giving feedback.

The final design for the behaviour of the device is shown in figure 52.

Collecting the data with the device is just half of the experience sampling method. Asking further upon the collected data is what needs to be done second. This will be explained in the next chapter.

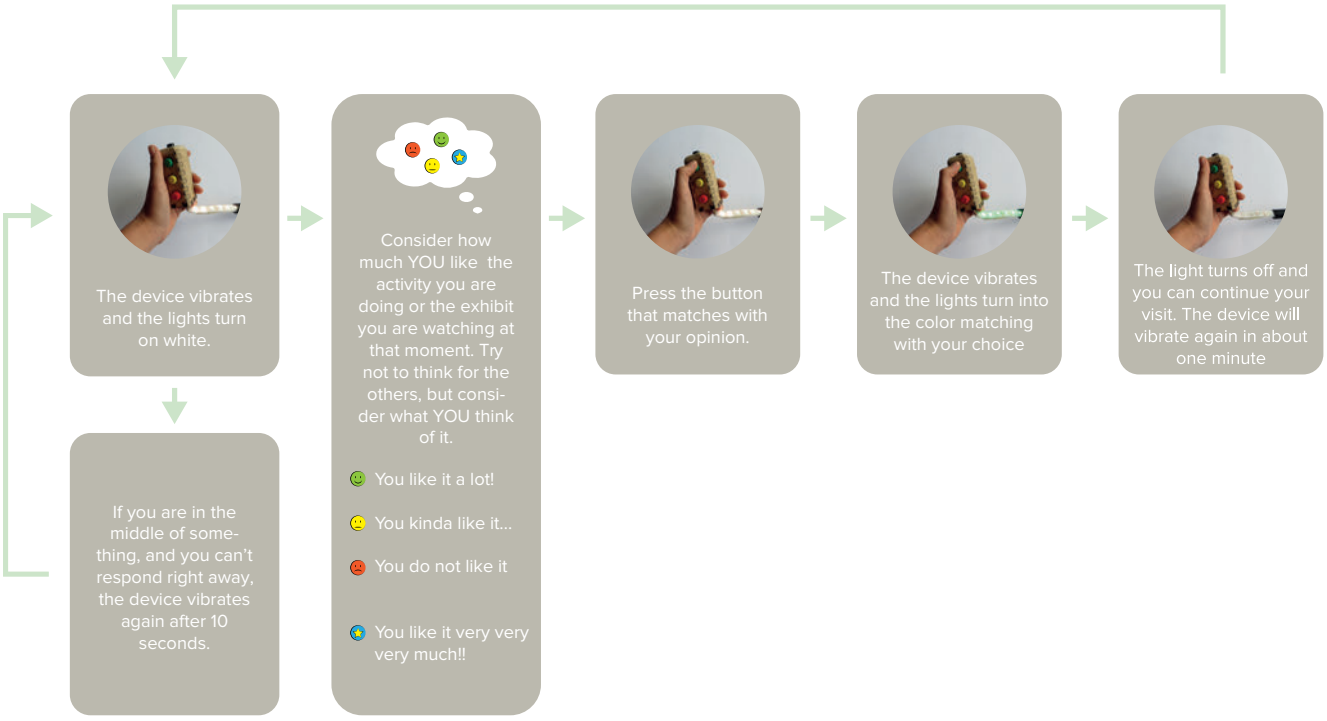


Figure 52. The final design of the behaviour of the device

3.8 PROTOTYPES USED DURING COMING TESTS

In chapter 8 and chapter 9, I will talk about more tests that were conducted to test the interview. For these tests, I of course also used some prototypes. To give a complete overview of all prototypes, they will be further elaborated on in this section.

3.8.1 PROTOTYPES DURING TEST 7, 8 AND 9

For the prototype of device, the same prototype was used in test 7, 8 and 9 as in test 4 and 5. The p5.js sketch as used in test 5 was also used in test 7. For test 8 and 9, the p5.js sketch was improved.

p5.js prototype v3

For test 7, the system made in p5.js was updated. During test 5, when the visitor would stand still at one location, it would not result in a thicker line at that location, but in a thicker line to the next location. This did not represent the areas where they spend the most time right.

. In the new sketch, every 5 seconds the program asks you to indicate the location of the visitor. the program asked the experimenter to indicate the location of that visitor on the map. If this location is within a certain radius from the previous location, the previous drawn line becomes thicker. The new location is outside of this radius, the program will reset the thickness of the line back to it's starting thickness and draws a new line from the previous indicated location to the newest indicated location. (see figure 53)

p5.js prototype v4

For test 8 and 9, the system made in p5.js was updated again, as it was noticed during test 7 that indicating the location of the visitor every 10 seconds was to much hassle.

In this version, the end of the line was dragged further as the participant moved. A new line is drawn after a certain distance has been travelled with thickness 1. When you do not drag the line, the previous drawn line gets thicker every second. When you then drag the line again, which results in new lines, the thickness becomes 1 again. Furthermore, the map was changed as it makes it more simplistic. (see figure 54)

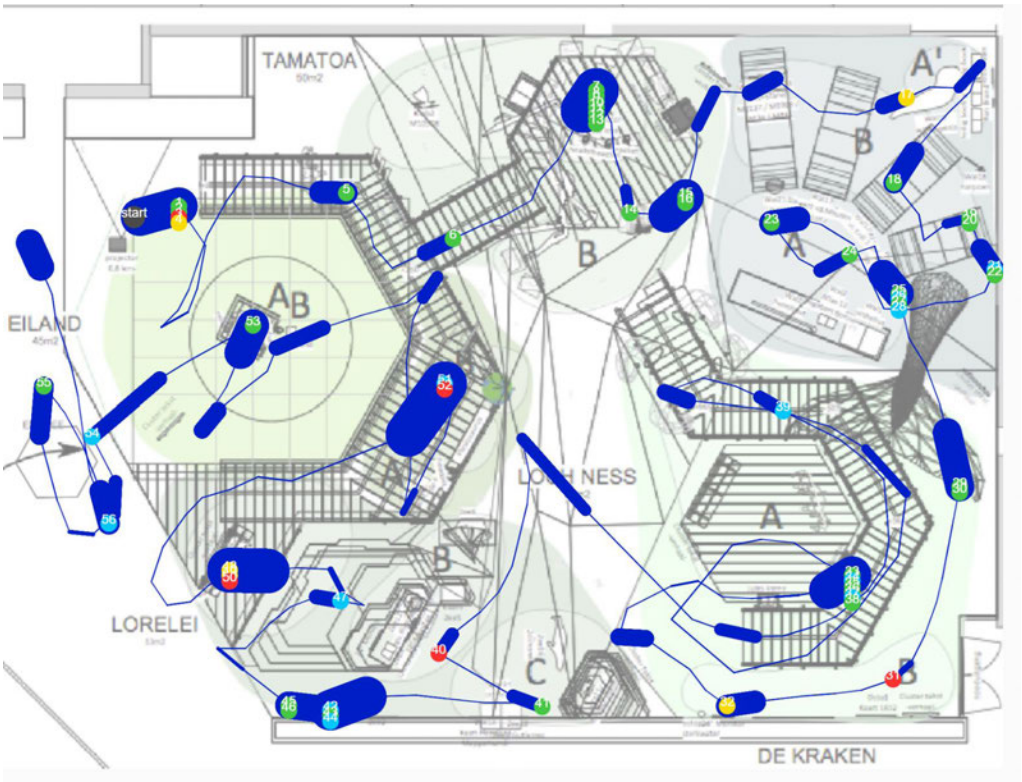


Figure 53. p5.js prototype v3
The sketch can used via: https://editor.p5js.org/ellis/present/cD99U3Wap
The sketch can be edited via: https://editor.p5js.org/ellis/sketches/cD99U3Wap

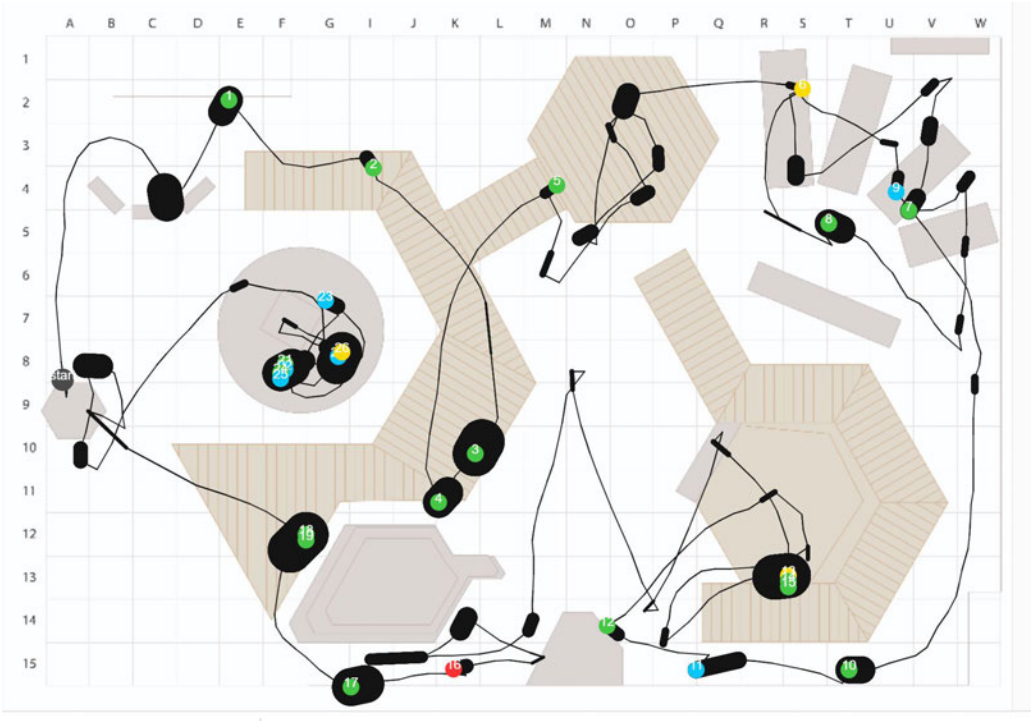


Figure 54. p5.js prototype v4
The sketch can used via: https://editor.p5js.org/ellis/present/cD99U3Wap
The sketch can be edited via: https://editor.p5js.org/ellis/sketches/cD99U3Wap

3.8.2 PROTOTYPES USED DURING TEST 10 AND 11

After the test in chapter 6, a last iteration was done to design the portable tracking device. From previous test it became clear that the device should have the following characteristics:

Form:
- Easy to hold in your hand
- Possibility to let go of the device so you would have both hands free
- Usable for left and right handed users

Functionality:
- One button on the top of the device
- At least four buttons on the side of the device
- Vibration motor
- Led light to confirm the press button to the user
- Wireless connection to the heat-map system to send through the given input
- UWB tracking module to keep track of the route

FORM OF THE TRACKING DEVICE

The final form of the device was created by first making it out of clay. This model is shown in figure 55.
Next, digital 3D model was made and the device was 3D printed. The 3D printed model is shown in figure 56. The device should be usable for both left and right handed visitors. Therefore, the indication of the buttons is placed on both sides of the device. The strap that is attached to the device can be worn around the wrist of the visitor. This way, the visitor can let go of the device and is free to use both hands to participate the activities during the exhibition visit.

Figure 55. Clay model of the tracking device

Figure 56. 3D print of the tracking device

ELECTRONICS OF THE TRACKING DEVICE

The tracking-device interacts with the visitor just as the wooden prototype did, which was explained in paragraph 3.7. An extra functionality that was added, is that the device sends the given input to the p5.js heat-map system automatically. This was done by using an nrf24l01 module for Arduino. This will be explained more in paragraph 8.4.3.

I created the circuit on a breadboard and wrote the code. to make the device function. A Printed Circuit Board (PCB) was created and used to create the tracking device. This PCB was created by Hubald Verzijl. He also calculated the needed resistors and transistor. The scheme on which the PCB is based can be found in appendix D. (see figure 57 to 61)

Figure 57. Me, soldering the electronics of the tracking device together.

Figure 58. The data receiver

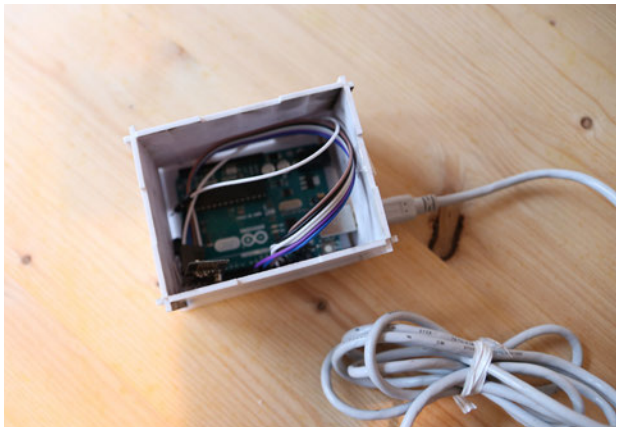


Figure 59. The inside of the data receiver

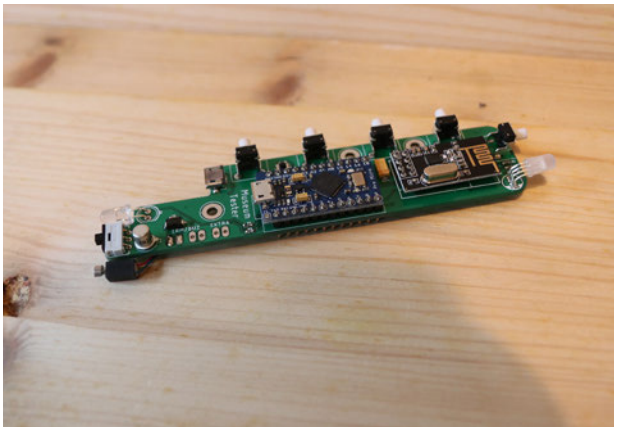


Figure 60. The PCB of the tracking device

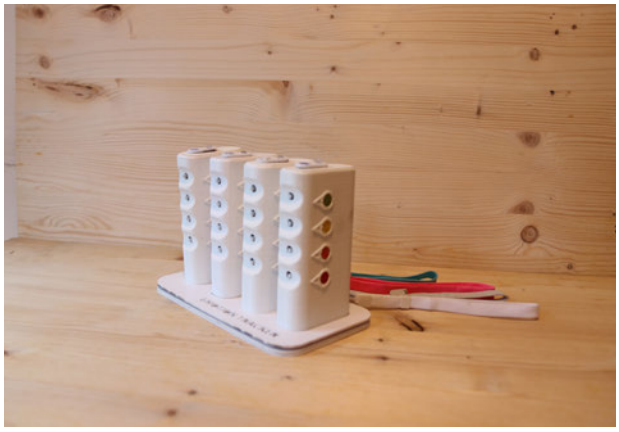


Figure 61. The tracking devices

CONNECTION BETWEEN THE TRACKING DEVICE AND THE P5.JS SKETCH

In the last p5.js sketch that was made, the only thing that has to be conducted by hand is indicating the location of the visitor. This can be done by dragging the end of the line. When the visitor presses a button, a coloured circle corresponding to the pressed button is placed on the map automatically.

The connection between the tracking device and the p5.js sketch was established by using an nrf24l01 module for Arduino. The communication is visualized in figure X. The nrf24l01 module is implemented in the portable tracking device. When a button is pressed, it sends out a message. This message consists out of the colour of the device (this is the colour of the strap of the device) and a number that depends on the pressed button. For example, when the green button is pressed on the blue device, the device sends out the message 'BLUE 3'. The data receiver also contains an Arduino and a nrf24l01 chip. This chip picks up the message that was send out by the device (see arrow 1 in the figure 62). The data receiver is attached to the laptop, and sends the message to the serial port of the computer (see arrow 1 in figure 62). A special program called p5.serialcontrol should be installed on the computer. In this program, the port to which the data receiver is connected should be opened. The program will read the serial port see (arrow 3 in figure 62) and makes it able for the p5.js sketch to read the message that is written to the serial port of the laptop (see arrow 4 in figure 62).

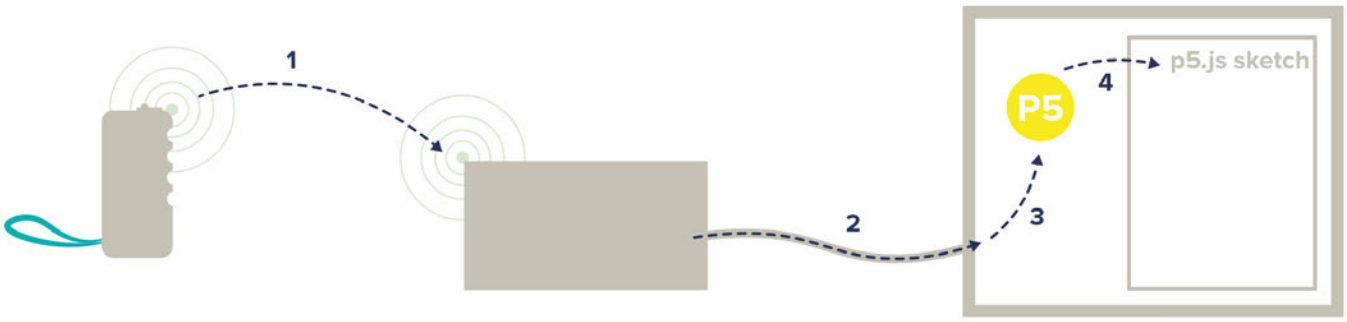


Figure 62. Visualisation of the data transfer between the device and the p5.js sketch

THE P5.JS SKETCH

In the p5.js sketch, the coloured circles in the left upper corner (see figure 63), corresponding the colour device of the person that is tracked, should be clicked. For example, the person holding the device with the blue strap is tracked, the blue circle should be clicked. This way, the program will only use the data that was send by the blue device, which are messages starting with BLUE.

Next, the starting location of the visitor should be indicated by pressing at that location on the screen. By dragging from this point, a line can be drawn to indicate the route of the visitor. Just as in the previous sketch, the line gets thicker when this location is not changed. This way, a ticker line indicates that the visitor stayed at that place for a longer time.

When the blue devices sends a trigger to the visitor and a button is pressed, the p5.js program receives a message containing BLUE following by a number which indicates the pressed button. The p5.js program places a coloured circle in the colour of the pressed button on the last indicated location.

The last extra implementation in this new sketch was a button to stop the time in the upper right corner (see figure 63). When this button is pressed, the function which caused the line to get thicker is turned off. This button should be pressed at the end of the route tracking.

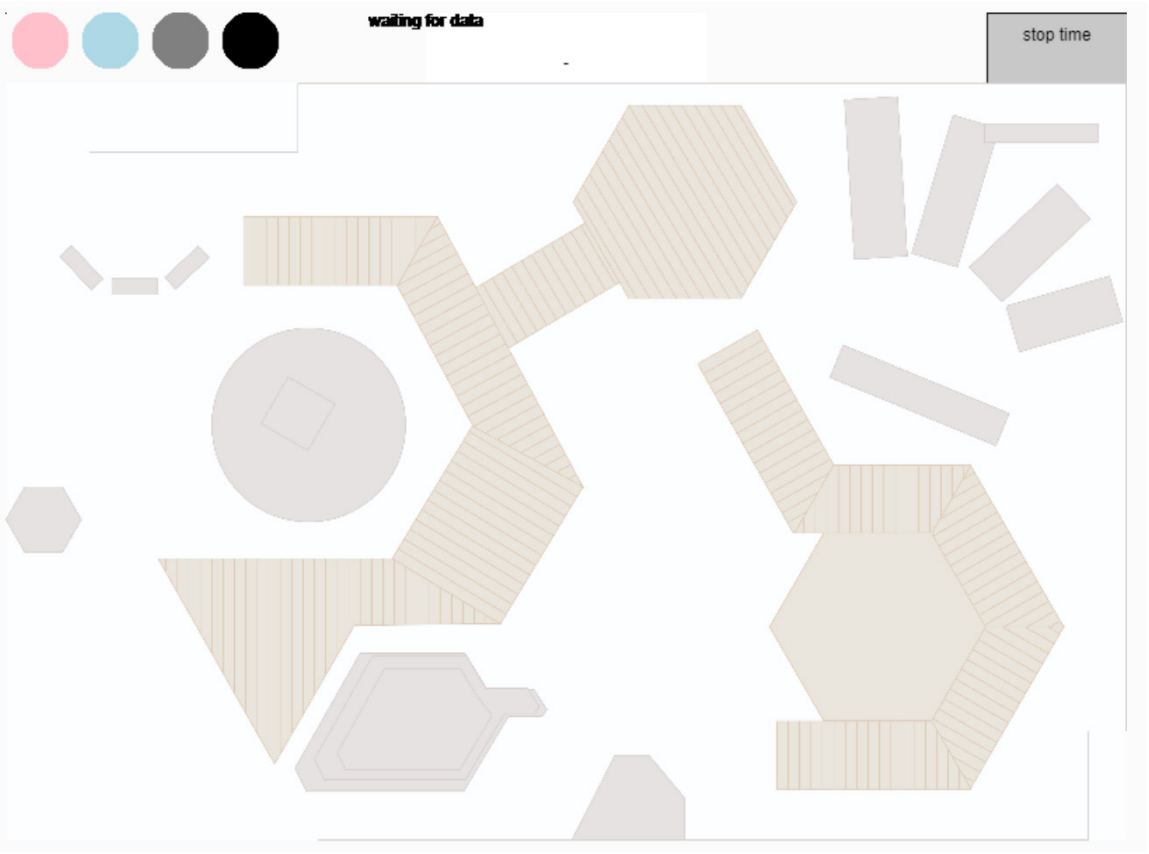


Figure 63. The final p5.js sketch
The sketch can used via: https://editor.p5js.org/ellis/present/KMu-Oojk
The sketch can be edited via: https://editor.p5js.org/ellis/sketches/KMu-Oojk.

4.

DESIGNING THE INTERVIEW

As mentioned in the introduction of chapter 3, experience sampling is not just the collection of feedback by the portable device. This experience samples gets really interesting as soon as we use it to ask the participants further upon. How to conduct this interview will be further developed in this chapter.

4.1 WHEN AND WHO?

In paragraph 2.3 a visualisation was made that shows the framework of the evaluation process, including the most important steps of the data gathering stage. This visualisation is shown once again in image 64.
The image shows, that the interview will be held with five families. In paragraph 1.3.2 you can find that with a family, we mean a group of visitors, consisting out of one or two children in the age range of six to twelve and one or two adults. Image 56 also shows that the interview is held in version 2 of the research, after the family has visited the exhibition with the portable tracking device, which results in an heat-map for every family member.

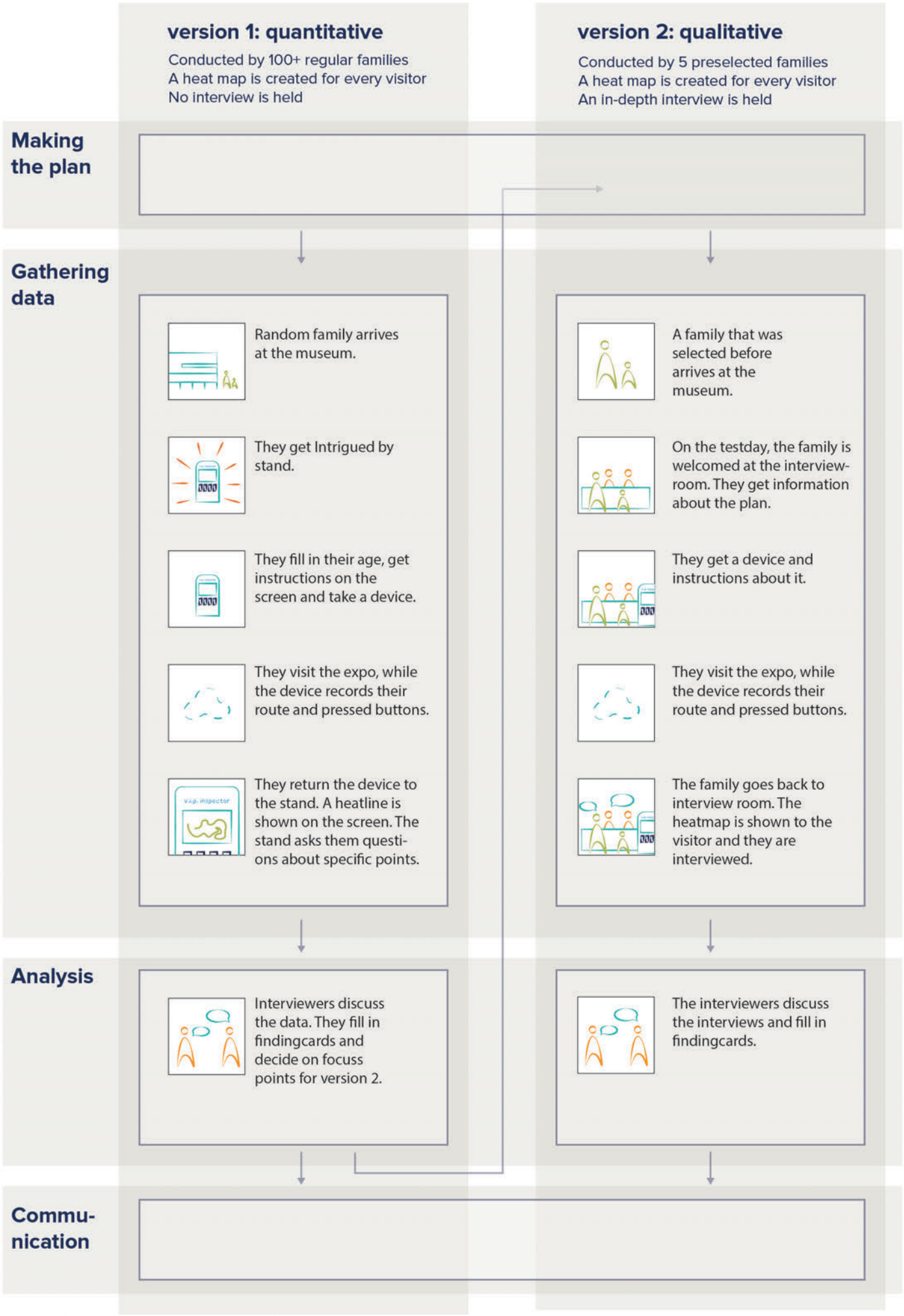


Figure 64. A schematic overview of the evaluation process.

4.2 WHAT DO WE HAVE TO START FROM?

The interview has quite some information to start from. Looking at the visualization in image X, in paragraph 8.1, we can see that we have the following things to base the interview upon:

› The evaluation questions
› Personal heat-mapfrom the visitor that is about to be interviewed
› Quantitative results from research version 1, with indicated patterns which resulted in focus points

I will now explain all these things further.

4.2.1 EVALUATION QUESTIONS

The evaluation quesions can be divided into two categories. Firstly, there are general research questions, which are applicable to every family exhibition. Secondly, specific evaluation questions connected to the sea monsters exhibition are formed. The evaluation questions are listed again below.

General evaluation questions:

› On what places in the exhibition does interaction take place between child and parent?
› Is there enough to do for all ages of the target group?
  - What parts do what age-group like?
  - Why?

Specific evaluation question:

› Do children think the exhibition is exiting, or maybe even too exiting?

PARTLY ANSWERED QUESTION BY RESEARCH VERSION 1

The Qualitative results from research version 1 actually already give us partly the answer to evaluation question 2:

› Is there enough to do for all ages of the target group?
  - What parts do what age-group like?
  - Why?

From the heat-maps, it can be seen what areas are appreciated by which age groups. However, However, it is not known what these positive moments were based on. Is it because of a certain exhibit, was it caused by an interaction which takes place in this area?

4.3.2 THE HEAT-MAP

Furthermore, a heat-map was created to structure the research. Details about the heat-mapare discussed in paragraph 3.1. The most important features to take into account:

› The heat-map shows the route the visitor walked in the exhibition and whether they spend a lot of time, or less time at a certain location. This is visualised by the thickness of the line. The thicker the line, the more time the visitor spend at this location.
› The heat-map shows how much someone liked the exhibit they are watching, or the activity they are doing every minute, by a tree colour scale:
  - Blue/star : I like it very very much
  - Green: I like it
  - Yellow: I kinda like it
  - Red: I do not like it
› Visitors stay 15 to 40 minutes in the exhibition of sea monsters. Therefore it creates a heat-map of 15 to 40 points

An example of a created heat-map by one of the test-persons is shown below in figure 65.

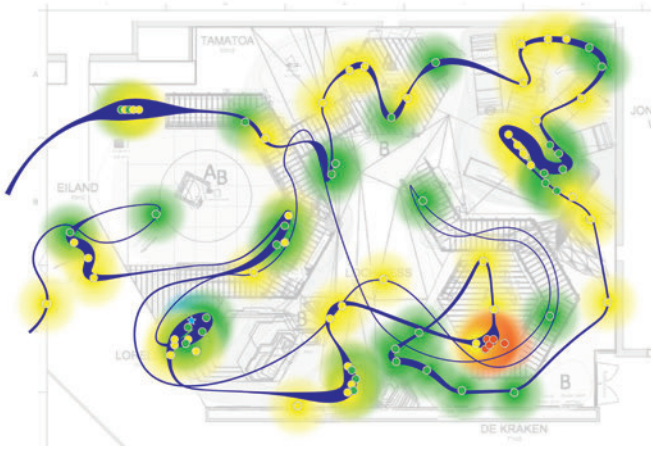


Figure 65. An example of a heat-map, created by the data of test 4.

4.2.3 THE QUANTITATIVE RESULTS FROM RESEARCH VERSION 1

During research version 1, 100+ regular visitors will take the portable tracking device with them during the visit of the exhibition. The heat-map software will create heat-maps out of this data. The software will also recognize patterns. These patterns could be:

› An area which is often rated as positive or negative by a certain age-group
› An area where people often stand still
› An area where people often walk past
› How often is an certain area visited by the visitor

These patterns will be reviewed by the researchers. The questions which arise from these patterns could be included in the interview.

4.3 A FIRST ATTEMPT

Looking at a personal heat-map can already arise lots of questions you could ask the participant, but it also might leave your head blank. To get an idea about what questions pop up by simply walking through the complete exhibition visit, a first attempt for an interview was done.

4.3.1 METHOD

A test-person was asked to visit the sea monster exhibition with the portable tracking device. She was visiting the exhibition alone. I followed here to take note of the route she walked. This test is test number 7, so in paragraph 7.3.6 it can be seen which p5.js sketch was used. The heat-map which came out of this was shown to the participant and discussed together. A puppet was placed on the heat-map which represented the participant. I made the puppet walk over the line and stopped at every area of a new sea monster. At red (sad face) or blue (star) data-points, the participant was asked; “You liked it a lot/did not like it here. Do you remember what happened?” At all moments where the person stayed for a long time, she was asked; “You stayed pretty long/not so long here. Do you remember why?”

4.3.2 RESULTS

The answers which came out of this were interesting, but it was hard to ask further upon right away. Furthermore, it took about 30 minutes to interview this one person.

4.3.3 CONCLUSION

It was found that discussing all areas with the participant takes a lot of time. Furthermore, it was noticed that the questions needed to be written down before the interview started as otherwise consistency between the different tests would be lost and irrelevant data would be gathered.

I therefore think it is a better idea to pick a few points and ask further upon these. This way we might miss information about less outstanding areas, but it gives us the opportunity ask in depth about the points we DO discuss. Furthermore, we need some more handles to ask questions which give meaningful information, and process the data to meaningful insights. All in all, the interview needs to be more structured as it makes the process more efficient and productive.

4.3.4 APPROACH

IIn paragraph 4.4 a format will be created that structures the interview and dives deeper into several aspects that form the experience of the participant.

4.4 MORE HANDLES TO STRUCTURE THE INTERVIEW

4.4.1 THE DEVELOPMENT OF THE INTERVIEW FORM

ANALYSING THE QUESTION FLOW OF THE FIRST ATTEMPT

After the first interview attempt, the way of asking questions was analysed. It was concluded that there are several starting points to get more information about the different locations in the heat-map.

Visualizing the steps that create a certain experience, creates a vision of how can ask further upon each elements of an experience.

THE PROCESS OF EXPERIENCING

Figure 66 schematically shows all steps that take place when a visitor interacts with an element of the exhibition. When following the numbers in the illustration, it becomes clear what happens when a visitor interacts with the exhibition.

1. The visitor arrives at a certain place with expectations, gathered by previous experiences and gained knowledge.
2. An element of an exhibition will give the visitor information. This can for example be written or spoken text, but could also be a big red button which gives the visitor information, or the sight of an interesting object.
3. This information will give the visitor a feeling about the element of the exhibition.
4. The visitor reacts to the information (step 2, 3 and 4 might be repeated several times).
5. The visitor learns from the exhibition element and is able to judge the element.

THE INTERVIEW FORM

Figure 66 can gives some handles to understand what to ask further upon to get to know the reason behind why a visitor does or does not like as certain element of the exhibition.

From the first attempt to interview a participant, described in paragraph 7.2, we learned that discussing all areas with the participant takes a lot of time. Therefore it is a better idea to pick a few points and ask further upon these. This way, information about less outstanding areas might be missed, but it creates an opportunity to talk more in depth about the points that do get discussed. I therefore decided to talk more in depth about 6 location per visitor.

I created an interview form that can be filled in for each location that is discussed during the interview, based on the steps of the process of experiencing. This form is shown in figure 67. Figure 60 shows the connection between the form and figure 68. When interviewing a visitor, the interviewer could start at any of these starting points, and fill in the remaining spaces together with the visitor.

The remainder of this chapter is as follows. Paragraph 4.5.2 explains more about expressing feelings. In paragraph 4.5.3, different control means are explained and paragraph 4.5.4 will tell more about question flows.

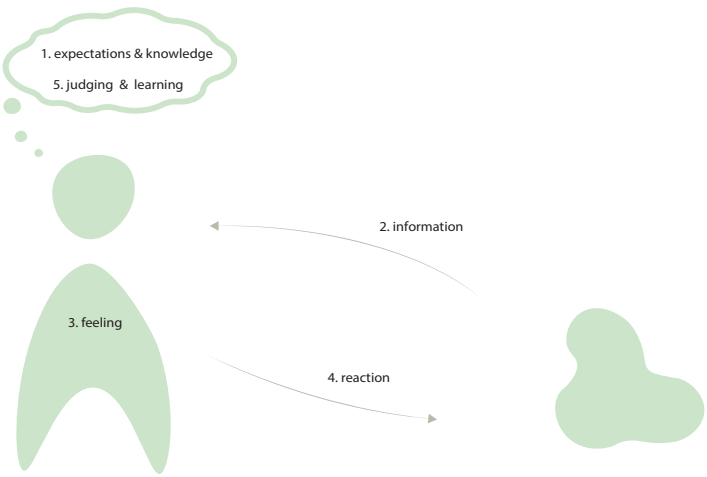


Figure 66. Interaction steps

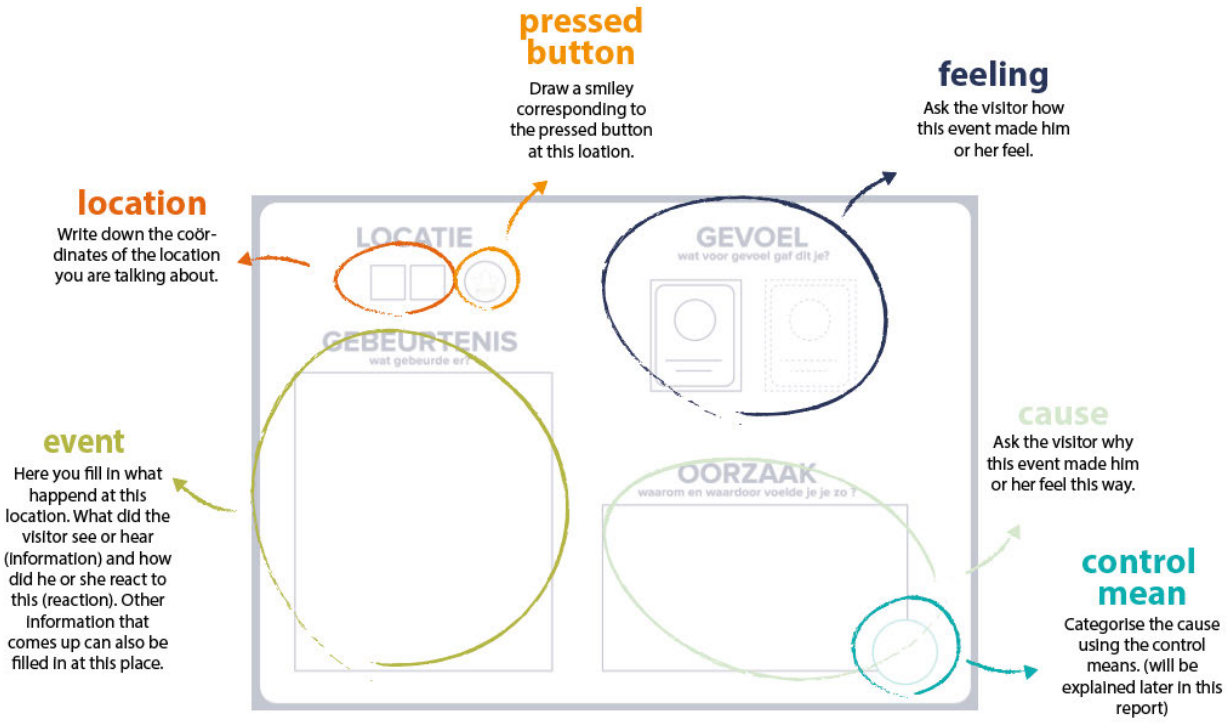


Figure 67. Interview form

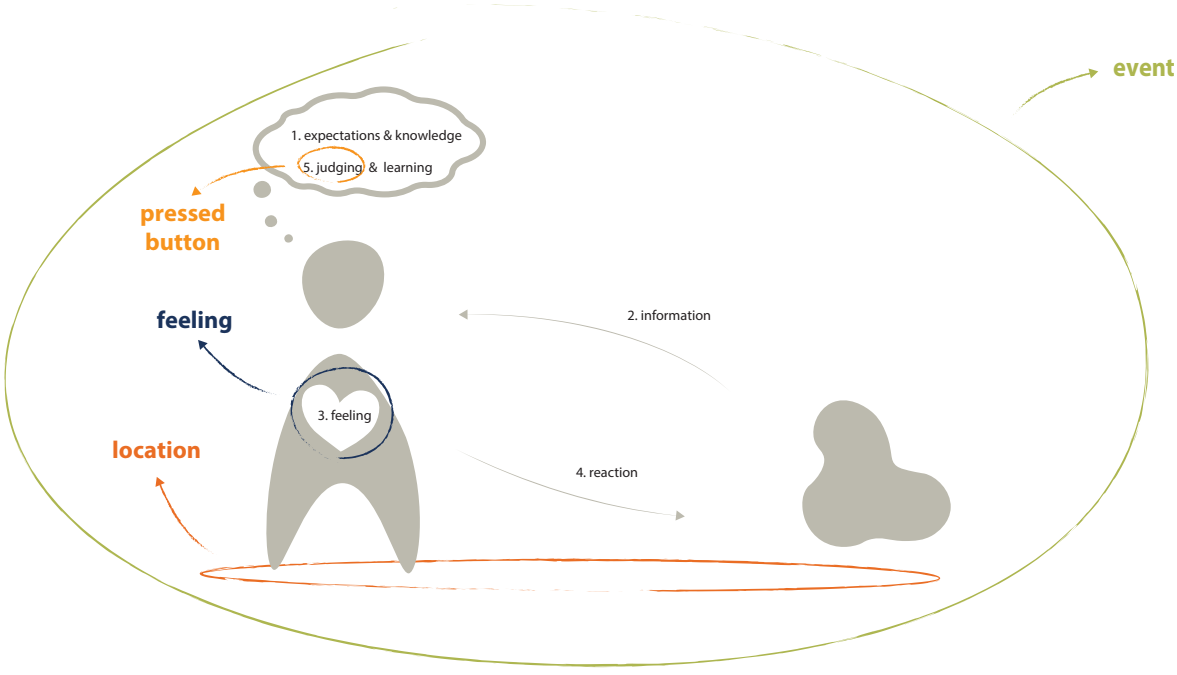


Figure 68. Connection between the interview form and interaction steps

4.5.2 EXPRESSING EMOTIONS

A positive or negative feeling towards a certain moment can be caused by numerous emotions. It can be hard for children to express the emotions they experience. A tool that could help them with this is PrEmo, created by Desmet (Desmet, 2013).

PREMO

Desmet distinguished 14 emotion which can be evoked by consumer product. The emotions people feel are a combination of the 14 emotions as described by Desmet. From these 14 emotions half of them are pleasant emotions (i.e. desire, pleasant surprise, inspiration, amusement, admiration, satisfaction, fascination), and the other half are unpleasant emotions (i.e. indignation, contempt, disgust, unpleasant surprise, dissatisfaction, disappointment, and boredom). All emotions come with a cartoon which represents this emotion. These illustrations are shown in figure 69. He named this set of emotions the PrEmo tool.

Figure 69. The PrEmo Tool as created by Desmet. (Desmet, 2013)

These cartoons will be used to help participants to express their feelings behind a positive or negative rating. When they give a red, sad-face, rating, the interviewer can ask them what happened at this place. Next, the interviewer can show them the range of unpleasant emotions with corresponding cartoons and ask them to identify what emotion or emotions fit with how the situation made them feel.

PREMO AS USED BY S. DE JONG

S. de Jong also used the PrEmo tool during her project as described in paragraph 1.7.1. She made a connection between the PrEmo tool and the emojis as used in the popular messengering program Whatsapp and Facebook, since children are already familiar with these images so they are recognisable for them right away.

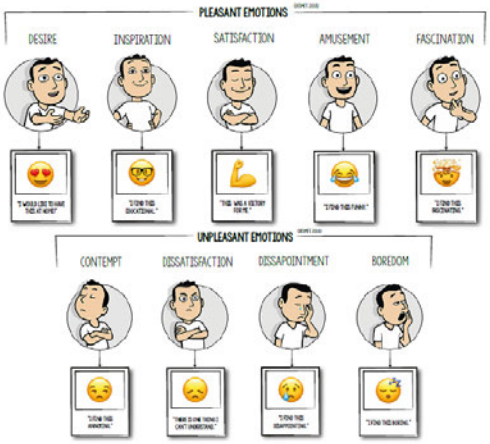


Figure 70. Set of Premo emotions and matching emojis as created and used by S. de Jong (De jong, 2017)

An image created by S. de Jong which shows the matching cartoons and emojis is shown in figure 70. De Jong made a selection and left out five emotions (indignation, disgust, unpleasant surprise, admiration and pleasant surprise). She made this selection since she thinks these emotions are overlapping with other emotions and this might cause confusion for the children.

CREATING A SET OF EMOTIONS FOR THIS PROJECT

The connection between emojis and the PreMo is also useful for this project. For this project the emotion of pleasant surprise is put back into the set, since the sea monster exhibition is designed with the idea to surprise the visitor at certain points.
Another addition to the set is “I think this is scary” , since one of the evaluation questions is focussing on this feeling. The set of emojis that results from this is show in figure 71.

Figure 71. Set of emojis for this project

4.5.3 CONTROL MEANS

In the research 'exhibition designers from the 21st century', earlier mentioned in paragraph 1.7.2, a list of control means was created. Control means are elements of an exhibition which the exhibition designer can control to influence the experience of the visitor. This research identifies four categories of control means, namely interaction, senso-aesthetics, lay-out and content.

USING THE CATEGORIES

The categories of control means are used to cluster the feedback given by the participants during the analysis of the data. At the end of the interview we gained lots of information. Clustering them into categories can be very time-consuming. By using these categories as a pre-set framework for the clustering, the process is speed up.

Knowing this, the interviewer can ask about the experience of the visitors with these categories in mind and figure out what kind of control mean is responsible for the positive or negative experience.

CREATING CATEGORIES FOR THIS PROJECT

Keeping the categories with the evaluation questions in mind, the category of interaction is split into two categories; namely participation and interaction. This way, five categories come to exist. I created illustrations to make the categories easier to recognise. The illustrations and the explanation of each category are shown in figure 72.

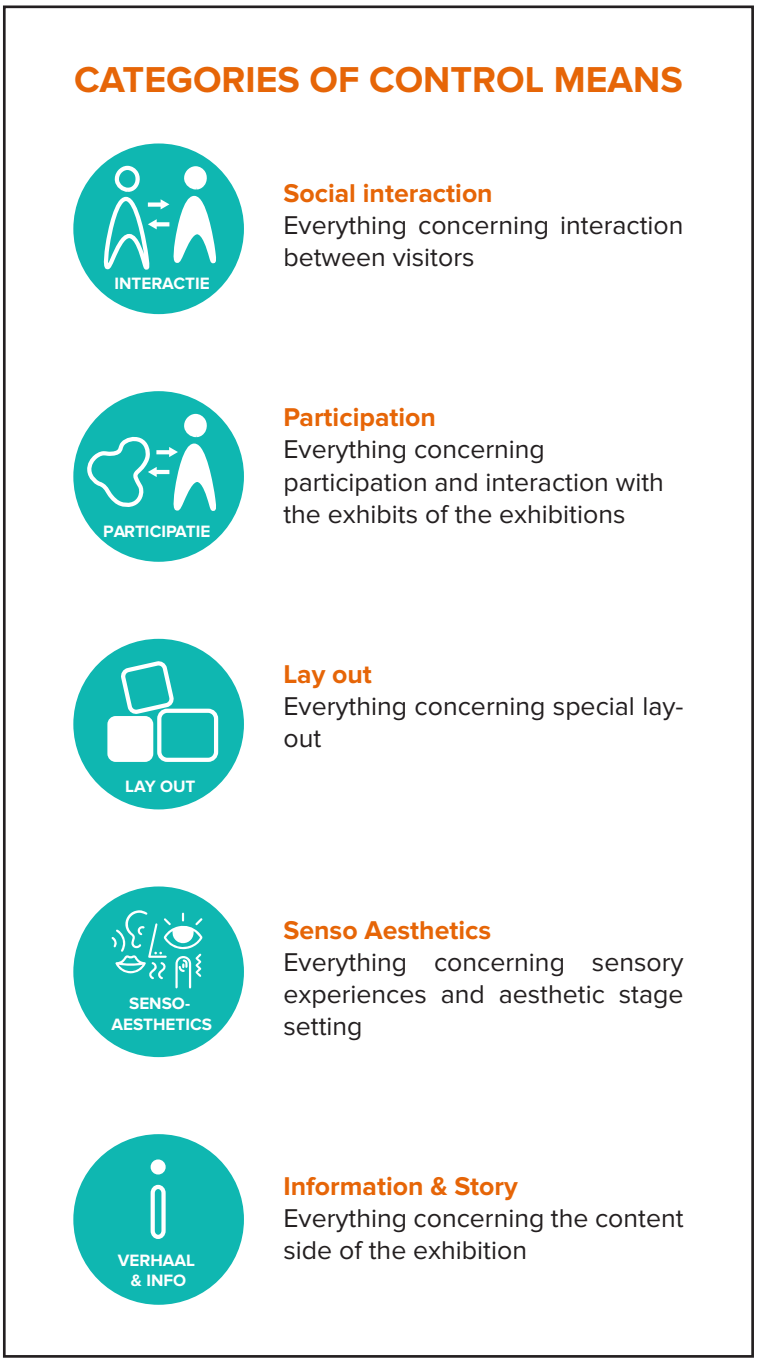


Figure 72. Categories of control means for this project

4.5.4 QUESTION FLOWS

As mentioned in the previous paragraph, it is possible to start at any starting point on the interview form. However, where to start depends on the evaluation questions that were set up.

I indicated three logical question flows. Every one of these question flows results in information regarding one of the evaluation questions as we formulated for the sea monster exhibition. I will discuss these question flows in this paragraph.

QUESTION FLOW 1:

Location > event > control mean > feeling > why

In this case we start from an interesting point in the heat-map. Subsequently the interviewer asks why the participant gave the rating they gave and how this made them feel. Next, we ask them why. Evaluation question 2 can be answered by using this question flow.

Evaluation question 2:

Is there enough to do for all ages of the target group?

- *What parts do what age-group like? Why?*

In paragraph 4.2.1 it is discussed that this question is partly answered by the quantitative data which will be collected in version 1 of the evaluation. However, the why behind the rating yet is still unknown

In order to get insights in this, the following question flow will be considered.

1. **Location**:
   - "At this point you gave a star."
2. **Event:**
   - "What happened here?"
3. **Control mean:**
   - "What did you like here so much?"
4. **Feeling:**
   - "How did you feel here?"
5. **Why:**
   - "Why did this [control mean] make you feel this way?"

Not only the participants personal heat-map can be used to decide on the points to ask about. The qualitative data as gathered by research version 1, can also be used to decide on the locations to ask about. The question flow will be as follows:

1. **Location**:
   - "At this point lots of people in your age group gave a star."
2. **Event:**
   - "Do you remember what happened here?"
   - "Do you also like this point?"

From this point, there are two ways to go. When the participant also likes this point, the follow-up questions will be as follows:

3. **Control mean:**
   - "What did do you like here so much?"
4. **Feeling:**
   - "How did you feel here?"
5. **Why:**
   - "Why did this [control mean] make you feel this way?"

When the participant does not like this point, we will ask him or her why. Next, the interviewer will ask the participant to imagine why his or her peers did like the area. The follow-up question will be as follows:

3. **Control mean:**
   - "Why do you think your peers like this point?"
4. **Feeling:**
   - "How do you think your peers you feel here?"
5. **Why:**
   - "Why do you think this [control mean] make them feel this way?"

QUESTION FLOW 2:
Control mean > location > event > feeling > why

The question-flow could also start with the control mean. The interaction between the parent and the child is a control mean, and therefore evaluation question 1 can be answered with by using this question flow.

Evaluation question 1:
On what places in the exhibition does interaction take place between child and parent?

The question flow will look like this:

1. **Control mean:**
   - "I would like to talk to you about the interaction between you and your child/ mother/grandpa etc."
2. **Location:**
   - "At what point did these interactions take place and added this to or de-tracted it the positive experience of the exhibition?"
3. **Event:**
   - "What happened here?"
4. **Feeling:**
   - "How did this make you feel?"
5. **Why:**
   - "Why did the interaction make you feel this way?"

QUESTION FLOW 3:
Feeling > location > event > control mean > why

Lastly, the question-flow can start from a feeling. Looking at the evaluation questions, evaluation question number 3 asks for this approach, since feeling exited or scared is a feeling.

Evaluation question 3:
Do children think the exhibition is exiting, or maybe even too exiting?

This evaluation question can be cut up into two questions:

- Do children think the exhibition is exiting?
  - At what points?
  - Why?
- Do children think the exhibition is scary at some point?
  - At what points?
  - Why?

The question flow for the evaluation question:
Do children think the exhibition is exiting?

1. **Feeling:**
   - "Did you feel exited in the exhibition?"
2. **Location:**
   - "At what point?"
3. **Event:**
   - "What happened here?"
4. **Control mean:**
   - "What caused that you felt that way?"
5. **Why:**
   - "Why did this [control mean] make you feel this way?"

The question flow for the evaluation question:
Do children think the exhibition is scary at some points?

1. **Feeling:**
   - "Did you feel scared somewhere in the exhibition?"
2. **Point:**
   - "At what point?"
3. **Event:**
   - "What happened here?"
4. **Control mean:**
   - "What caused that you felt that way?"
5. **Why:**
   - "Why did this [control mean] make you feel this way?"

5.

DESIGNING THE ANALYSIS & COMMUNICATION

5.1 WHAT ARE WE WORKING TOWARDS TO?

For the analysis, the data that is gathered during the interview is used to try to find patterns, generalize findings to a broader scope and for finding evidence to support the conclusions. Figure 65 shows a model to guide analysis, created by Sanders and Stappers (Sanders & Stappers, 2012). This model is based on Ackoff's DIKW scheme, created to distinguish levels of sense-making. (Ackhoff, 1989). The letters D, I, K and W stand for Data, Information, Knowledge and Wisdom. Sanders and Stappers also created a table containing the relationship between the different levels in the model of figure 65. This table is shown in figure 73.

Looking at the scheme in figure 74, one can see that we already went from phenomenon to data during this interview. We already selected things participants mentioned while writing them down on the interview forms. We even already interpreted them to information.
How much further we want to analyse this data and information to knowledge or wisdom, is depending on what we want to do with it.

5.1.1 USING RESEARCH FOR DESIGNING

The results of the analysis will be used to identify what are the strong and weak point of the exhibition design. We can learn from this and create even better exhibitions in the future. This can be done by making a transition between research and design. The crossing from to design is called bridging. Bridging can be done at each level in the DIKW model, however, it has different results.
Bridging on the level of data might give us small ideas. Examples of ideas when bridging at data level can be to move a bench within the exhibition or a sign. Bridging on the level of information will give new views which makes it able to create concepts. A concept on this level could for example be the realization that people only watch a complete movie when they have the option to sit down while watching it. When bridging on the level of knowledge, one can see a bigger picture which can result to create big ideas. These ideas are more radical, fundamental and/or substantial. An example is the realization that the best way to transfer the intended message is not by designing an exhibition but by providing a workshop. (Sanders & Stappers, 2012)

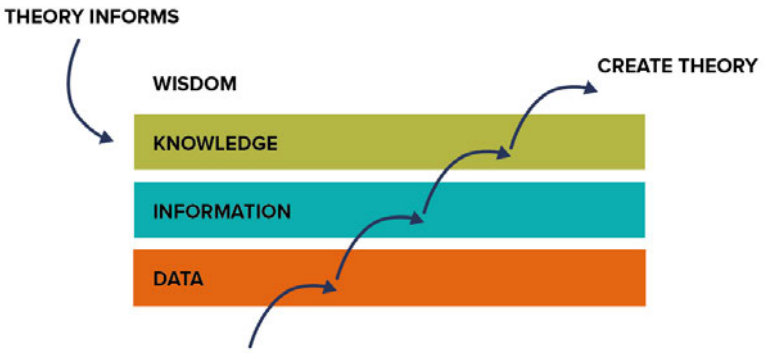


Figure 73. DIKW model, adjusted from (Sanders & Stappers, 2012)

5.1.2 BRIDGING AT INFORMATION LEVEL

In paragraph 1.4 I the goal of the evaluation is defined. This goal is to collect takeaways for future exhibitions. This goal can be reached by bridging from research to design on the information level. To do this, the data which we gathered during the test-day have to be turned into information level. Looking at figure 74, we see that this can be done by choosing interpretation.

INTERPRETING DATA

By filling in the interview forms, a selection is already made, since the interviewer is not able to write all things down that the visitor says. Hence, recording the interview should be considered. This would lead to more raw data without any interpretations yet, which prevents important details to get lost. However, transcribing the interview and analysing all this data will take up a lot more time. Therefore, for this project a second interviewer will make notes by typing along with the interview. The interviewer him or herself can make notes on the heatmap while conducting the interview. To make sure interesting data is interpreted in the right way, the interpretation of the data will be done right after the interview, so the interview is still fresh in mind for the conductors.

ANALYSIS ON THE WALL

According to Sanders and Stappers, analysis on the wall is the way to interpret data to information (Sanders & Stappers, 2012). In this technique, raw data is analysed and categorized in themes to find outstanding information. In this project, this technique is used as a base to create a method to analyse the interviews. In the next paragraph I will explain this method step by step. The visualisation in figure 75 is used for this, which shows how the information is analysed and passed.

LEVEL	CONTAINS	...WHICH CAN BE...	...AND TURNED TO...	BY...
wisdom				
knowledge	theories, patterns		wisdom	using the knowledge
information	interpreted symbols, categories	compared, grouped	knowledge	finding patterns
data	selected materialized stuff	stored and retrieved	information	choosing interpretations
phenomenon (evidence)	stuff and events in the world		data	selecting, recording

Figure 74. Relation between levels in the DIKW model, adjusted from (Sanders & Stappers, 2012)

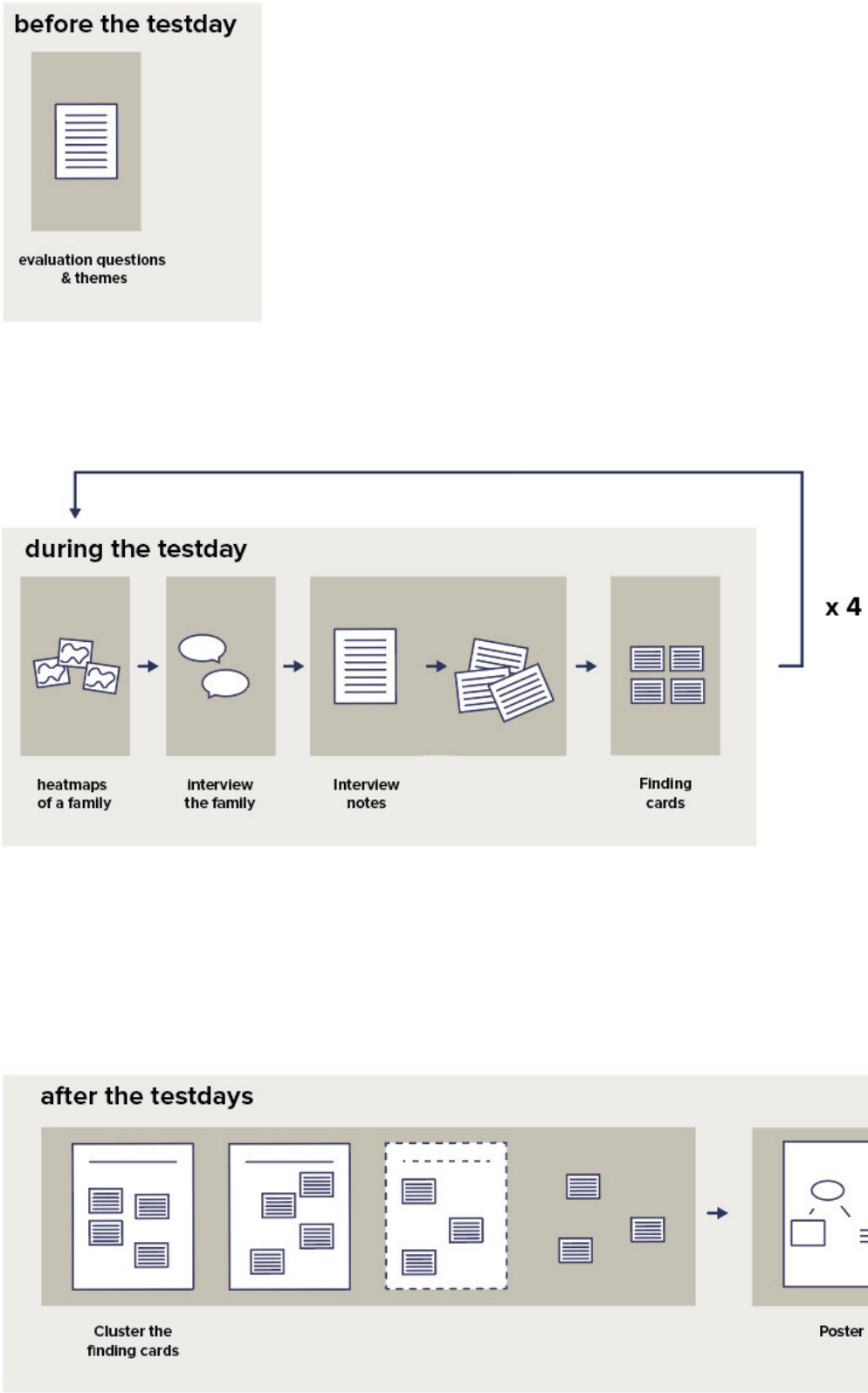


Figure 75. Visualisation of how the information is analysed and passed.

5.2 THE STEPS OF THE ANALYSIS

BEFORE THE TEST DAY

Before the test day, several themes are defined. Paragraph 2.1, contains the formulated research questions. From this research questions, different themes can be derived. In the case of the research questions of the evaluation for sea monsters, these themes are intergenerational interaction, the atmosphere of the area and providing sufficient entertaining elements for each age group. These themes will be written down on the interview form, so we remember to ask about these themes further during the interview.

DURING THE TESTAY

During the test day, a family visits the exhibition, which results in a heat-map. This heat-map will be used to interview the family members. This interview results in interview notes made by the evaluation conductors and filled in interview forms. After the interview, the evaluation conductors take a moment to discuss their notes and fill in some first finding cards. This finding card is pictured in figure 76. This whole process takes place for every family.

AFTER THE TEST DAY

After the test day, the interview forms and finding cards will be analysed. This will take about half a day. The evaluation themes are written down in the middle of a big flip-over page and hang on the wall. The interview forms will be spread out over the table. Next, the interview forms can be put on the filip-overs with the right theme. Not all interview forms will fit with one of the pre-set themes. Therefore, new categories might be formed, and written down on new flip overs. The interview conductor should write notes on the flip-over, to indicate connections or new ideas when these arise.
When this is done, it is time to fill in the insight cards. On these insight cards, the evaluation conductors will write down their findings of the analysis. By doing this, the most important conclusions and idea's will be selected.

In the research exhibition designers from the 21st century, earlier mentioned in paragraph 1.7.2, a list of control means was created. Control means are elements of an exhibition which the exhibition designer can control to influence the experience of the visitor. The research identifies four categories of control means, namely interaction, senso-aesthetics, lay-out and content. It might be helpful for the evaluation conductors to use these categories of control means to cluster the feedback given by the participants during the analysis of the data.

Next, one of the interview conductors will take the responsibility to create a poster out of these insights cards. He of she will make a raw set-up of the poster. The professional graphic designer within the museum can be asked to make the poster look perfect. This poster should be hung in the canteen, so all employees of the museum can see the result. This likely will cause conversations to take place between employees of the museum during lunch-breaks, which helps to spread the information between the different employees.

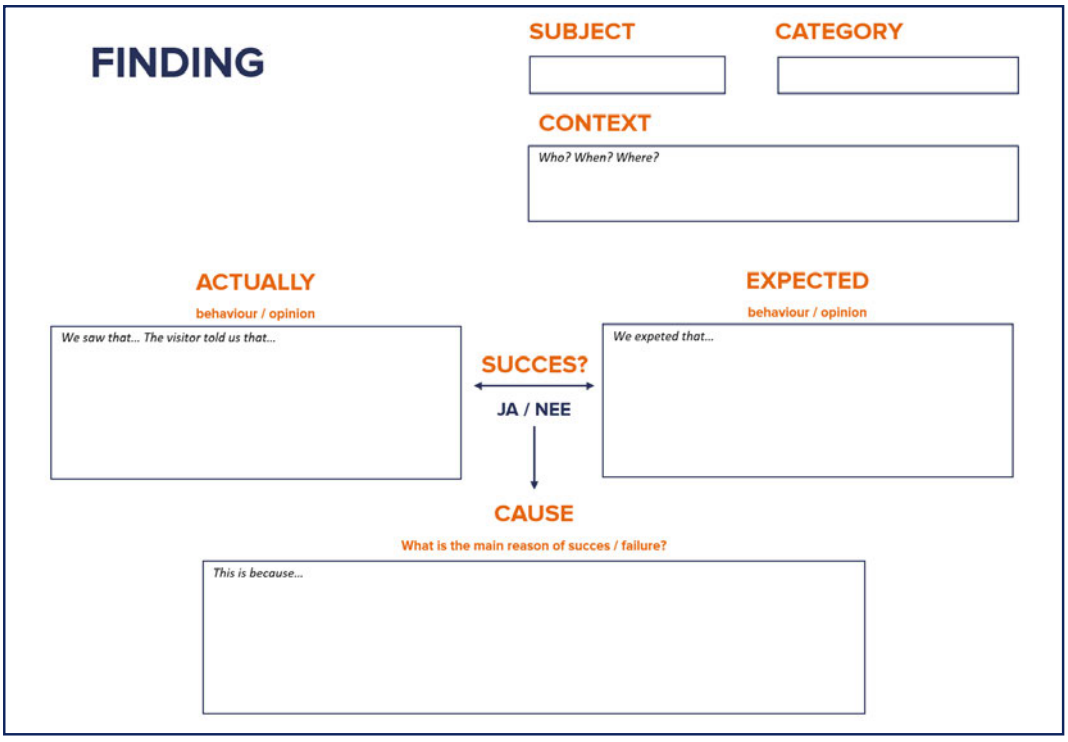


Figure 76. Finding card

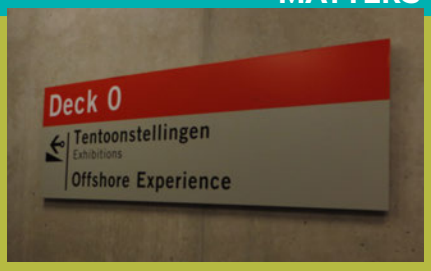
6.

PROVISIONAL DESIGN OF VERSION 2

In this chapter, all designed steps of version 2 of the evaluation will be collected to create a provisional design. This provisional design of version 2 of the evaluation is presented by the storyboard as shown below. This manual contains more elaborated information about this step. However, I the actual manual is just created for the final design.

BEFORE THE TEST DAY

PRACTICAL PERIPHERAL MATTERS



Who and what do we need at what moments? During this step you will fix all practical peripheral matters to make the research work.

ORGANIZE PARTICIPANTS

Five families get selected for this part. These families could for example be gathered by using social media. We preselect these visitors, so they will have time to take part in the interview and so we can time their participation better.
The families get contacted and are given a certain timeslot.

DURING THE TEST DAY

ARRIVAL AT THE MUSEUM

One of the preselected families arrives at the museum. They report their presence at the Ticket counter. They are asked to wait in the entrance hall. The facilitator meets the family in the entrance hall and they walk to the interview-room together.

EXPLANATION

The family gets welcomed with some coffee, lemonade and cookies. The visitor is asked to sign a form of consent. They get explained what is about to happen and how the device works.

DATA COLLECTION

Next, the family visits the exhibition. Every minute the device vibrates. Each family member holds a device and decides what emotion fits at that point: :(, :/ or :). If they like it very very much, they can press the star!

AFTER THE TEST DAY

ANALYSING THE DATA

The facilitators will analyse the interview forms, finding cards and heat-maps. They will cluster the data and try to find interesting findings and insights. They will record these on insight cards.

CREATING A POSTER

One of the facilitators will take the task to design a poster out of the insight cards.

INTERVIEWING

After the family visited the exhibition, they return to the facilitator to the interview-room. The facilitator takes the interview form and conducts the interview. First, the children are interviewed, and then the children. To reward them, the kids get a special Museum-tester badge.

THE VISITORS RETURN HOME

At this point, the visitor completed al his/her tasks. They feel like they made a meaningful addition to the museum and are proud of the special Museum-tester badge they got.
The family can decide to go home, but may also continue the museum visit.

PROCESSING THE DATA

After the interview, the interview notes are discussed between the evaluation facilitators and the special designed cards are filled in.

7.

TESTING THE PROVISIONAL DESIGN

7.1 FOCUS

In this chapter, the steps of the test day of evaluation process of version 2, up to and including the interview are tested. For this, two tests are done. The first one is test 8 and the second one is test 9.
The focus during this test will be on the interview, since this is the part hasn't been tested yet. However, it is still interesting to see if any flaws occur during the conduction of the other steps. (see figure 77)

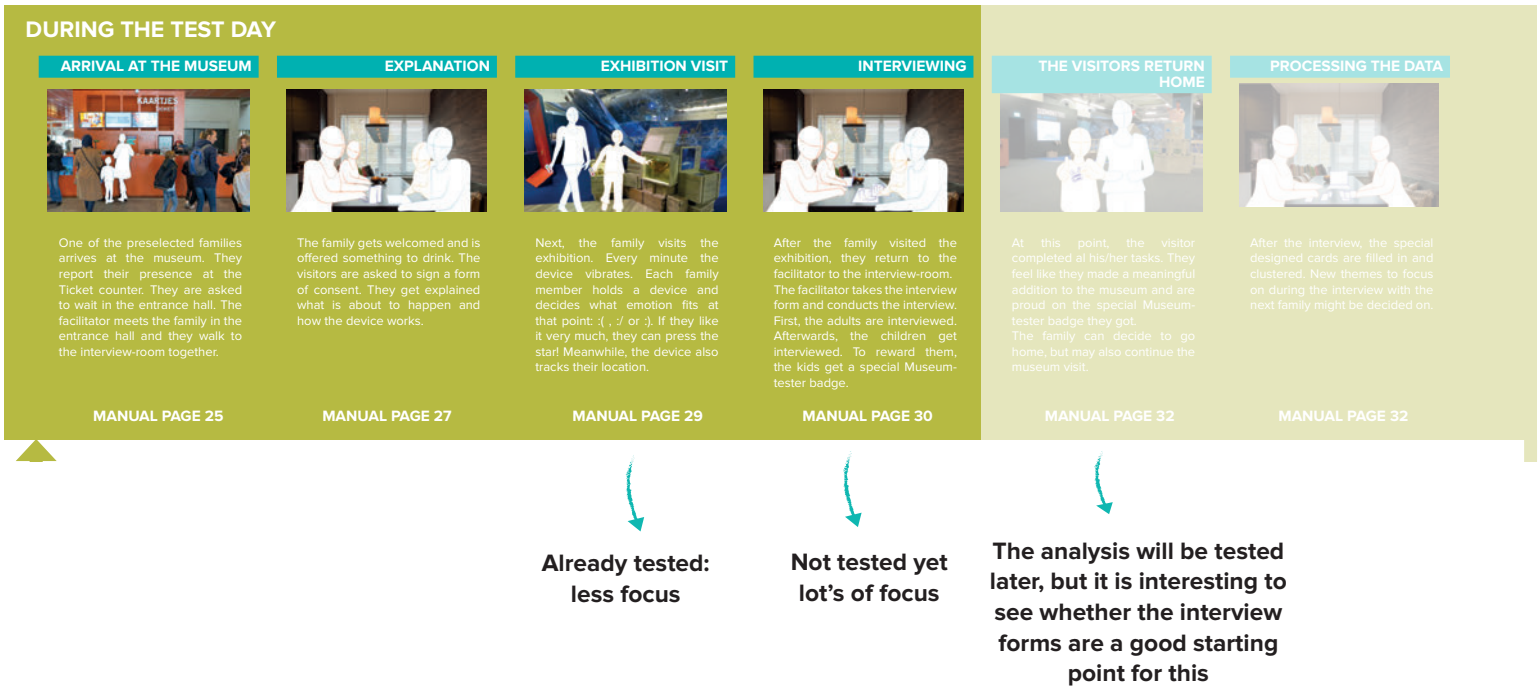


Figure 77. Focus of the test 8 and 9

7.2 SET-UP OF THE TESTS

RESEARCH QUESTIONS

The goal of the tests is trying to find answers to the following questions.

- Does the interview form help to structure the interview?
- Are the interview forms a useful starting-point to analyse the data?
- Is the information given by the visitors useful for the project office?
- Where do flaws in the process occur?

DIVISIONS OF ROLES

During the first test, I took the role of interview conductor upon me. During the second test, the main client project leader and the project assistant took these roles.

PARTICIPANTS

For the tests, two different families were selected

- Test 8: Mother and son (8)
- Test 9: Father, mother, son (6) and son(9)

Figure 78. Participants test 8

Figure 79. Participants test 9

7.3 PROTOTYPES AND THEIR LIMITATIONS

PORTABLE TRACKING DEVICE

The wooden prototype is used as described in paragraph 3.3.4. (see figure 80) This prototype still has some limitations.

- It is worn around the neck instead of just holding it
- Does not keep track of where you are walking, so a conductor still has to follow participants to record their route.
- It lights up when a button is pressed, so we can record which button they pressed. This way, participants see each other's opinion which might influence them.
- Although one device extra was made, two prototypes is still not enough for a family of four.
- The prototype isn't completely firm.

Figure 80. The wooden prototype

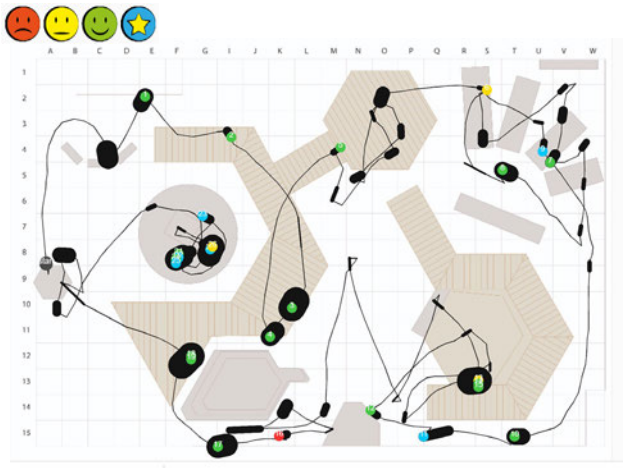


Figure 81. The heat-mapsystem in p5.js

HEAT-MAPSYSTEM

The route of the visitors isn't automatically recorded, so an observer (me) has to manually locate the people. This will be done with the p5.js sketch as explained in paragraph 3.3.6. (see figure 81) This sketch has some limitations to be aware of.

- The tool creates a line which isn't very smooth. This might influence the readability for the interviewer and interviewee.
- The given input by the user when pressing a button is shown by the lights on the portable tracking device. The lights light up in the corresponding colour. This also has to be recorded manually, by pressing one of the smiley buttons. A given input might be missed and therefore not be recorded.
- At the end, a screen shot of the visualization has to be made and printed. This takes some time.

7.4 PROCEDURE

FIRST TEST: TEST 8

The ‘Arrival at the museum’ and ‘Explanation’ step were conducted as explained in the storyboard. During the ‘Exhibition visit’ step, I followed the family and noted their route and pressed buttons by using the p5.js heat-map system. The family visited another exhibition after they finished the sea monster exhibition, so I could meanwhile print the heat-maps. When the heat-maps were printed the heat-maps, which took about 10 minutes, the participants just finished visiting the other exhibition and came back to the interview room. I conducted the ‘interviewing’ step. I showed them their heat-maps and tried to fill in four interview forms per person. First with the child and afterward with the mother. At the end the child got a museum tester magnet.

SECOND TEST: TEST 9

The procedure of test 9 was very similar to the procedure of test 8. The biggest difference was is that not me, but two project leaders conducted the explanation and the interview. One of them was the main client project leader and was closely involved in my graduation project. The other person was the project assistant. She did not know about the project yet. She got instructed during one hour before the test. Furthermore, the heat-mapwas not printed but shown on a tablet. An other difference is that the parents were interviewed first and while they were being interviewed, the children got an assignment to draw the thing from the exhibition they liked the most.

Figure 83. Me keeping track of the route of the participants of test 8

Figure 82. Explanation during test 9

Figure 84. Interview during test 9

7.5 FINDINGS

ARRIVAL AT THE MUSEUM
The arrival at the museum went well for both families.

EXPLANATION
During the first test, the cookies on the table were distracting for the child.

In practice, it is more logical to explain the steps to the visitors by showing them the device instead of showing the scheme as created and show in figure X. For me this felt more natural than using the scheme and the project leader also explained the device without using the scheme. This being said, the scheme is nice to use by the conductor of the explanation to take a peek while explaining the portable tracking device.

During test 9, the main client project leader welcomed the family and explained the tool. The project assistant was not informed well enough to explain the tool in the right way. This shows that you have to more time to get to know and try out all the tools before putting them in to practice.
In both cases the children seemed intrigued but the portable tracking device and liked to try out the buttons after the explanation.

DATA COLLECTION
Test 8 did not give important new information about the usability of the device. Test 9 however did.

Since there were only two prototypes of the portable tracking device available, during test 8 the mother got a device and one of the children, the boy who was 9 years old, got a device. The other child also wanted to push the button several times.

While following the family during test 9, I notice some interesting conversations which referred to the control mean categories as explained before. These events were not discussed later in the interview.

Furthermore it was hard to take notes of the route of two persons at once, however it was doable.

The family of test 9 at the beginning only pressed the green button and ignored the trigger for several minutes. The mother explained that they did not had their opinion ready yet, and therefore did not press the button yet.

INTERVIEWING
During test 1, the child was interviewed first. He was very high on energy and this made it hard to talk to the mother when it was her turn to be interviewed. This is why in test 9, the parents were interviewed first, and the child got the assignment to draw the thing from the exhibition they liked the most. This went a lot better.

During test 1, I tried to fill in an interview form right away, but I found out that showing the heat-maps already provoked so many response that it was hard to follow the steps of the form. This is why during test 9, I told the members of the project office to start with simply showing the heat-map to the visitors and give them some time to response. The project assistant, who was not involved in this project before, took the role of interviewer. After talking about the heat-mapin general, she tried to fill in the interview forms, but I this felt rather forced than helping. The feeling part on the interview form got a lot attention, while this is not necessary the part that is most important, it should only be a tool to help formulate the why. Furthermore, the project assistant was not very familiar with the sea monster exhibition, which made asking questions pretty hard. It was hard for her to pick a location to ask about.

RETURNING HOME
The parents said that the kids felt really honoured to be invited to the museum to test an exhibition. The children were very excited getting the museum tester magnet.

7.6 FINDINGS FROM TALKING TO THE PROJECT LEADERS

A few days after test 9, a meeting was scheduled to discuss the course of the test with the involved project leaders. They noticed that it was hard to ask further upon the heat-map, since the family only pressed green.

Furthermore, they wondered whether the visitors felt free enough to tell them about negative things in the exhibition. An idea that arose is that it could be interesting to apply the evaluation process to a exhibition which is not a family exhibition and see whether they press red then.

When talking with the project leaders, we came to realize that the insights we get from the evaluation might sometimes be obvious, but this does not make them less interesting. It might be a good idea to also make insight cards from obvious findings, since this rectifies thoughts we already have. We also came to realize that, if we want to get more specific answers, we also have to ask about these things even more specific. We might want to pick out only one evaluation question and focus on this specific question during the interview.

An interesting extra observation, is that the p5.js sketch which is use to track the visitors with, could also be an interesting tool on it's own for the project office. The project office could use it to observe visitors themselves. It would be even more useful when the tool has more options to add for example flags when something interesting happen so they can ask further upon these events.

7.7 DISCUSSION

The flow of the interview was not enough in the heads of the project leaders to use it in a fluent way. I only used the manual quickly to explain the procedure to the project leaders. When taking more time for this, the project leaders might have a better understanding of the process, which already makes the interview go smoother.

Besides that, I think a better interview guide, containing some catchwords to fall back to, might help the interviewer to be able to pick events to ask about. Furthermore, I think that the interview form is not a useful tool to use during the interview. However, when adjusted, It could be a good way to collect findings by the interview conductors afterwards.

7.8 CONCLUSION

Let's take a look at the research questions which I formulated at the beginning of this test.

Does the interview form help to structure the interview?
The interview form did help to structure the interview, but in it's form as it is right now it makes the interview flow less and gives it a rigid feeling. Feelings got to much attention. A interview guide containing some simple catchwords to fall back on might be more useful.

Where do flaws in the process occur?
The child should be interviewed second and get an assignment to draw while the parent is interviewed.

Is the information given by the visitors useful for the project office?
Yes. Even obvious findings are interesting, since they were never spoken about before or written down. Putting these findings on insight cards could create a set of card with inspirational insights for new exhibitions.

At the other hand, more and deeper information could be discovered when asking more specific questions.

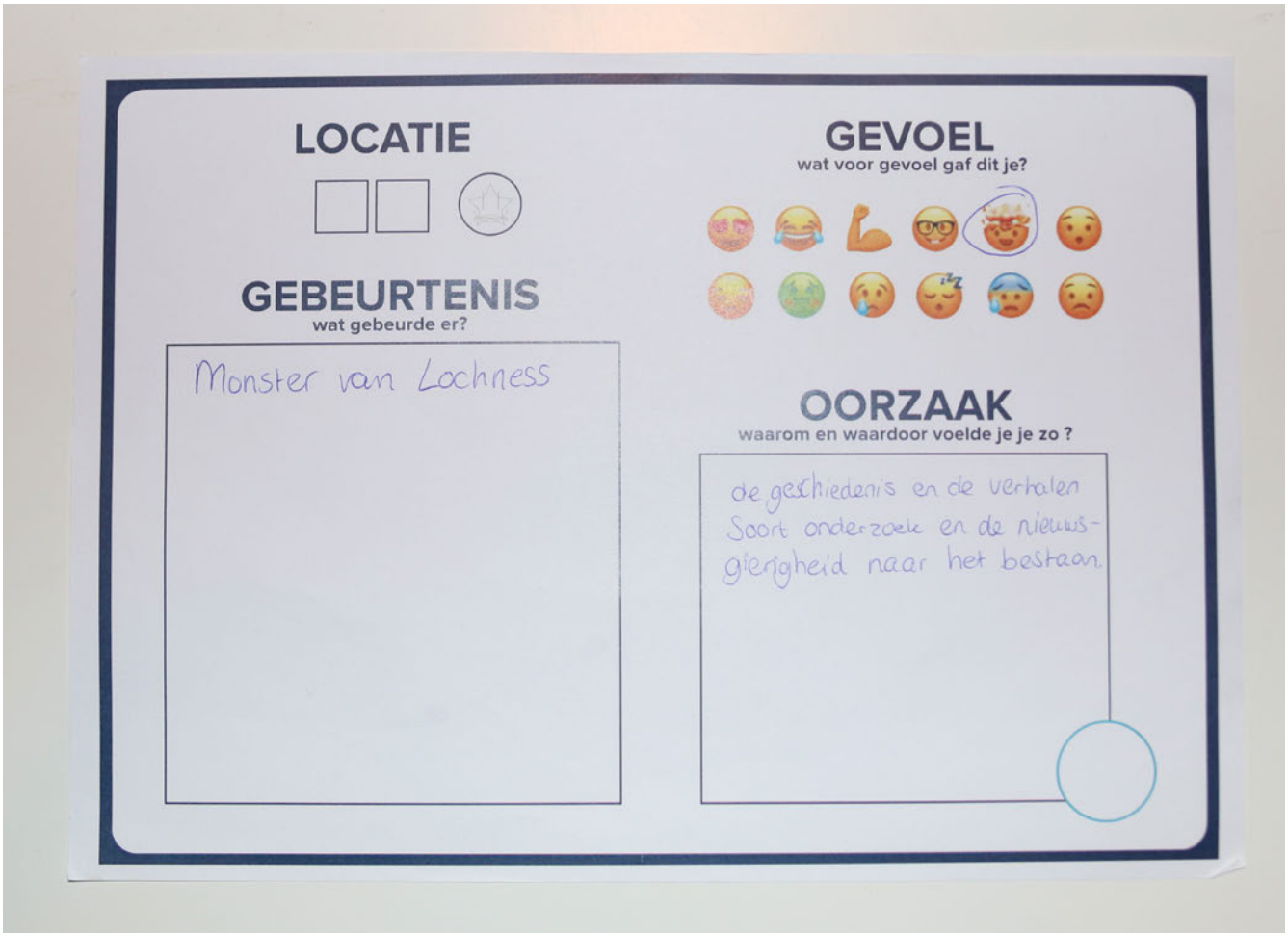


Figure 85. Filled in interview form

8.

THE FINAL DESIGN OF THE EVALUATION PROCESS

The refined assignment that was created in paragraph 1.9 stated that not only a tool should be developed. In fact, a complete tool-box, containing all elements the project office needs to conduct the evaluation process is desired. All elements of this tool-box will be explained in this chapter.

8.1 ADJUSTMENTS TO THE PROVISIONAL DESIGN OF VERSION 2

After the tests in chapter 6, I decided to change a few things in the design, regarding the interview and the analysis. These changes will be explained in this paragraph.

8.1.1 ADJUSTMENTS TO THE INTERVIEW AND ANALYSIS

First of all, the interview was changed. The old design is visualised in figure 87. The new design is visualised in figure 88. Since the interview-form was rather limiting instead of helping the interviewer, the interview-form was taken out. Instead of that a simple interview guide was made. This guide can be found in the manual on page \. The interview guide contains the steps of the interview. It also includes themes based on the evaluation questions that are defined during the start of the evaluation process, the 'defining the evaluation' phase.

After every interview, the interview conductors of the interview will go to this analysis room. They will fill in finding-cards (see figure 86). They try to cluster the finding-cards and look for patterns and decide whether new themes should be added to the interview guide. During the next interview they will be able to ask more about these new themes. When all tests are done, the evaluation conductors should look at the clusters once more to see whether new findings arise.

8.1.2 THE FINDING CARD

The design of the finding card is shown in figure 86. the tool-box contains a paper containing an empty finding card, which can be copied and used during the evaluation.

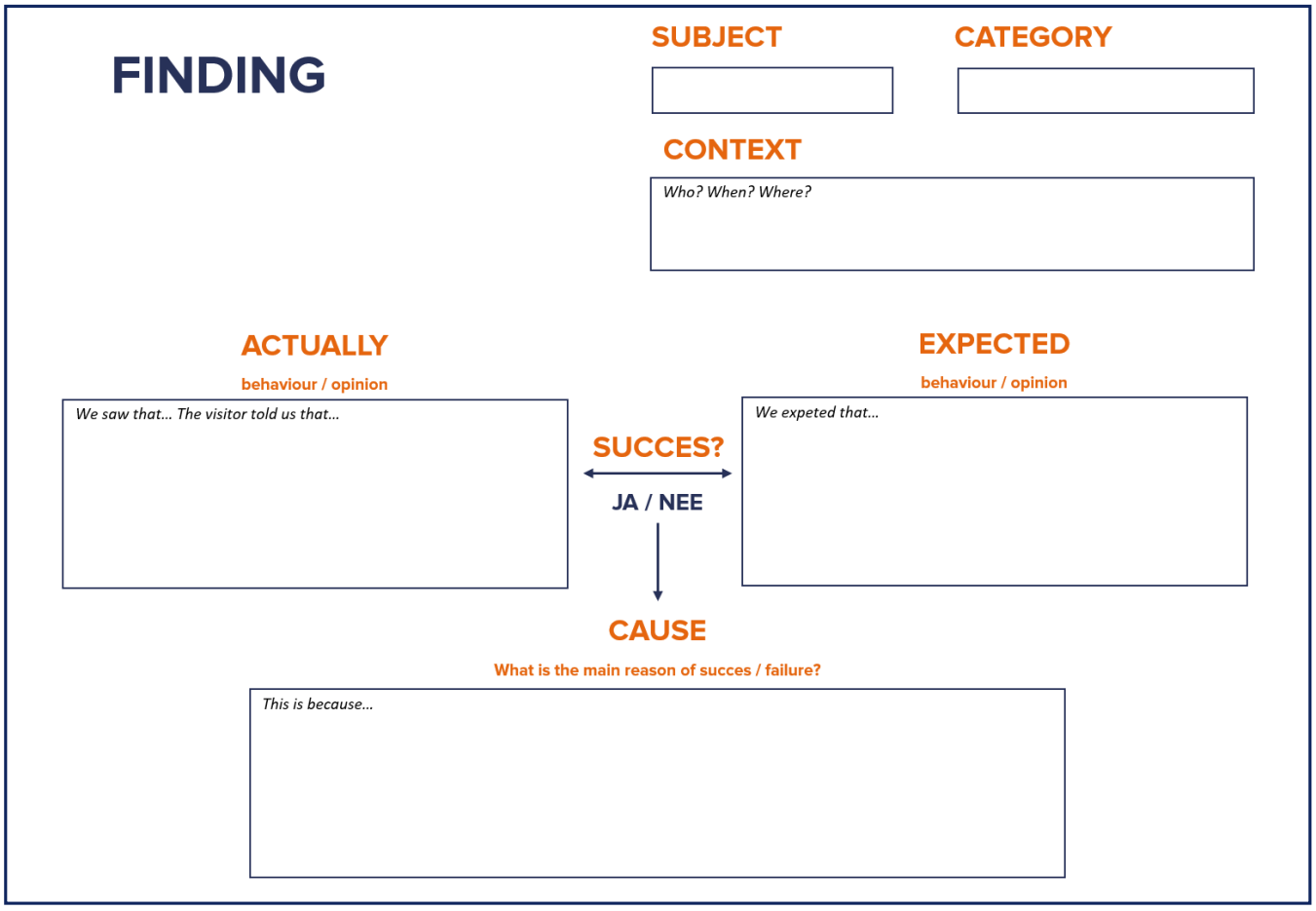


Figure 86. The finding card

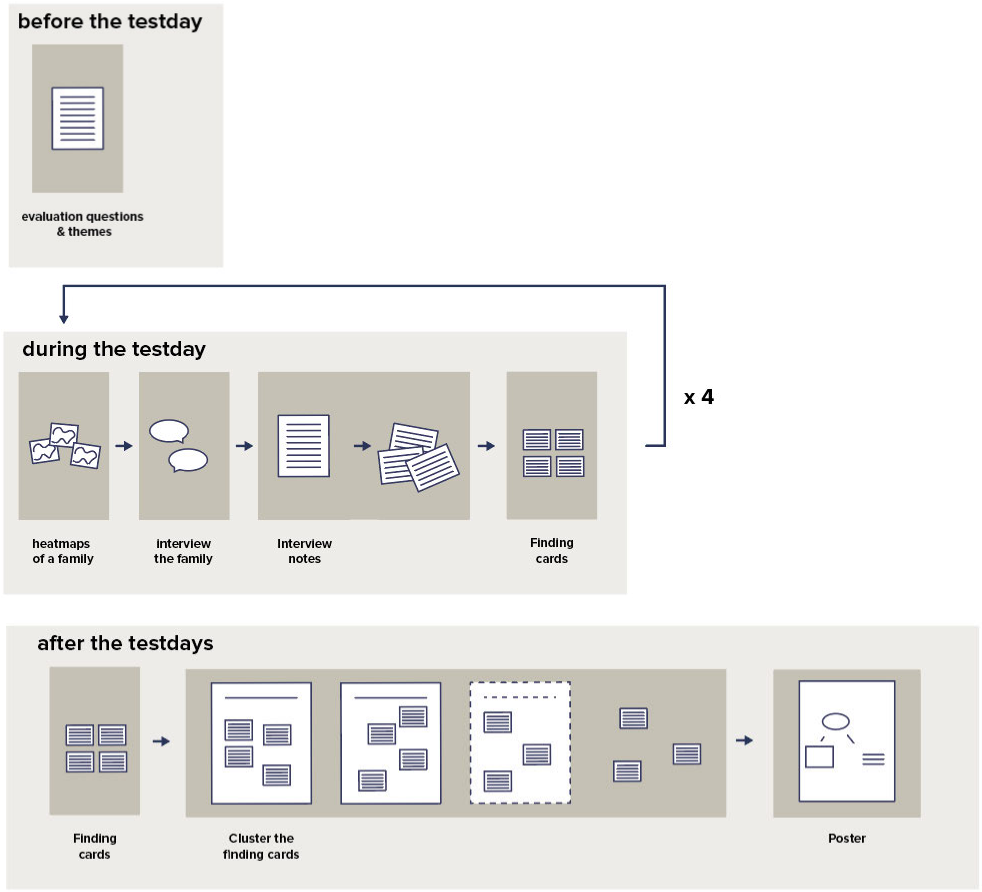


Figure 87. Old design of the interview and analysis

Figure 88. New design of the interview and analysis

8.2 OVERVIEW OF THE DESIGNED TOOL-BOX

At the beginning of this project, the assignment was to design a complete tool-box. It is important to notice that there is a difference between the complete tool-box, which is designed to conduct version 1 and 2 of the evaluation process and the tool-box that was developed in this project to test version 2 of the process.

8.2.1 THE COMPLETE TOOLBOX

Figure 89 shows the complete tool-box that is needed for the complete evaluation process. Figure 90 shows the tool-box that was developed in this project to conduct version 2 of the evaluation process. This tool-box (figure 90) is therefore a prototype version of the tool-box in as shown in figure 89.

8.2.2 THE INTERACTIVE STAND

The big difference between them is the emotion tracker device and the heat-map system. The heat-map system in the complete tool is integrated in an interactive stand. In the prototype tool-box, thsi system runs on an tablet. This prototype is explained in paragraph 3.8.2. The interactive stand was not designed during this project. However, the basic functions and characteristics of it were defined.

The interactive stand has a screen and contains several tracker devices. Visitors of the museum get an explanation about how to use the device on a screen which is integrated in the stand. They take a device with them while visiting the museum. The device will record their route and also triggers every minute, on which the visitor presses a button to indicate how much they like what they are doing or seeing at that moment. After their visit to the exhibition, they return the tracker device back to the stand. The screen shows the route they walked. During version 1, the stand will generate some questions based on the route and pressed buttons during the visit, on which the visitor can answer. During version 2, the stand will send the heat-map to a computer, so the heat-map can be printed for the interview.

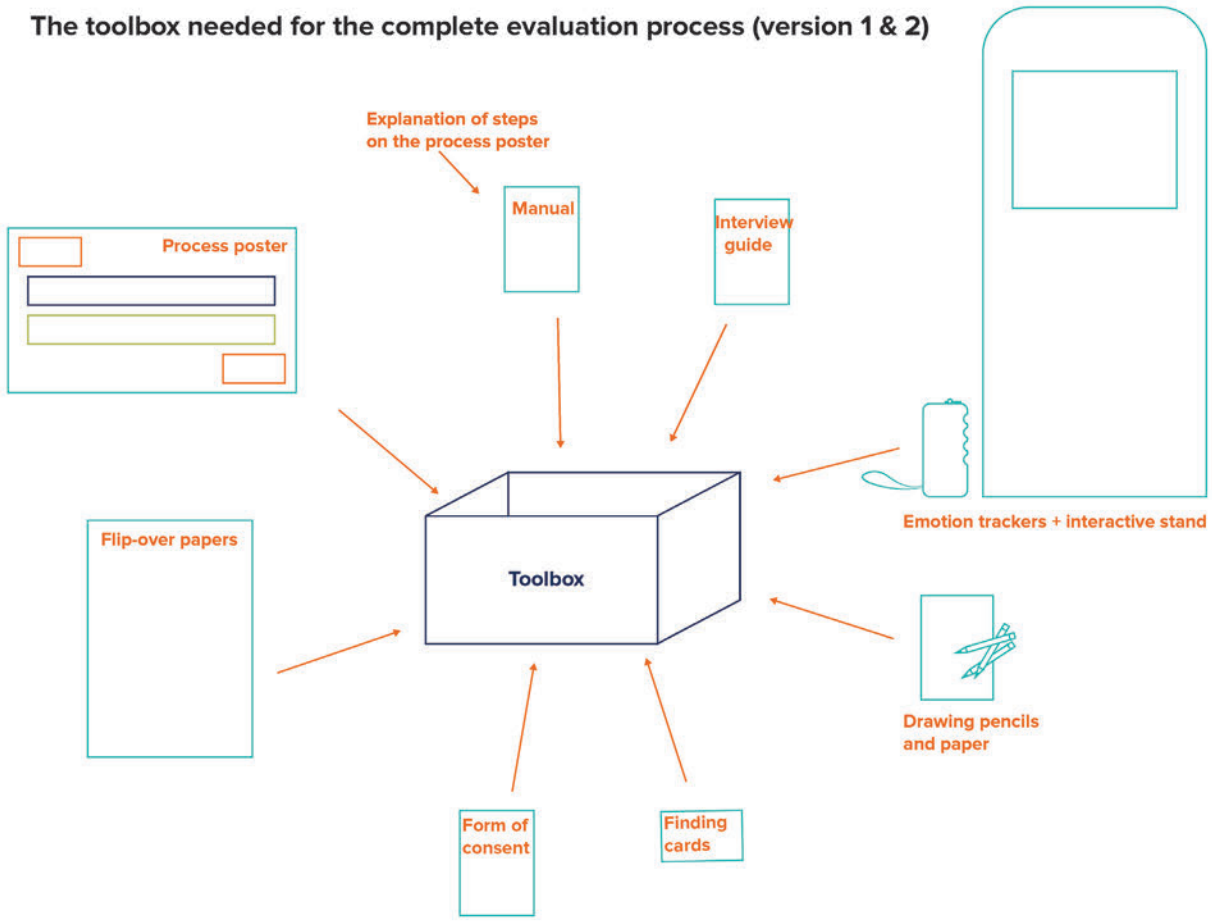


Figure 89. The complete tool-box

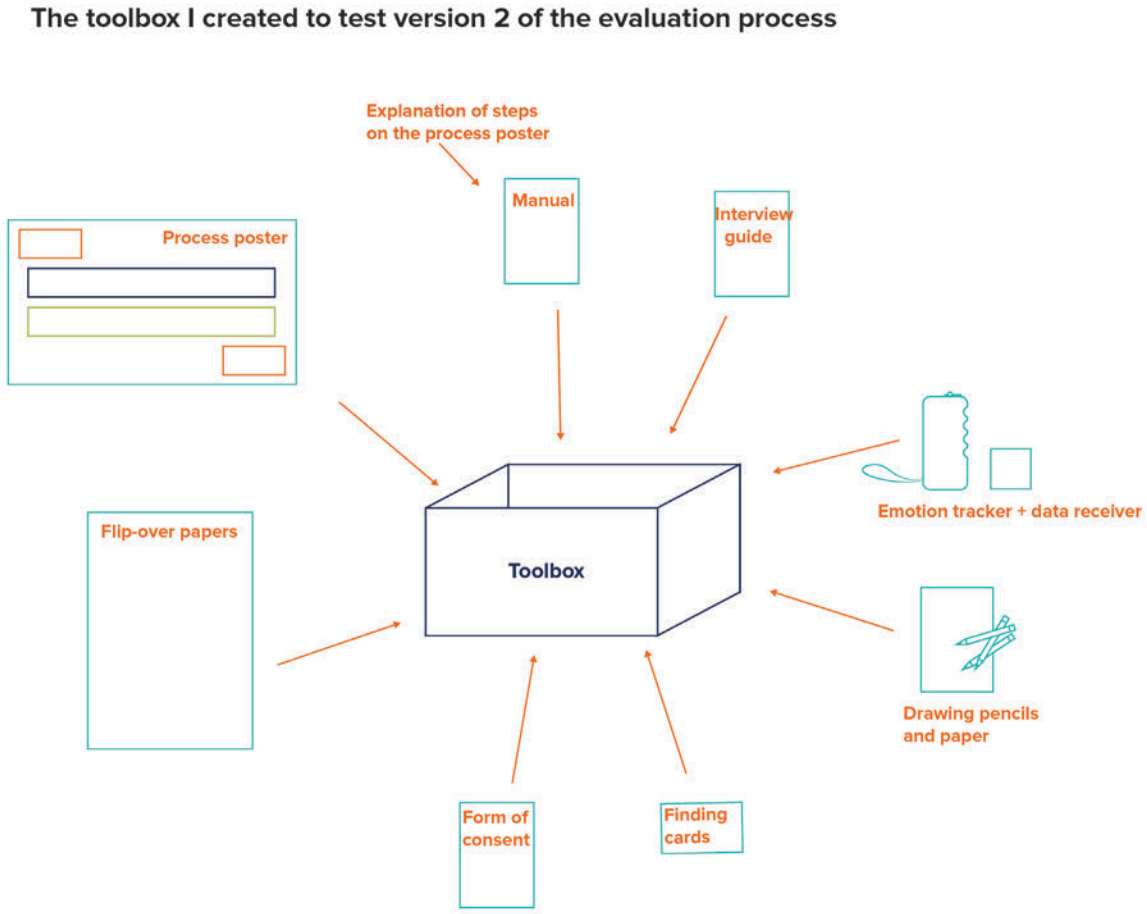


Figure 90. The prototype tool-box

8.3 THE PROCESS POSTER AND MANUAL

8.3.1 THE BUILD-UP

The framework which was created in paragraph 2.3 is used as a basis to build a storyboard showing all steps of the evaluation process.

It was decided that the interviews will be conducted with 5 families. However, collecting a large amount of heat-maps without conducting interviews can also gain valuable information. This is why the framework of the evaluation process included to versions to conduct the evaluation, which can be conducted separately, but enforce each-other when conducted both.

Version 1 is focusing on gathering qualitative results. 100+ regular visitors will use the portable tracking device and create heat-maps. These heat-maps will show patterns in what people do or don't like. This data answers already a part of one of the evaluation questions. Furthermore, it gives insights which can be integrated into the interview of version 2.
Version 2 is focusing on qualitative feedback. In this version, five preselected families will visit the exhibition while using the portable tracking device. Afterwards an interview will be conducted with these families.

In paragraph 2.3 I decided to focus on version 2 of the evaluation process. The steps of version 2 were developed in chapter 3, 4, 5 and 6. Although version 1 is not developed into detail in this project, the basic steps of this version are included in the storyboard.

8.3.2 HOW TO READ THE FOLLOWING PARAGRAPHS

The complete storyboard that was created can be found on the process poster that comes with this graduation report. A small version of this poster can be found in figure 91. Since this image is too small to read the text, the steps as shown on the storyboard will also be explained in the following paragraphs.

At the beginning of paragraph 8.3.3, 8.3.4, 8.3.5 and 8.3.6, a small version of the poster is pictured. The circled part is the part of the poster which contains the steps that are explained in the paragraph. Paragraph 8.3.3 will show you the part of the storyboard about 'defining the evaluation'. Next, 'version 1' of the evaluation will be explained in paragraph 8.3.4. Paragraph 8.3.5 contains all steps of 'version 2' of the evaluation and lastly, paragraph 8.3.6 will explain the 'conclusion' part.

A manual was created which explains more about some of the steps on the storyboard. This manual can be found in appendix E. Underneath some of the steps on the poster, a reference to a page in the manual is given. The corresponding page in the manual will explain the step more elaborated.

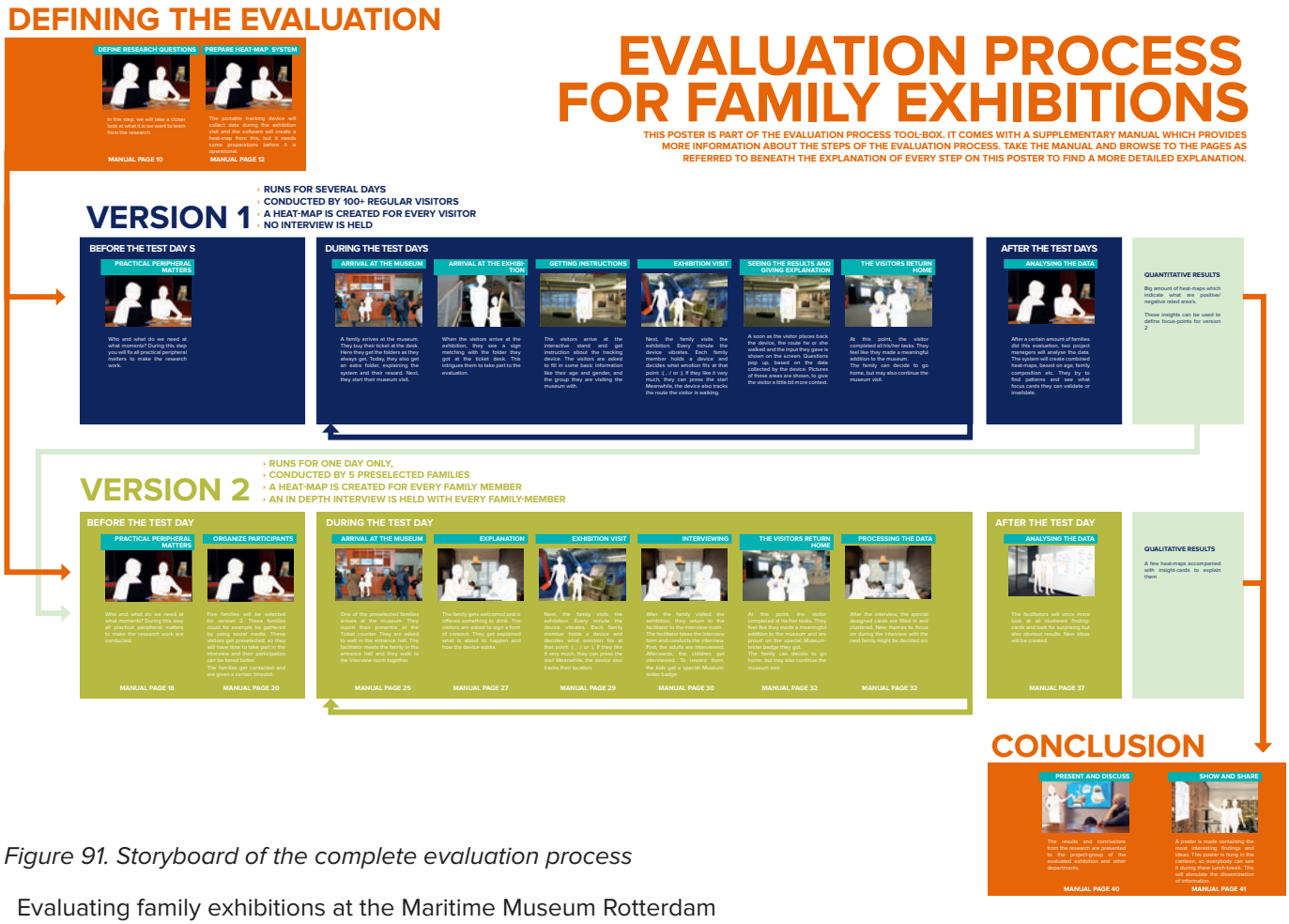
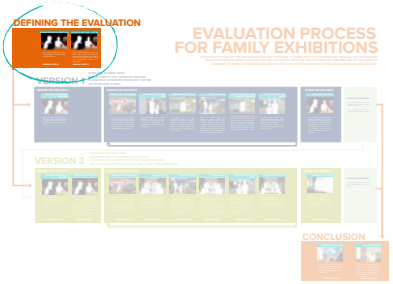


Figure 91. Storyboard of the complete evaluation process



8.3.3 DEFINING THE RESEARCH

The start of the two versions of the evaluation research are the same. It contains the defining of the evaluation questions and the preparation which have to be made to make the heat-mapsystem function.

DEFINE RESEARCH QUESTIONS

In this step, we will take a closer look at what it is we want to learn from the research.

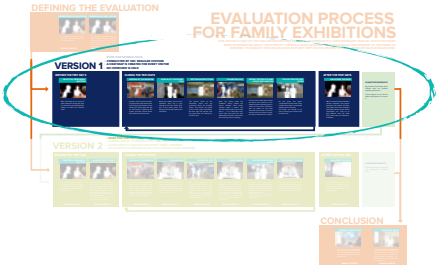
MANUAL PAGE 10

PREPARE HEATMAP SYSTEM

The portable tracking device will collect data during the exhibition visit and the software will create a heat-map from this, but it needs some preparations before it is operational.

MANUAL PAGE 12

8.3.4 VERSION 1



Version 1 is focussing on gathering quantitative data in the form of heat-maps of 100+ visitors. It runs for several days and is conducted by 100+ regular visitors. A heat-mapis created for every visitor. No interview is held.

Within this project, some decisions had to be made about what to focus on. I decided to focus on the development of version 2. Even so, the basic steps of evaluation version 1 were identified to create an complete overview of the whole process.

BEFORE THE TEST DAY

PRACTICAL PERIPHERAL MATTERS

Who and what do we need at what moments? During this step you will fix all practical peripheral matters to make the research work.

DURING THE TEST-DAYS

ARRIVAL AT THE MUSEUM

A family arrives at the museum. They buy their ticket at the desk. Here they get the folders as they always get. Today, they also get an extra folder, explaining the system and their reward. Next, they start their museum visit.

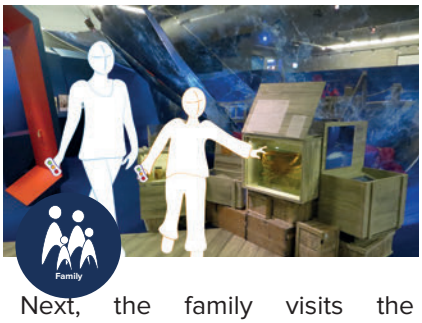
ARRIVAL AT THE EXHIBITION

When the visitors arrive at the exhibition, they see a sign matching with the folder they got at the ticket desk. This intrigues them to take part to the evaluation.

GETTING INSTRUCTIONS

The visitors arrive at the interactive stand and get instruction about the tracking device. The visitors are asked to fill in some basic information like their age and gender, and the group they are visiting the museum with.

DATA COLLECTION

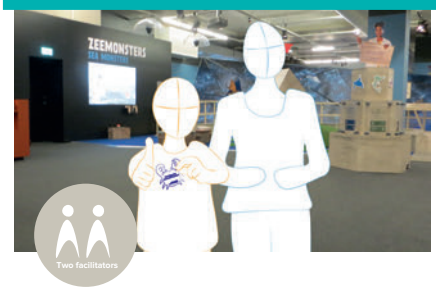


Next, the family visits the exhibition. Every minute the device vibrates. Each family member holds a device and decides what emotion fits at that point: :(, :/ or :). If they like it very very much, they can press the star! After the exhibition visit the return to the feedback column. Meanwhile, the device also tracks the route the visitor is walking.

SEEING THE RESULTS AND GIVING EXPLANATION

A soon as the visitor places back the device, the route he or she walked and the input they gave is shown on the screen. Pre-set questions pop up, based on the data collected by the device. The stand for example asks questions about locations where the visitor answered in an extreme way or where they stayed for a long time. Pictures of these areas are shown, to give the visitor a little bit more context.

THE VISITORS RETURN HOME



At this point, the visitor completed all his/her tasks. They feel like they made a meaningful addition to the museum.
The family can decide to go home, but may also continue the museum visit.

AFTER THE TEST-DAY

ANALYSING THE DATA

After a certain amount of families did this evaluation, two project managers will analyse the data. The system will create combined heat-maps, based on age, family composition etc. They try to find patterns and see what focus cards they can validate or invalidate.

RESULTS

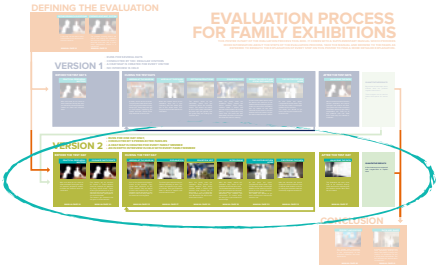
Big amount of heat-maps which indicate what are positive/ negative rated areas.

These insights can be used to define focus-points for version 2

8.3.5 VERSION 2

Version 2 of the evaluation process is focussing on gathering qualitative data. The gathering of qualitative feedback was one of the core goals of this project. This is why I decided to focus on version 2.

Version 2 runs for one day only and is conducted by 5 preselected families. A heat-map is created for every family member and an in depth interview is held with every family member.



BEFORE THE TEST DAY

PRACTICAL PERIPHERAL MATTERS

Who and what do we need at what moments? During this step all practical peripheral matters to make the research work are conducted.

MANUAL PAGE 18

ORGANIZE PARTICIPANTS

Five families will be selected for version 2. These families could for example be gathered by using social media. These visitors get preselected, so they will have time to take part in the interview and their participation can be timed better.
The families get contacted and are given a certain timeslot.

MANUAL PAGE 20

DURING THE TEST DAY

ARRIVAL AT THE MUSEUM

One of the preselected families arrives at the museum. They report their presence at the Ticket counter. They are asked to wait in the entrance hall. The facilitator meets the family in the entrance hall and they walk to the interview-room together.

MANUAL PAGE 25

EXPLANATION

The family gets welcomed and is offered something to drink. The visitors are asked to sign a form of consent. They get explained what is about to happen and how the device works.

MANUAL PAGE 27

EXHIBITION VISIT

Next, the family visits the exhibition. Every minute the device vibrates. Each family member holds a device and decides what emotion fits at that point: :(, :/ or :). If they like it very very much, they can press the star! Meanwhile, the device also tracks their location.

MANUAL PAGE 29

INTERVIEWING

After the family visited the exhibition, they return to the facilitator to the interview-room. The facilitator takes the interview form and conducts the interview. First, the adults are interviewed. Afterwards, the children get interviewed. To reward them, the kids get a special Museum-tester badge.

MANUAL PAGE 30

THE VISITORS RETURN HOME

At this point, the visitor completed al his/her tasks. They feel like they made a meaningful addition to the museum and are proud on the special Museum-tester badge they got.
The family can decide to go home, but may also continue the museum visit.

MANUAL PAGE 32

PROCESSING THE DATA

After the interview, the special designed cards are filled in and clustered. New themes to focus on during the interview with the next family might be decided on.

MANUAL PAGE 32

AFTER THE TEST DAY

ANALYSING THE DATA

The facilitators will once more look at all clustered finding-cards and look for surprising but also obvious results. New ideas will be created.

MANUAL PAGE37

RESULTS

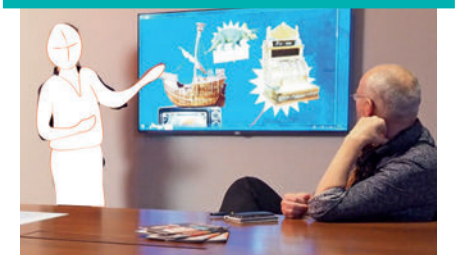
A few heat-maps accompanied with finding-cards to explain them.

8.3.6 CONCLUSION

At the end of the evaluation process, the information is analysed and will be communicated to other employees of the museum.

CONCLUSION

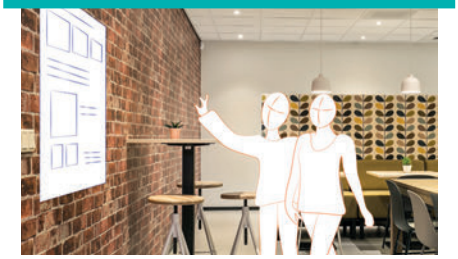
PRESENT AND DISCUS



The results and conclusions from the research are presented to the project-group of the evaluated exhibition and other departments.

MANUAL PAGE 40

SHOW AND SHARE



A poster is made containing the most interesting findings and ideas. This poster is hung in the canteen, so everybody can see it during there lunch-break. This will stimulate the dissemination of information.

MANUAL PAGE 41

9.

THE LAST TESTS

To find out whether the new set-up of the interview and the finding-cards work well, two last tests were done. Also, the final design of the tracking device was tested during these tests.

9.1 FOCUS

In this chapter, the steps of which the test day of evaluation process version 2 consists, will be tested. To do this, two test are conducted. The first test is test 10. The second test is test 11. The focus during this test will be on the interview, since this part changed after testing the preliminary design in chapter 7, and the analysis. Even though it is not the main goal, it is still interesting to see if any flaws occur during the conduction of the other steps. (see figure 92)

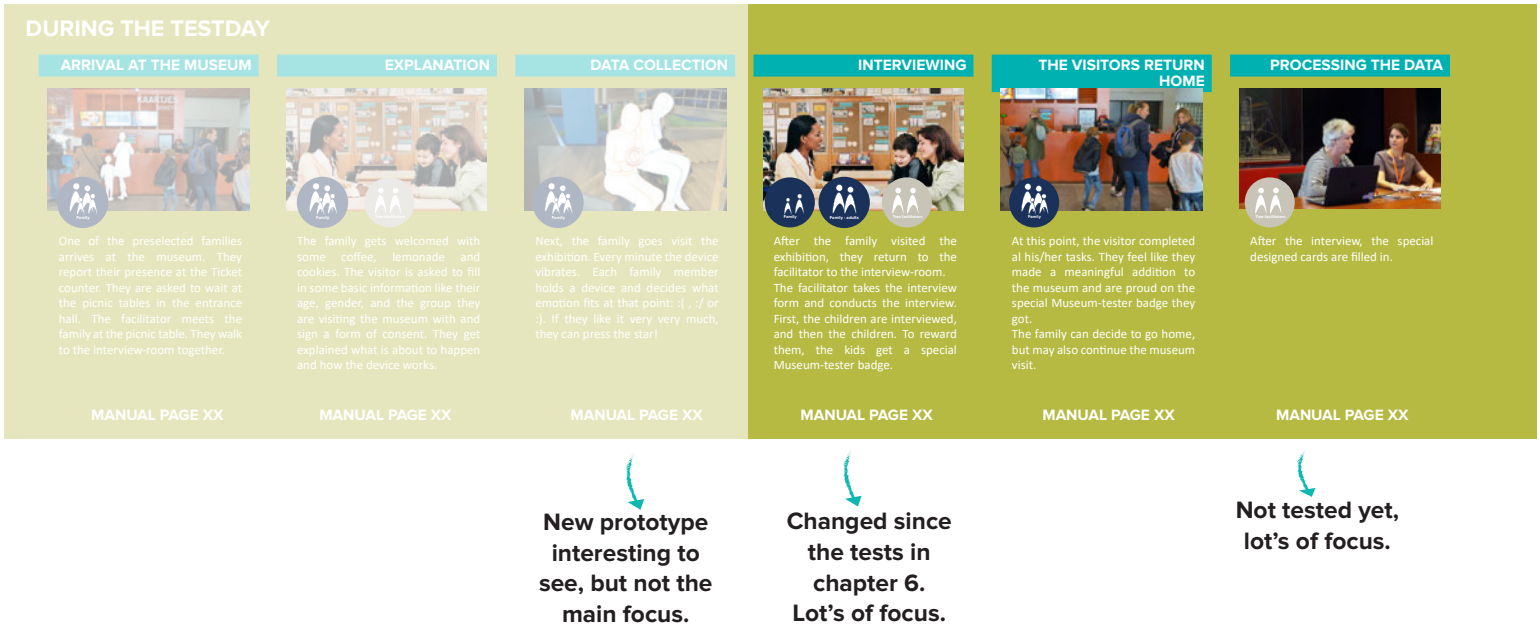


Figure 92. Focus of test 10 and 11

9.2 SET-UP OF THE TESTS

RESEARCH QUESTIONS

During this test the following question will be answered.

- Is the interview guide, combined with the heat-map, enough to structure the interview?
- Are the finding-cards useful to write down the information and conclusions from the interview?
- Where do flaws in the process occur?

DIVISIONS OF ROLES

During both tests, the same project-leader executed the interview. During the first test, the main project leader also attended the interview. During the second test me myself took the role as second interviewer and took notes.

PARTICIPANTS

For the tests, two different families were selected

- Test 10: Mother and son (8)
- Test 11: Father, mother, and son (8)

PROTOTYPES

The prototypes that were used are explained in chapter 8.

FIRST TEST: TEST 10

The 'Arrival at the museum' and 'Explanation' step were conducted as explained in the storyboard and manual. During the 'Exhibition visit' step, the main project leader followed the family and noted their route using the p5.js sketch. Unfortunately, the connection between the device and the p5.js sketch was lost. Therefore, no heat-map was created.

Consequently, the interview was held without a heat-map. Although this was not the way the test was meant to go, it was very interesting to see how the interview went without using a heat-map. During the interview, the project leader asked the participants to remember what things they rated very high or very low. The interview guide was used to ask further upon these points.

First the child was interviewed and afterwards the mother was asked about the museum visit. At the end the child got a museum tester magnet.

After the family went home the finding-cards were used to discuss the interview and collect findings.

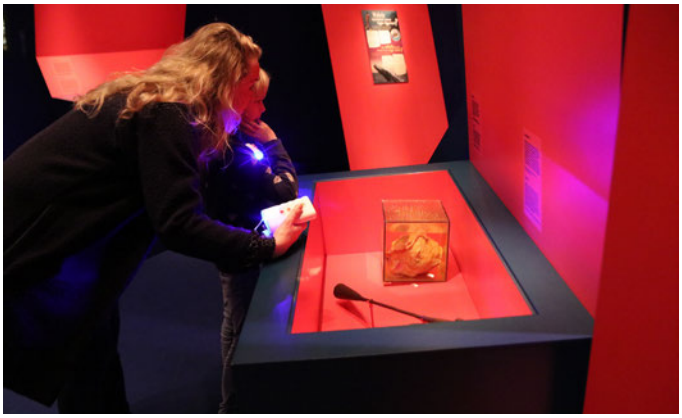


Figure 93. The family of test 10 visits the exhibition

Figure 94. The family of test 10 gets interviewed

Figure 95. The family of test 10 visits the exhibition

SECOND TEST: TEST 11

The arrival and explanation of test 11 went as described on the process poster. The connection between the tracer device and p5.js sketch was fixed, and the route could be collected as planned; the pressed buttons automatically resulted in coloured circles on the floor-plan.
While the family got something to drink after the exhibition visit, I printed the heat-maps. The interview was held as was described in the manual. At the end the child got a museum tester magnet.
After the family went home the finding-cards were used to discuss the interview and collect findings.

Figure 96. Explanation during test 11

Figure 97. The child of test 11 gets to wear device around his wrist

Figure 98. The family of test 11 visits the exhibition

Figure 99. The family of test 11 looks at their heat-maps

Figure 100. Interview during test 11

Figure 101. The child in test 11 gets his museum tester magnet

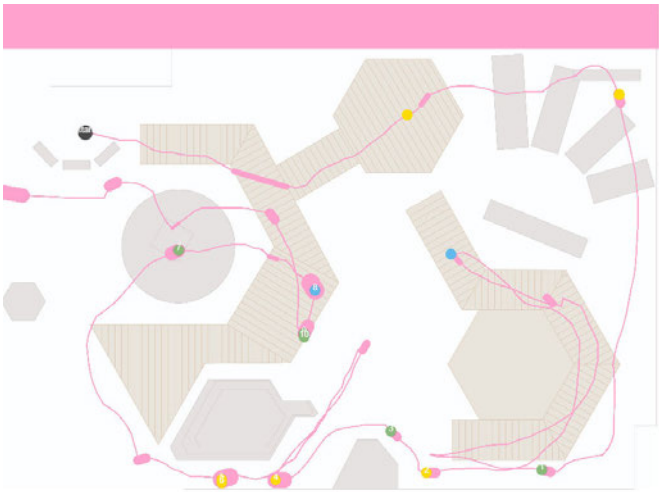


Figure 102. The heat-map of the child

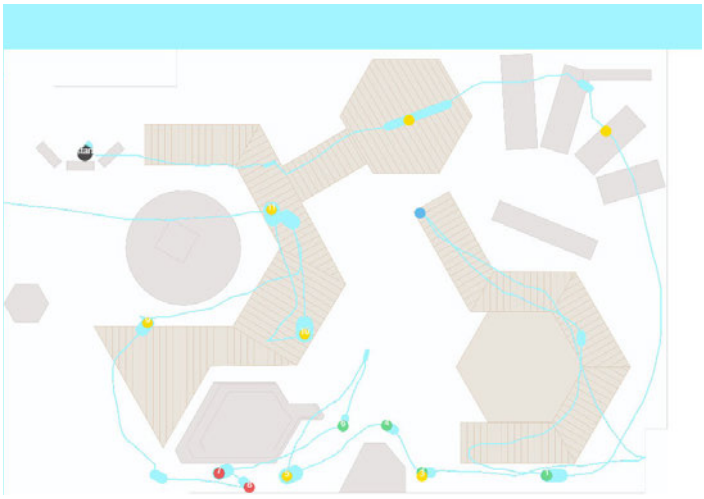


Figure 103. The heat-map of the mother

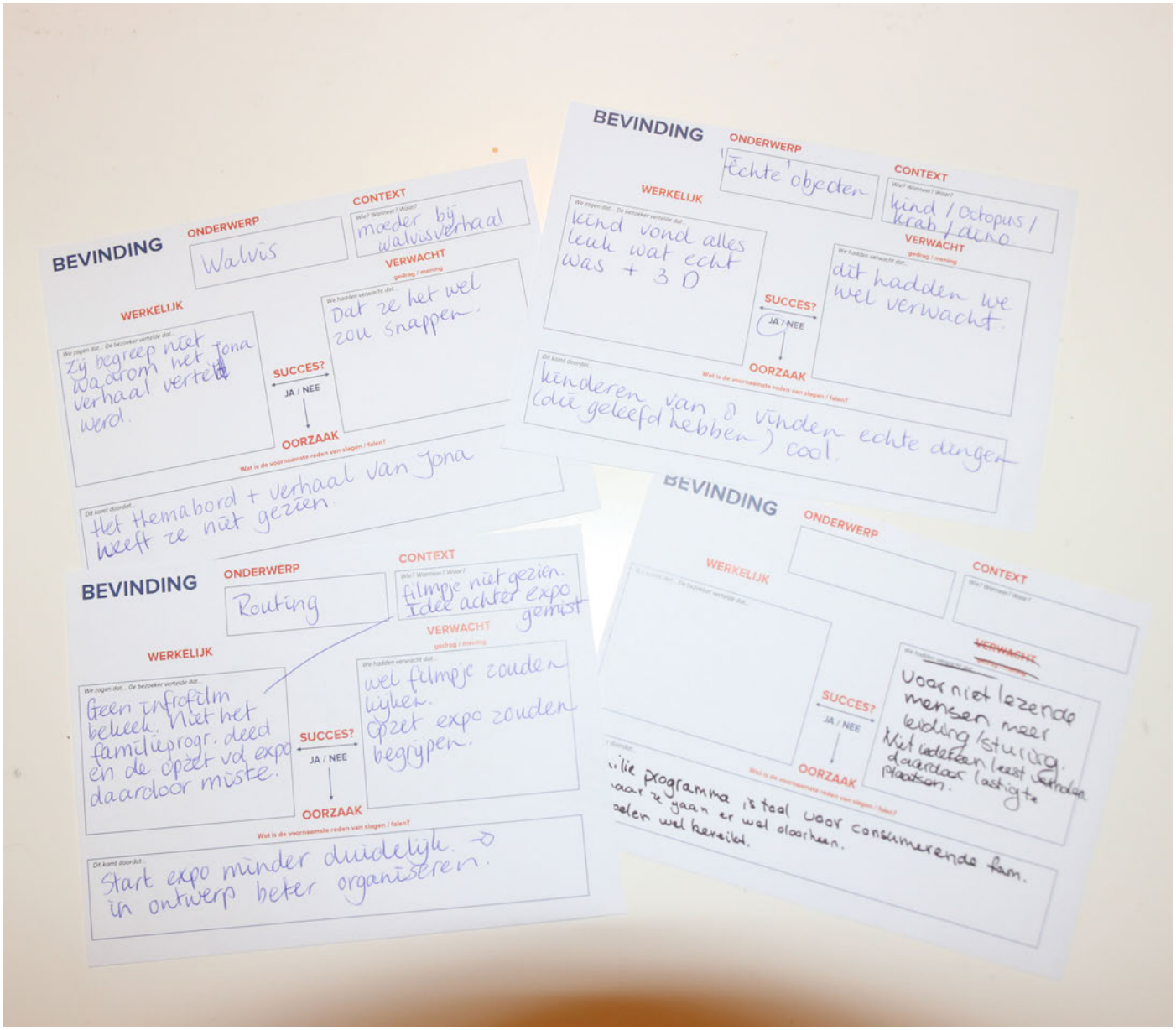


Figure 103. The filled in finding-cards

9.4 FINDINGS

THE NEW PROTOTYPE OF THE DEVICE

Halfway test 11, the connection between the tracking device and the p5.js sketch could not be established. During test 12 this problem was fixed. Comparing to the system that was used during test 8 and 9, the new system was much easier to keep track of the route. Furthermore, due to the prototype looking more professional, the participants really felt free to do with it whatever they wanted. The child during test 11 even swung the device in the air.

It was immediately clear for the participants how to hold the device. The negative shapes that are created to put your fingers made clear how to hold the device. The device was quite big for the children. A next design could be made a little bit smaller for an even better user experience.

INTERVIEWING

During test 10, the interview was held without making use of an heat-map whereas during test 11 a heat-map was used to structure the interview.

It was interesting to notice the difference. The interview of test 10 mainly was focussed on the most positive and most negative elements of the exhibition the participant could remember. During test 11, also areas were discussed which where not outstanding.

The project-leader indicated that she felt more comfortable during the interview of test 11 , when she made use of the heat-map.

USING THE FINDING-CARDS

After the interview, the finding-cards were filled in. I noticed that the cards weren't always filled in as they were meant to be. As the conversation went along, things were written down on the cards, without actually paying attention to what should be written down in what box. However, after these first thoughts were written down, I noticed that the instructions in the boxes of the finding-cards did trigger the project-leaders to think deeper about the findings, and the other boxes were filled in with new information.

During test 10, an interesting new idea was formed. One of the project-leaders came to the idea that it might be a good idea to start selling 'public speech boxes' for children about topics in the museum. This idea was created because the mother during test 10 mentioned that she thought it was a very good idea if her child would take the octopus as a subject for his presentation at school.

9.5 CONCLUSION

To conclude this last test, the research questions which were set up before conducting test 10 and 11 will be answered

Is the interview guide, combined with the heat-map, enough to structure the interview ?

The interview guide was way more useful then the interview forms in test 8 and 9 were. The heat-map itself already gave enough structure to ask further upon. However, I did notice that the project-leader who was conducting the interview did imply answers in her questions a lot. It might be useful to include information in the manual about how to conduct the interview in a way that influences the opinion of the participants as less as possible.

Are the finding-cards useful to write down the information and conclusions from the interview?

The finding-card were useful, although they were not exactly used as was designed. However, it was a good starting-point for the project leaders to start their conversation and write there observations down

10.

EVALUATION OF THE PROJECT

10.1 RECOMMENDATIONS

HAVE THE DEMANDS BEEN MET?

At the beginning of the project, in paragraph 1.1, the following problem definition was formulated:

"How do we get honest and useful feedback from visitors of immersive exhibitions, while influencing the flow of the visit as little as possible?"

At the end of chapter 1, in paragraph 1.9, it was decided to design a tool-box, containing all tools needed to conduct an evaluation of a family exhibition. The following wishes and demands were defined:

- The method has to give insight into the strengths and weaknesses of the exhibition
- The method collects takeaways for future exhibitions
- The method will make use of a fun, interactive tool
- The MMR will need more no more than 3 days with 2 people to execute the complete process.
- The method has to be suitable for various family exhibitions
- The method has to be applicable for visitors of 6 to 80 years old

Looking at the designed tool-box that was explained in paragraph 8.2, the designed method and tool-box meets all set wishes and demands. However, I do think there are still quite some improvements to make.

HOW TO GET MORE OUT OF THIS METHOD

First of all, the original idea of the portable tracking device was to collect information of many visitors, and ask them questions via an interactive stand based on there walked route and given feedback. This concept is used in version 1. Within this project, this interactive stand was not developed. I expect that the added value of the tracking device will show more in version 1 then in version 2.

THINKING BIG: WHEN THE COMPLETE SYSTEM WOULD BE DEVELOPED

When the complete system would be developed, including the interactive stand, the portable tracking device for will have a great added value. Data of numerous visitors could be recorded and visualized in one big heat-map. Furthermore, visitors could be asked specific questions in the interactive stand, based on the walked route and given input.

THINKING SMALL: STAY JUST WITH VERSION 2

When the method would be developed further with just focus on version 2 of the evaluation process, I think the portable tracking device could still be valuable. If time and money would be invested in the portable tracking device, and automatic tracking of visitors and their given feedback will become reality, the heatmap that is created by it is proven to be an interesting tool to form the interview around.

MORE RESEARCH

One of the factors that could be researched more is the moment on which the device triggers. In this project, this was defined by a timeslot. However, the device could also trigger based on the behavior of the visitor. It could trigger when the visitor is at a certain place in the exhibition, or when he or she starts moving after standing still for a long period of time.

Furthermore, in this project the device was used by the visitor to rate how much he or she likes what he or she is doing at a certain location. In test 9, it was questioned whether enjoyment is actually the best emotion to rate. It could be made more specific. The visitor might for example be asked to rate the excitement he or she is feeling. This more specific emotion could give more specific information and therefore detailed answers to the evaluation questions.

10.2 PERSONAL REFLECTION

THE MUSEUM

When I was looking for a graduation project, I knew I wanted to find an assignment concerning the development of interactive exhibitions. This field of expertise attracts me, since the focus is on telling stories, instead of producing and selling products. Besides that, such projects allow you to think big and out of the box. Furthermore, designing interactive exhibitions is project based, resulting in flows of very busy and a bit more quiet periods, which I know is a way of working that suits me.
The Maritime Museum Rotterdam was therefore the perfect place to do my graduation project when it comes to gaining insights into the realization of exhibitions. Unfortunately, the assignment didn't turned out to fit me as much as I had hoped. Nevertheless, I met lots of inspiring people and learned a lot about the development of exhibitions and above all, about myself!

MOMENTS ON WHICH ENERGY FLOWED

The moments which gave me energy were mainly the moments that I was working on the prototypes. Programming, 3D printing and laser cutting are activities which I enjoy. For a moment I thought that the practical making of prototypes is what I should do in the future. However, I realize now is that what I like most about this, is working on the design side of a project instead of the research side. I am just more of an engineer than a researcher!

It also gave me a boost to make the electronics hardware together with a friend. I designed the fuctionalities and the code of the electronics and he helped me making a PCB. Working together on a project gives me so much energy!

Furthermore, I really enjoyed being around people who are interested in cultural activities. It inspired me to develop myself further on cultural aspects.

MOMENTS WHERE ENERGY WAS LOST

When I started this project, my original plan was to create a product that would help the MMR to evaluate their exhibitions. Halfway the project, I turned out to develop a method. At that point, a lot of attention already went to the development of the portable tracking device. I didn't dare to let go of the portable tracking device, since this was something I put time and effort in and I enjoyed making. Furthermore, my interest in designing a method for a research wasn't very big; creating structure in fuzzy data isn't my strongest skill. I continued with the portable tracking device, which made it really hard for me to create one clear story out of my project. From this, I learned some important lessons.

First of all, I learned that sometimes you really have 'to kill your darlings'. Changing direction isn't failing. It is a sign of learning and it takes courage. In the end, it might even give you more energy than it costs you.

Secondly, when I start a project, I must state more clearly what I will be making and what each party expects from the project, especially myself.

Lastly, my project turned out to be very researched centred. I experienced that this is not the area at which I am at my best. A friend reminded me; "Ellis, don't judge a fish on the ability to climb a tree". I often felt like a fish trying to climb a tree during this project. I am proud that I have made it into that tree, but from now on, I will make sure to start projects where I can show off how good I am at swimming!

HELLO WORLD!

During this project a learned a lot. Not only about the world of designing exhibitions, but also about myself and who I am as a designer. I am looking forward to put all the things I have learned into practice during projects in the future!

X.

REFERENCES

REFERENCES

Amsterdam University of Applied Sciences. (2019a, September 23). Methode: onderzoeken van ontwerpaannames en de bezoekersbeleving. Retrieved from https://designingexperiencescapes.com/tools/methode-onderzoeken-van-ontwerpaannames-en-de-bezoekersbeleving/

Amsterdam University of Applied Sciences. (2019b, September 23). Toolkit De Tentoonstellingsmaker van de 21ste Eeuw: Evalueren van ontwerpbeslissingen. Retrieved 14 November 2019, from https://designingexperiencescapes.com/tools/toolkit-de-tentoonstellingsmaker-van-de-21ste-eeuw-evalueren-van-ontwerpbeslissingen/

Amsterdam University of Applied Sciences. (2019c, September 24). Tools voor moderne tentoonstellingsmaker. Retrieved 14 November 2019, from https://www.hva.nl/create-it/gedeelde-content/nieuws/nieuwsberichten/2019/09/onderzoek-helpt-tentoonstellingsmakers-met-evaluatie-van-bezoekersreacties.html?origin=bGZ6vMa/S5eqv7YC8g5YnA,WShJbk3lR4acMLAkmxQ24Q?345g

3.6 How to formulate findings | EvalPartners. (n.d.). Retrieved 6 February 2020, from https://www.evalpartners.org/toolkit/3-6-how-to-formulate-findings

Aasbakken. (2011). Evaluating user experiences from interactive art installations (Scriptie). Retrieved from https://artentnu.files.wordpress.com/2012/01/mia2011.pdf

Bhutada, S. (2018, May 22). Insight or Finding? What's the difference? Retrieved 5 February 2020, from https://medium.com/@shipra_26297/insight-or-finding-a-case-of-tomayto-tomahto-91132dbcf8f

Dalton, J. (2016, March 28). What is insight definition. Retrieved 4 February 2020, from https://thrivethinking.com/2016/03/28/what-is-insight-definition/

Dalton, J. (2017, October 9). How to write a powerful consumer insight statement . Retrieved 4 February 2020, from https://thrivethinking.com/2017/10/09/write-a-powerful-consumer-insight/

de Jong, F. S. (2018). Letting children give constructive feedback for improving museum experiences (Thesis). Retrieved from -

Desmet, P. (2003). Measuring emotion: Development and application of an instrument to Measure Emotional Responses to Products. Funology: From Usability to Enjoymen. Retrieved from https://www.researchgate.net/publication/313757692_Measuring_emotion_Development_and_application_of_an_instrument_to_Measure_Emotional_Responses_to_Products

Experience lab; Reasons why museums should share more experiences less information. (2017, March 26). Retrieved from http://www.peakexperiencelab.com/blog/2017/3/24/7-reasons-why-museums-should-share-more-experiences-less-information

Falk, J. H. (2009). Identity and the Museum Visitor Experience (1st ed.). New York: Routledge.

Falk, J. H., & Dierking, L. D. (2018). Learning from Museums. Retrieved from https://ebookcentral.proquest.com/lib/delft/reader.action?docID=1162089&ppg=143

FALK, J. H., MOUSSOURI, T., & COULSON, D. (1998). The Effect of Visitors ' Agendas on Museum Learning. Curator: The Museum Journal, 41(2), 107–120. https://doi.org/10.1111/j.2151-6952.1998.tb00822.x

Feedback Smiley. (n.d.). [Photograph]. Retrieved from https://www.feedbacksmiley.nl/?gclid=Cj0KCQiA0NfvBRCVARIsAO4930mZ3YLmffOy49TBYuRKg9LRk2lyY72n-kv8Gs-wzcVJa7a40_QqaFoaAuSREALw_wcB

Gonçalves, L., Campos, P., & Sousa, M. (2012). M-Dimensions: a Framework for Evaluating and Comparing Interactive Installations in Museums. Retrieved from file:///C:/Users/e.bots/Desktop/Drive%20bestanden/CameraReady-INTERACTIVEMODULESEVALUATION.pdf

Instructables. (2017, October 1). Arduino GPS/GSM Tracker . Retrieved 16 October 2019, from https://www.instructables.com/id/Live-GPS-Tracking-With-Buzzer-and-Boundary/

Interactive display Louwman museum . (n.d.). [Photograph]. Retrieved from https://www.van-raalte.com/producten/digital-signage-binnen-buiten/digital-signage-binnen/

Interactivezuil Louwman museum. (n.d.). [Photograph]. Retrieved from https://www.van-raalte.com/projecten-en-ideeen/louwman-museum/

Khan, V. J., Markopoulos, P., & Eggen, J. H. (2009). Features for the future Experience Sampling Tool. -.

Kotler, P., & Kotler, N. (1998). museum strategy and marketing. Retrieved from https://onlinelibrary.wiley.com/doi/abs/10.1111/j.2151-6952.1998.tb00845.x?casa_token=lgd9bxaZ7xkAAAAA:NPk5cAtvfJ2NU_O-Hy5C1JbW7Q6fgJYPANZEnr962ODzz-ALc4oKEeT2lGGgBsc78apVWWjjhVQFyn7N

leerlijn rekenen. (2017, September 13). Retrieved 5 December 2019, from http://onderwijsgek.nl/downloads/

Locatify: Precise Indoor Positioning is finally here thanks to Ultra-wideband RTLS. (2017, November 7). Retrieved from https://locatify.com/blog/in-practice-precise-indoor-location-detection-with-uwb-ultra-wideband/

Maiers, C., & Welk, A. (2018, May 10). How to Draw Concrete Insights out of Qualitative Data. Retrieved 5

February 2020, from https://willowtreeapps.com/ideas/how-to-draw-concrete-insights-out-of-qualitative-data

Maritiem Museum Rotterdam . (n.d.). Jaarverslag 2018. Retrieved 5 February 2020, from https://www.maritiemmuseum.nl/jaarverslag-2018

nfc-tracker - nfc tracker. (n.d.). Retrieved 16 October 2019, from https://www.nfc-tracker.com/en/nfc-tracker/

Oxford Learner's Dictionaries. (n.d.). Retrieved 7 February 2020, from https://www.oxfordlearnersdictionaries.com/

Peppler, K. (2017). The SAGE Encyclopedia of Out-of-School Learning. Retrieved from https://books.google.nl/books?id=BWJCDgAAQBAJ

Portigal, S. (2013). Interviewing users : how to uncover compelling insights. Retrieved from https://learning-oreilly-com.tudelft.idm.oclc.org/library/view/interviewing-users/9781457102851/?ar&orpq&email=8ae510dd5bb3c7664760531a9a0f0e1e81b84e2d&tstamp=1575904384&id=93A689211AF6BB8E767D3C2F14C28DF0A1871618

Preece, J., Rogers, Y., & Sharp, H. (2002). Interaction design: beyond human-computer interaction. Retrieved from https://arl.human.cornell.edu/879Readings/Interaction%20Design%20-%20Beyond%20Human-Computer%20Interaction.pdf

Sanders, E. B. N., & Stappers, P. J. (2012). Convivial toolbox. Amsterdam, Nederland: BIS Publishers BV.

Stichting opvoeden.nl. (2018, October 17). Spraak- en taalontwikkeling. Retrieved 6 September 2019, from https://www.opvoeden.nl/spraak-en-taalontwikkeling-50/

Storksdieck, M., Ellenbogen, K., & Heimlich, J. E. (2005). Changing minds? Reassessing outcomes in free-choice environmental education. Environmental Education Research, 11(3), 353–369. https://doi.org/10.1080/13504620500081228

Teach Your Child How to Read a Map. (n.d.). Retrieved 5 December 2019, from https://www.teachkidshow.com/teach-your-child-how-to-read-a-map/

Technology. (2019, April 24). Retrieved 15 October 2019, from https://www.decawave.com/technology1/

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APPENDIX

THE ASSIGNMENT

The Project Office at the Maritime Museum Rotterdam wants to investigate various evaluation methods for exhibitions and establish a method to evaluate future exhibitions.

The MMR is already asking visitors what they think of their exhibitions. A grade emerges from this. The scores are often high, but the reason behind this grade often remains unclear. That is why we like to dive into various research and evaluation methods, so we can monitor the results of our exhibitions better. Questions that the MMR has are for example: how do we change from 8 to 9? Why don't we get 10? What are the concrete starting points for improving our exhibitions?

THE MAIN QUESTION IS:

How can we evaluate the results of our exhibitions as well as possible and formulate specific points for improvement for future exhibitions?

SUB-QUESTIONS INCLUDE:

1. How do other museums do this? What can we learn from this?
2. What evaluation / research methods are there to evaluate / measure exhibitions? Which fits best with our needs?
3. What exactly do we want to evaluate / measure and what areas of improvement are we looking for?
4. How do we set substantive (measurable) goals for future exhibitions?
5. How do we apply results from our evaluations in future exhibitions?

B. PERSONAL MEANING MAPPING

Personal Meaning Mapping (PMM) is a tool to measure learning as a result of a concept or experience. PMM is not a test. There is not right or wrong answer. It simply is used to get insights in the development of knowledge an learning about a subject. PMM is based on a persons own ideas and perceptions about the subject. Therefore, it is not only about the information that was shown by the museum, it is also considering the links and connections between new information and information that visitors knew before or even changes in their perceptions. (Falk & Dierking, 2018, pp. 142-144)

The development can be measured in four dimensions:
1. Quantity
2. Breadth
3. Depth
4. Quality of responses

The results can be measured within the subject or between subject.
When PMM is used within the subject, a visitor is asked to make a PMM before the museum visit. Afterwards, the visitor is asked to add information to the previously made PMM with a different color of pen or make a new one. This method creates the most rich, qualitative information when analyzing a few of them in depth.
In the case that PMM is used between subject, one group of visitors make a PMM before or even without visiting the museum. A different group does visit the museum and is also asked to make a PMM. The PMMs of the different groups can be analyzed and compared.

HOW TO USE PERSONAL MEANING MAPPING

First of all, it is important to do some research to what key word or words are the best ones to used. These words are written down in the middle of the paper. Needless to say, the words should cover the subject you want to know the participants knowledge about. Participants are now asked to add all associations they have with the subject. This can be in words or drawings. They are also asked to show the links between the added information, by connecting the items with lines. This information is written down in a specific color of ink (for example bleu).
When the participant is finished, they are asked to explain the things they wrote or draw down. An interviewer should also ask them about the things they do not explain from themselves. This information is written down with a different color of ink (for example black).
When conducting the in-between method, the same procedure can be applied to both groups and the PMMs can be compared.

When using the within method, the participant now visits the exhibition. After visiting the exhibition, the participant is shown there previously made map. They can now add information to this map with a different color of ink (for example green), or decide to make a completely new one. Again, the PMM should be discussed with the interviewer. Information is added in another color of ink (for example red). The first and second PMM can be compared.
To make sure that participants knows what he or she is expected to do, it is recommended to first let them make an example PMM. The subject of the example PMM should be completely unrelated to the subject you are interested in.

ANALYZING AND PROCESSING THE PMMS

PMM gathers a rich an large amount of data. As mentioned before, the development can be measured in four dimensions:
1. Quantity
2. Breadth
3. Depth
4. Quality of responses

Quantity

The amount of vocabulary used to describe the subject.

Breadth

This can be measured by counting how many items are linked to the starting words.

Depth

How deep is the understanding of the subject? This can be tested by the amount of explanation the participant can give and their use of vocabulary

Quality of response

In this case, you grade how much the participant knows about the subject, for example on a scale of 1 to 4. (Storksdieck, Ellenbogen, & Heimlich, 2005)

APPLYING PMM IN THIS PROJECT

For the MMR it can be interesting to use the PMM method already at the beginning of the design process for a new exhibition. Several individuals from the targetgroup should make a PMM about the subject of the new exhibition. In this way, we can get an insight current knowledge of the targetgroup. With this as a starting point, new, intended connections can be determined. After the exhibition is realized, a group of visitors will be asked to make a PMM, just as the group of people did at the beginning of the design process. This could be the same group of people (within) or maybe even a different group (in between).
When to check the learning result?
So when should the second PMM be made?

LEARNING PROCESS

What is important to note, is that learning about a topic doesn't stop when visitors leave the museum. A museum visit often plants a seed for more questions and interest. A great example of this is given by Falk & Dierking, 2018. They describe how PMM was used to see what children learned from visiting a science center. One of the kids that was interviews told how he asked his dad more about generator after he got home from his visit. His dad explained him hoe a generator works. This example shows how the museum visit is not only providing information to learn from, it is also providing inspiration and arouses curiosity, which leads to more learning.

At the other hand, learning about a topic also doesn't start at the museum! Visitors often already know a thing or two about a subject before the visit an exhibition about it. In the case of the generator exhibitions, several children indicated that they already know that dynamos generate electricity, but they didn't know how.
Learning is a process of series of related, overlapping experiences.
(Falk & Dierking, 2018, pp. 145-148)

DEVELOPMENT OF READING AND WRITING

Although a PMM can be drawn, often a PMM is written. When using this technique on young children, a lack of development of writing can be a obstructing factor. The table below shows an overview of the development of reading and writing over different ages.

Age 4 – 6

Able to make correct, simple sentences. Still learning a lot of words. Sometimes trip over their words, when they want to tell a lot. More and more longer sentences. Starting to use sentences with 'and', 'or', 'because' and 'but'. The child learns to talk about the past and the future and thoughts. The child starts to explore writing.

Age 6 – 9

Children start to learn reading and writing. Their vocabulary expands, and sentences get longer and better. By reading, children learn to think better.
They learn that one word can have different meanings and some words mean about the same.
Their knowledge of words deepens. Take the word apple. They know a apple is round and has seeds. They learn that an apple belongs to the category of fruit and food.

Age 9 – 12

Children learn the rules of grammar. They learn to write pieces of tekst. The child gets better in writing down what it feels or experiences. They are getting better in giving their opinion.

(Stichting opvoeden.nl, 2018)

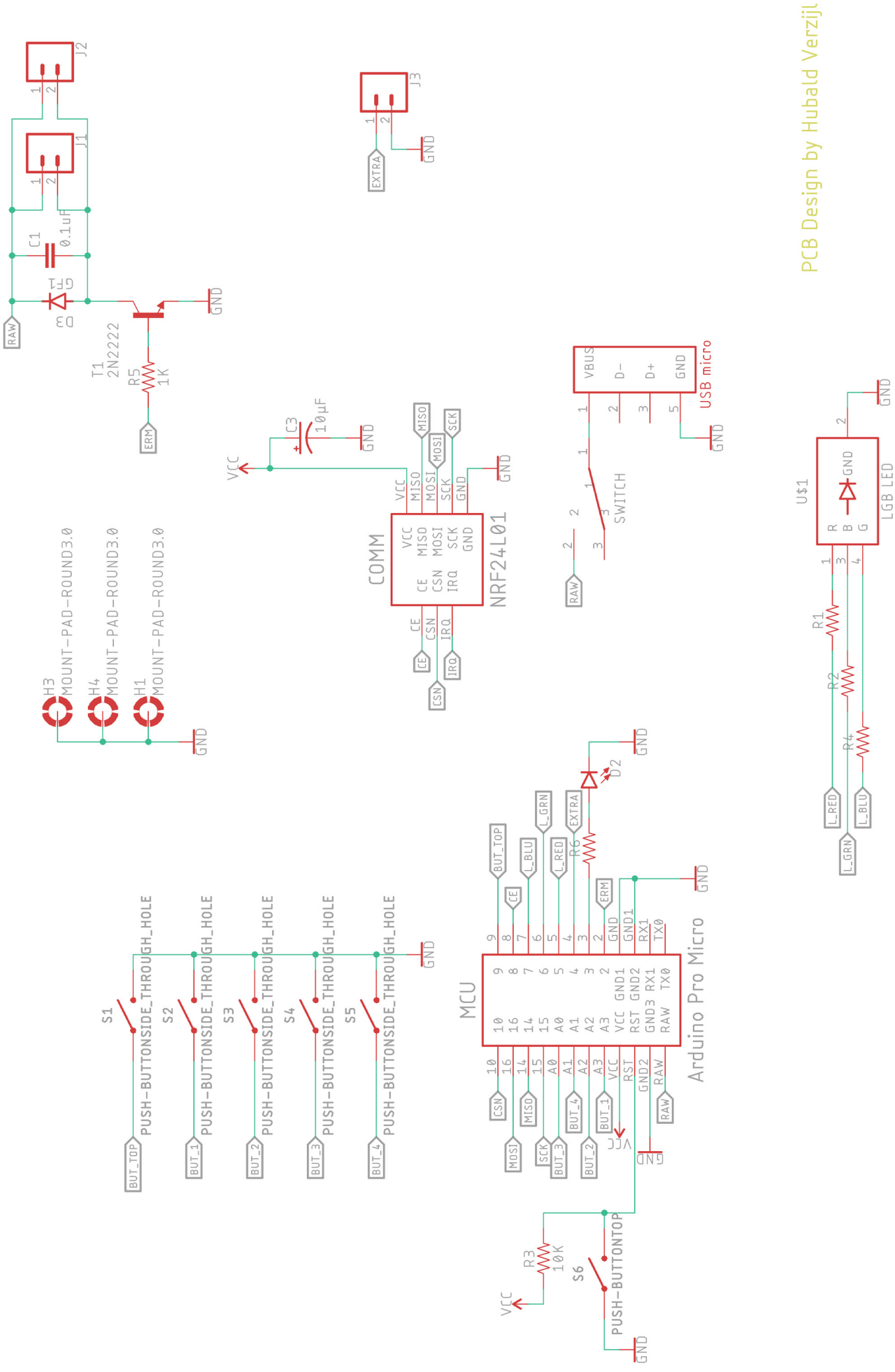
C. INTERVIEW GUIDE

INTERVIEW
Set-up:
C1: Voert het woord
C2: Maakt aantekeningen, zit al aan de tafel klaar. Mag af en toe wel aanvullen natuurlijk.
(tijdens 1 2 en 3 print Ellis de heatmaps)
1. Vraag of ze wat willen drinken
Begin nu al met opschrijven wat ze zeggen
2. Laat het kind en ouder naast elkaar zitten.
3. Vraag hoe het ging, hoe het was.
4. Geeft ouder en kind allebei de heatmap. Neem een moment om eerste reacties vanzelf te laten komen. Vraag of ze de plattegrond snappen. Laat ze eerst zelf even uitvogelen. Dit roept al reacties op, ze zullen waarschijnlijk al dingen noemen. Als ze er niet uit komen, volg dan de lijn van een van de heatmaps en geef aan welk zeemonster waar zit.
5. Wanneer de eerste reacties rond zijn, vraag het kind om hetgeen wat hij/zij het leukst vond te tekenen op een papier. Ondertussen kun je de ouder interviewen.

INTERVIEW MET OUDER
6. Vraag op opvallende punten door
a. Sterren
b. Rood
c. Lang/kort stil staan
Wat gebeurde hier?
Waarom vond je het zo leuk stom?
Probeer steeds te vragen: Waarom? Waarom? Waarom?
7. Punten op? Vraag dan:
a. Welke dingen vond je zelf interessant?
b. Op welke plekken heb je je kind wat kunnen leren?
8. Wil je nog iets kwijt?
INTERVIEW MET KIND
9. Vraag op opvallende punten door
a. Sterren
b. Rood
c. Lang/kort stil staan
Wat gebeurde hier?
Waarom vond je het zo leuk stom?
Probeer steeds te vragen: Waarom? Waarom? Waarom?
10. Punten op? Vraag dan:
a. Welke dingen vond je zelf interessant?
b. Op welke plekken heb je iets nieuws geleerd van papa/mama?
c. Hoe vond je de sfeer in de tentoonstelling?
11. Wil je nog iets kwijt?

LAAT DE OUDER WEER AANSCHUIVEN
12. Bedank het gezin. Geef het kind een magneet.

D. PCB DESIGN


PCB Design by Hubald Verzijl
J2
J1
J3
C1
0.1uF
D1
T1
2N2222
R5
1K
RAW
ERM
EXTRA
GND
VCC
C3
10µF
MISO
MOSI
SCK
COMM
NRF24L01
CE
CSN
IRQ
VBUS
D-
D+
USB micro
SWITCH
U$1
LGB LED
R1
R2
R4
L_RED
L_GRN
L_BLU
H3
H4
H1
MOUNT-PAD-ROUND3.0
S1
S2
S3
S4
S5
PUSH-BUTTONSIDE_THROUGH_HOLE
BUT_TOP
BUT_1
BUT_2
BUT_3
BUT_4
MCU
Arduino Pro Micro
D2
R6
R3
10K
S6
PUSH-BUTTONTOP

E. MANUAL

This booklet will guide you through all the steps to prepare, conduct and analyse the evaluation of an exhibition. It is advised to first read all steps thoroughly before starting the evaluation process, so you know what you are working towards.

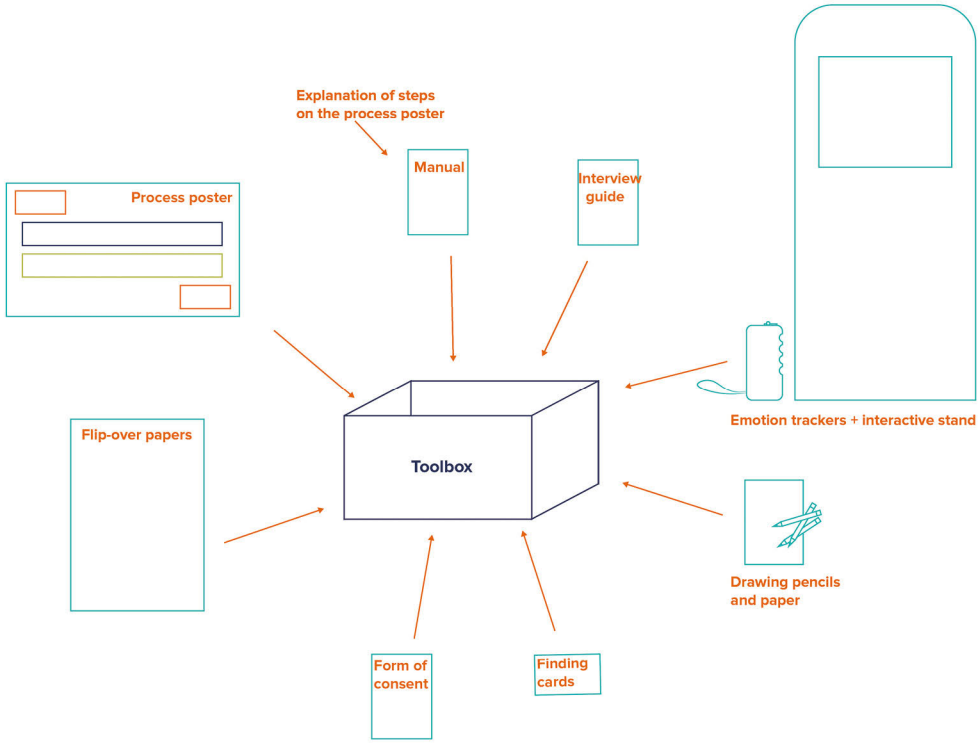
Did you open this booklet while you are still designing the exhibition? Excellent! This is the best moment to start to thinking about the evaluation! Did you are already realised the exhibition you want to evaluate: No worries! You can still catch up!

Good luck!

THE TOOL-KIT

This booklet is part of a bigger tool-kit, which, next to this booklet, consists out of:

- Portable emotion tracker devices
- Interactive stand, including visualisation software
- UWB Anchors
- Interview guide
- Finding cards
- Form of consent

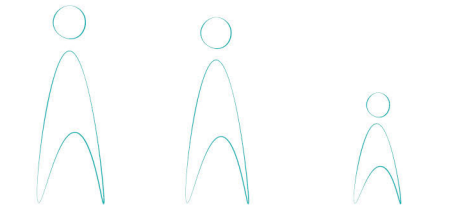


FIRST THINGS FIRST: ARE YOU IN THE RIGHT PLACE?

Before we can start, let's check whether this method is the right one for you to use.

Family exhibitions

This method was originally made for the Maritime Museum Rotterdam. However the method might also be useful for other exhibitions, it is designed for evaluating family exhibitions.
Family exhibition are focussing on families consisting out of one or more children, accompanied with their parent and/or grandparents. The children are 4 years old and up. The parents are between 20 and 40 years old and the grand parents are 60 years old or older.



grand parents
age: 60 +

parents
age: 30- 40

children
age: 4 years & up

What are you about to find out?

When this evaluation is conducted correctly, it results into valuable qualitative insights, combined with powerful quantitative data.

It will provide answers to the questions:

- What parts of the exhibition are appreciated by which age group?
- At what places do visitors spent a lot of time?
  - Why?
- At what places do visitors spent very little or even no time?
  - Why?

Other exhibition specific research questions can be added to this research. You will learn more about this on page X.

SHORT EXPLANATION OF THE METHOD

This method is based on the principle of experience sampling. Experience sampling consists out of two steps.

Quantitative data gathering

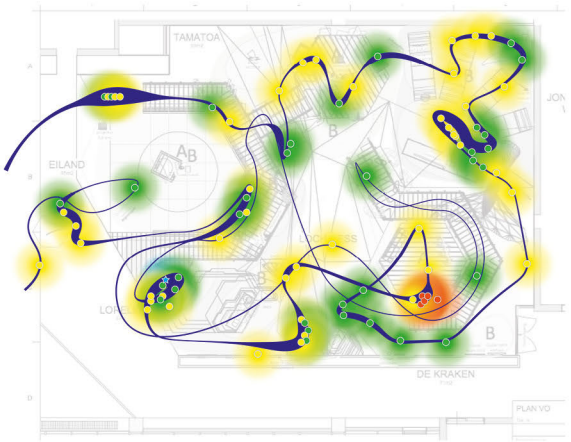
Visitors give small samples of what they think of the exhibition, while they are visiting the exhibition. They will give these sample by using the emotion tracker device. Visitors take the device with them and are asked to rate the exhibition every minute. They do this by pressing a button with :). :/ or :(. Besides that, the device also tracks the location of the visitor.

The data collected by the portable tracking device is send to the interactive stand, which creates a visualisation of the path of the visitor on a floor plan of the exhibition. It also visualises how long the visitor stayed at certain places.

Qualitative data gathering

Next, the visualisation can be used as a base for an interview with the visitor. This interview will give you insights in the 'why' behind the given feedback.

The tracking device



Example of a heat-map

HOW TO RUN THE PROCESS

Gathering qualitative data by conducting interviews and processing the data which evolves from this is very time-consuming. Therefore, interviews can only be held with a limited amount of visitors.
At the other hand, the quantitative data gets more powerful the more people provide feedback. To get best of both worlds, this method therefore is split up into two versions.

Version 1: Quantitative research to identify focus points

This version runs for several days. Random visitors are asked to take along and use the tracking device. The interactive stand creates heat-maps out of this. No interview is conducted.
This quantitative data can be used to identify outstanding patterns within the data.

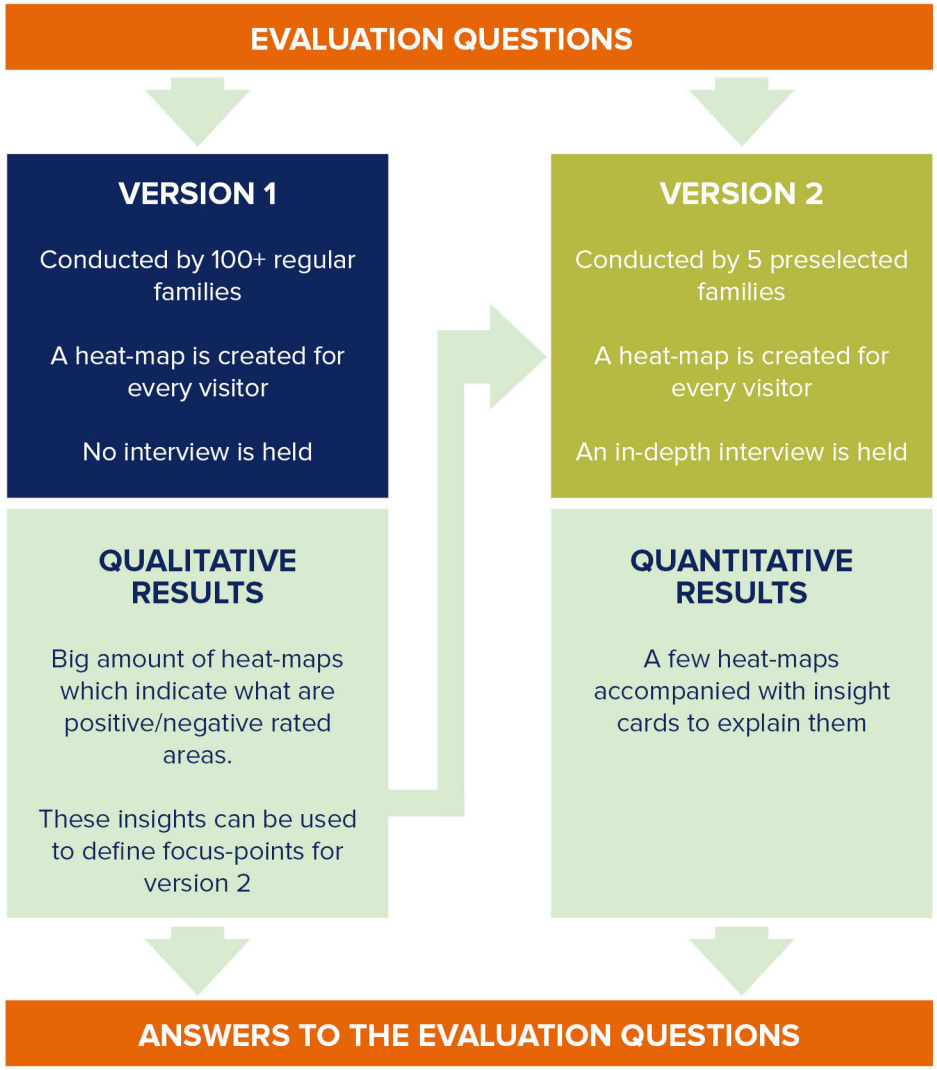
Version 2: Quantitative and Qualitative research

During version 2, one special test-day is planned on which several preselected visitors are invited. These visitors will not only use the portable tracking device during their museum-visit which creates a heat-map, but are also interviewed about their heat-map.

OVERVIEW OF THE PROCESS

The poster which comes with this booklet, helps you to understand the order of the steps in the evaluation process. The poster indicates steps that are explained in this booklet. Go to the page in this booklet as identified on the poster to learn how to conduct the different steps.

A more simplified overview is also given in the figure below.



GENERAL PREPARATIONS OF THE EVALUATION PROJECT

Before you can run the execution of part 1, there are some things you have to prepare. The system needs some files and information before it is able to function.

DEFINE EVALUATION QUESTIONS

It is important to get clear what it is you want to know. This way, you are able to prepare the interview in such a way that you will get answers to your questions. The method will always give some answers to some fixed research questions, but more specific questions could be added, depending on exhibitions you are testing.

FIXED EVALUATION QUESTIONS

The method is designed so you will find the answer to the following evaluation questions:

- What parts of the exhibition are appreciated by which age groups and what parts are not?
- At what places do visitors spent a lot of time?
  - Why?
- At what places do visitors spent very little or even no time?
  - Why?

ADDING SPECIFIC QUESTIONS

Other exhibition specific research questions or themes you want to know more about can be added to this evaluation. These specific evaluation questions can be used to specify the interview even more.

FORMING QUESTIONS USING THE TM21 TOOL KIT

Having a hard time defining what it is you want to know? A tool that will help you with this is the TM21 tool kit. This method will help you to define measurable goals. This tool-kit can be downloaded via: https://designingexperiencescapes.com/tools/toolkit-de-tentoonstellingsmaker-van-de-21ste-eeuw-evalueren-van-ontwerpbeslissingen/

Assumption cards

The tool-kit contains assumption cards. These cards are filled in during the design phase. During the exhibition phase, some of these assumption cards are selected to test.

Use the tool-kit during a project-group meeting at the moment when preliminary design is formed. Formed assumptions and success factors will be formulated as follows:

Example of an assumption

- As [fill in role] I expect that [name of part] will have an effect on[name role, eg the visitor], so that [goal].
- As a designer [role] I expect the use of colour on the floor [part] can contribute to a clearer routing of the exhibition [effect], so that visitors know better what to find where[goal].

Examples of success factors

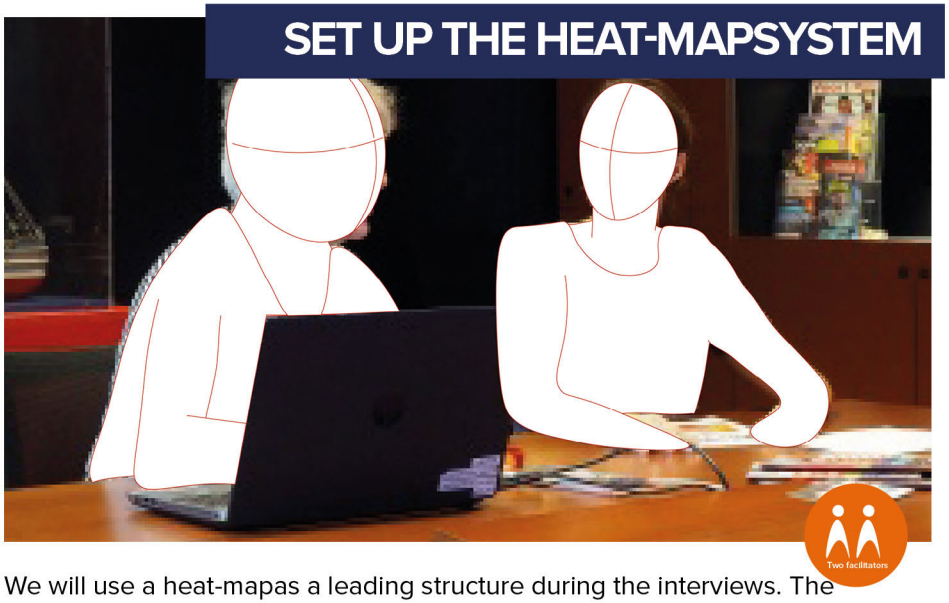
My expectation is a success if:

- Observations show that visitors follow the routing;
- Interviews show that the routing contributes to a better understanding of the exhibition.

Testing the assumption card

The assumptions as written down on the assumption card can be included in this research. Decide how the success factor will be tested. Will the success factor be tested from the quantitative data (version 1 of this research) or from the qualitative data (version 2 of this research)?

SET UP THE HEAT-MAPSYSTEM



We will use a heat-mapas a leading structure during the interviews. The specially designed software will create this heat-mapfor you, but it needs some preparations before it is operational.

1. CREATE A RECOGNIZABLE FLOOR PLAN

The visualisation software will draw the route of the participant on a floor plan. This floor plan will be leading during the interview. Therefore, the floor plan should not only be functional, but also be recognisable for the participants.

STEP 1. FIND OR CREATE A BASIC FLOOR PLAN OF THE EXHIBITION

Make sure to have a floor plan of the exhibition to start from. The dimensions of the floor plan should be 1000*1500 px and it should be saved as an jpg. Convert the floor plan is such a way that it exactly has these dimensions and file type.

STEP 2. RECOGNISABLE ELEMENTS

What are big, recognisable elements in the exhibition for the visitor? Make pictures of these elements. Upload the pictures to the software.

STEP 3. COMBINE THE FLOOR-PLAN AND THE ELEMENTS.

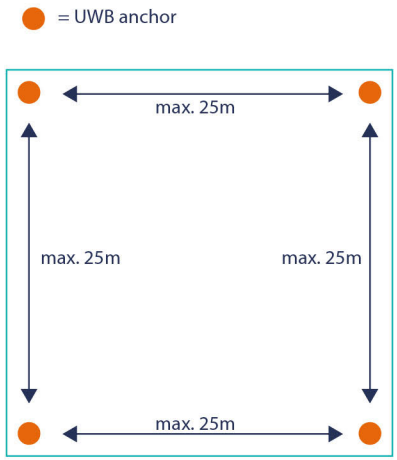
Use the software program to place the elements on the floor plan. These elements can turned off to make the heat-mapcalmer for the researcher who know the exhibition well enough to read the floor plan without the elements. During the interview the elements will be turned on, so it gives the visitor points of recognition which will make it easier for them to read the floor plan

2. INSTALL THE ANCHORS

To define where in space the visitor is located, anchors need to be placed within the exhibition-area. The system will be able to calculate the distance from the device to the anchors. This way, it is able to define where in the exhibition the device, and therefore the visitor, is located.

PLACING THE ANCHORS

If you would draw a polygon by connecting the placed anchors, the area within this polygon is the area in which the system is able to detect the location of the device. The UWB anchors may be up to 25 meters apart and should be placed two and a half to five meters above the floor.



It is important to take in account that the signals which the anchors are radiating won't be able to go through thick, massive objects, like walls. At every location within the exhibition, the device needs to be able to reach at least three anchors.

Make sure you place the anchors in such a way that this area covers the whole exhibition. This tool kit comes with four anchors. When you are planning on evaluating an exhibition that covers a bigger area, or an area with massive objects like walls in it, you will need to purchase extra anchors.

The anchors can be powered via USB or PoE (Power Over Ethernet). A 10000 mAh USB battery can power the anchor for 50 to 60 hours.

INDICATE THE LOCATION OF THE ANCHORS IN THE SOFTWARE

When the anchors have been placed, the location of the anchors should be indicated in the visualisation software, so it is able to calculate the location of the device, and therefore the visitor, on the floor plan.

VERSION 1

Due to the scope of this project, this part of the evaluation process is not worked out.

VERSION 2: BEFORE THE TEST DAY

PRAVCTICAL PERIPHERAL MATTERS

Who and what do we need at what moments? During this step you will fix all practical peripheral matters to make the research work.

RESERVE A ROOM

Reserve a room where the interview will be held. This should be a room that feels like part of the museum. A room at the backstage offices of the museum is therefore not suitable. In the MMR, this could be the Verolme room.

BLOCKING AGENDAS

Make sure to reserve time in your agenda and the agenda of your fellow researcher. Fort the test day you need two full days (eight hours). For the processing, you need half a day (four hours). Try to schedule the processing day the day right after the test days, or at most one day in between.

PRINTING FORMS

For the interview you need to copy the finding cards. Make sure to have about 20 copies per family.

BRING PENCILS

Bring some coloured pencils to the interview room, and some pens to write with.

GIVE-AWAYS

The give-aways are little, physical products to thank the participants. Make sure to have enough give-aways for all participants.

ARRANGING CATERING

Facilitate coffee, thee, lemonade and water for the visitors. Also organise to have something to eat to offer the participants like cookies and a healthy alternative like fruit.

INSTRUCT TICKET DESK EMPLOYEES

Make a list containing the names of the families who will come at the test day. Also write down the time when they are scheduled on this list. Give one of these lists to the employee who works behind the ticket desk. Instruct the employee to tell the families to wait in the entrance hall when they arrive at the given time. If they arrive earlier, the employee should explain the family that they can visit the museum till the scheduled time, but that they should not visit the exhibition which will be evaluated yet.

INSTRUCT EXHIBITION SUPERVISOR

Inform the exhibition supervisor that is guarding the exhibition about the test day.

CHARGE THE PORTABLE TRACKING DEVICES

Make sure to fully charge the portable tracking devices and the tablet.

An example of a give-away is this magnet, which children got when they helped evaluating the Sea Monster exhibition at the MMR

ORGANIZE PARTICIPANTS

We preselect our participants, so they will have time to take part in the interview and so we can time there participation better.

CRITERIA

This method is designed for family exhibitions. Therefore, we need five families with the following characteristics:
-A family of 2 to 4 persons
-One or two children in the age of 6 to 12
-One or two adults

Regarding on the evaluation questions as formed in on of the previous steps and the target group of the exhibition, extra criteria could be added to this list. This can for example be criteria based on:
- Gender
- Age
- Family composition
- Ethnic background
- Etc.

HOW TO FIND THEM

Try to find participants who are willing to spend time on the test. You could for example place a call on your social media channels, send an e-ail to all the 'Spetters'. 'Spetters' is an existing pool of people who feel connected with the museum and like to participate in events and researches of the MMR.

INSTRUCT THE FAMILIES

Instruct the families before their visit by sending them the following e-mail.

"Dear family [FAMILY NAME],

How incredibly nice that you have registered as a museum tester! On [DATE OF TEST], you will test the "sea monsters" exhibition. This letter provides more information about the day. If you still have questions, don't hesitate to ask!

Course of the day
You are expected at [TIME] in a museum. You can report at the ticket desk. Please tell the employee behind the desk your name, so he or she can instruct us that you arrived. I will pick you up in the hall after which you will get more explanation about the evaluation.

You will visit the exhibition together with your family. Afterwards we would like to ask some questions about the visit through an interview. In this interview, there are no wrong answers! So don't be afraid that you have to like everything. We would love to hear what you like, but we are also really interested in the things you did not like!
All in all, the entire test will take approximately one to one and a half hours. You are free to continue visiting the museum after the test.

Photos, video and privacy
During the test we sometimes take photos that you will also be on. We use these photos to show our colleagues how the day went. Sometimes we make such a beautiful photo that we would like to put it on our social media or in a newsletter. We will never include your last name or contact details.
Of course we always take into account the privacy of our visitors. We therefore ask you to take a look at the form of consent attached to this email. It states once again what we intend to do with the photos that we make during the test day. You can indicate on this form whether you give permission for the use of the photos and whether you would like us to make the photos anonymous. We respect your wishes and will not post any photos if you give no permission for this. During the test day we will ask you to fill in and sign a printed version. Feel free to share photos of the test day on social media yourself if you want to!

Contact
If you have any questions or if you are unable to arrive, contact me: [CONTACT DETAILS]

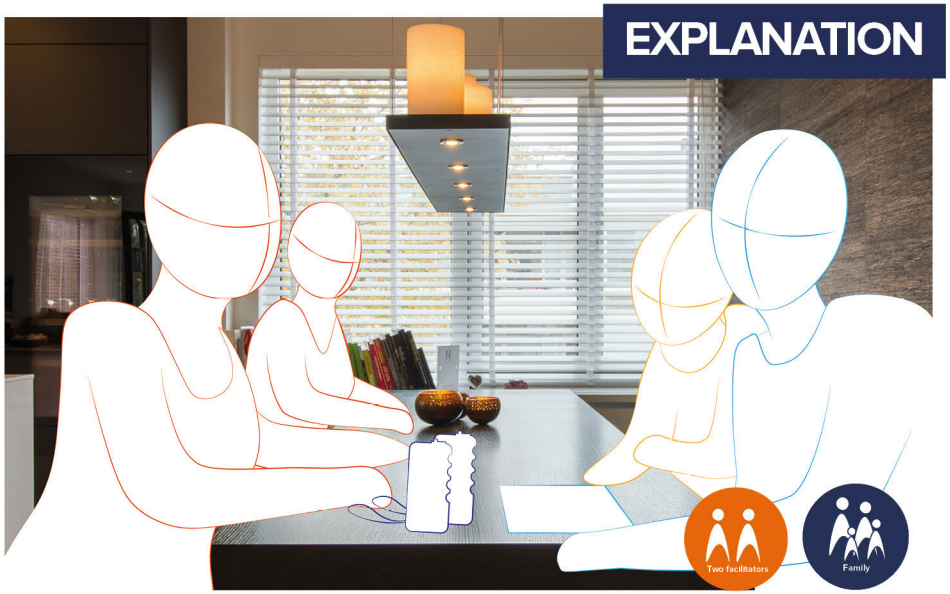
With kind regards
[YOUR NAME] "

VERSION 2: DURING THE TESTDAY

ARRIVAL AT THE MUSEUM

The family will arrive at the entrance hall. Make sure to put a list with names of the participants at the ticket desk. Pick up the family at the ticket desk.

EXPLANATION



1. PICK UP THE VISITORS AT THE ENTRANCE HALL

There is a high chance that the visitors have not been in the museum before, so therefore you have to pick up the them in the entrance hall to take them to the interview room.

2. MAKE THEM FEEL AT EASE

It is important that the visitors feel comfortable, so they open up and give honest feedback during the research. Offer the participants something to drink.

3. SIGNING THE FORM OF CONSENT

The visitors already received the form of consent by email. Give the adults two times a printed version of the form of consent and ask them to sign it. Make clear that this form is meant to protect their privacy. Keep one of the forms yourself and give one of them back to the visitor.

4. EXPLAIN THE RESEARCH

Now it is time to explain the research to the visitor. This will be something like this:

“Thank you for participating! Today, we will evaluate the Sea monster exhibition. We are very interested in what you think of the exhibition. It is important to know that you as participant can’t do anything wrong. Of course it is nice to hear when you like things about our exhibition, but we are just as happy to hear from you what you don’t like about it.

In a few minutes, you will go visit the Sea monster exhibition. You will get a special museum testing device with you during the visit. This device will keep track of where you walk and also asks you to tell it how much you like the exhibitions every now and then. After the visit, you return here and we will ask you some questions about the input you gave.

Look, this is the testing device! You can carry it around in your hand. The strap is put around your wrist. When you need both hands for something in the exhibition you can just let go of it and the device won’t fall but hang on the strap.”

Give all family members the devices that you just connected to them in the software and attach it to their wrist. Explain how the device acts by using the table below. Make sure you tell them that they should rate how much they like it themselves and that no answer is wrong.

Turn on the preview mode on the device. This will let the device function, even though it isn’t in the exhibition area jet. The family is now free to try out the buttons and see how it responds.

5. CONNECT THE DEVICE TO THE FAMILY MEMBERS

Give all family-members a tracking device. Indicate in the heat-map software which device is used by which family member.

6. SEND THE FAMILY TO THE EXHIBITION

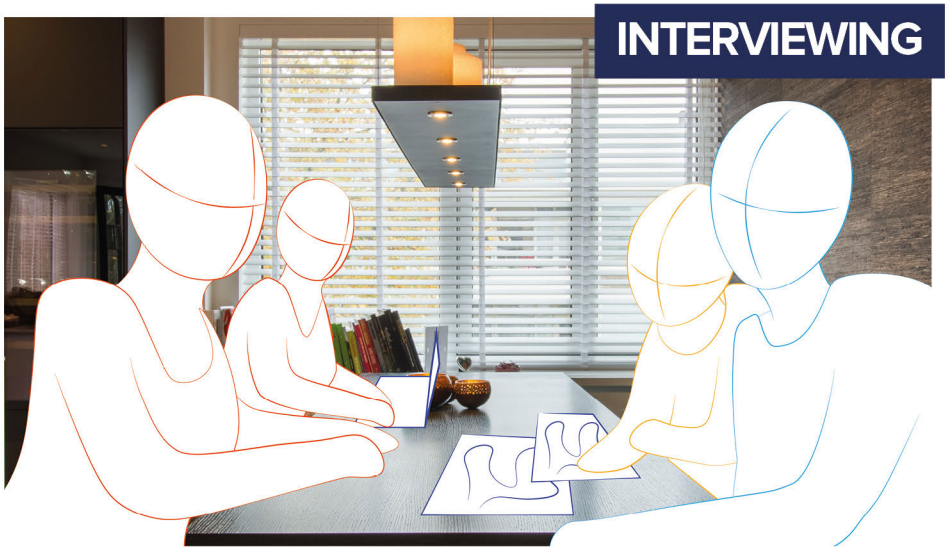
Turn of the preview mode and tell the family that they can now go an visit the exhibition. The devices will start functioning automatically as soon as they enter the exhibition area. Tell them that they can return when they are done visiting the exhibition. Make sure to mention that it doesn’t matter how much time they take or whether they visit the complete exhibition or not. Just visit the exhibition as you normally would do!

In the case that a family takes more then 40 minutes to visit the exhibition, the time schedule for the next family will get in trouble. This is why after 40 minutes, the lights in the device will show a disco pattern with all kinds of colours. When this happens, the family should come back to the interview room.

The visitors will do this part of the research all by their own. Make sure to tell the museum observer of that day what is going on.

This time gap can be used to analyse the gathered data by the interviews from the previous family.

INTERVIEWING



During the interview, one facilitator will take the lead and conducts the interview. The other facilitator assists when needed, and is given the task to document the interview. The interview guide is shown on page X and X. The

1. RETURNING TO THE INTERVIEW ROOM

After the visitors finished the visit of the exhibition, the family returns to the interview room. Have the child and parent sit side by side. Offer them something to drink.

2. FIRST REACTIONS

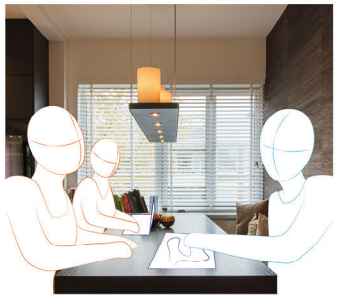
Ask the participants how they think it went. Pay attention to what they say! Do they already mention why they did or did not like something?

Show the parent and child their heat-map. Take a moment to let first reactions come naturally. Ask if they understand the map. First let them figure out the map by themselves. This will already evokes reactions and they will probably already mention some interesting things. If they do not understand the map, mention some recognizable elements of the exhibition.

3. SPLITTING THEM UP

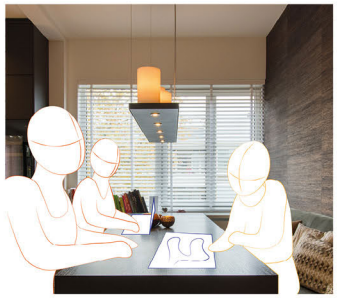
When the first reactions have taken place, ask the child to sit down at a different table and make a drawing of what he / she likes best about the exhibition. In the meantime you can interview the parent.
First, you will interview the parent. Next you will interview the child. Give the child some drawing pencils and paper. Ask them to draw the most interesting things they saw in the exhibition.

4. INTERVIEW THE PARENT



- Follow the route the participant walked on the heat-map. Ask questions about outstanding elements. For every point ask:
  - What happened here?
  - Why did or didn't you like it here?
  - Always try to ask: Why? Why? Why?
- If you are done asking about the heat-map, ask more about the theme's you defined.
  - Did you learn something new in this exhibition?
  - In which places did you teach your child something?
  - *(fill in extra theme)*
  - *(fill in extra theme)*
- Ask the participant whether he or she would like to add anything else.

5. INTERVIEW THE CHILD



When interviewing the child, try to make the parent interferes as less as possible. Create some physical distance to favour this.
First, ask the child about the drawing he or she made. Next, conduct the interview according the same steps as you did with the parent.

- Follow the route the participant walked on the heat-map. Ask questions about outstanding elements. For every point ask:
  - What happened here?
  - Why did or didn't you like it here?
  - Always try to ask: Why? Why? Why?
- If you are done asking about the heat-map, ask more about the theme's you defined.
  - Did you learn something new in this exhibition?
  - In which places did you teach your mother/father help you to understand or do something?
  - *(fill in extra theme)*
  - *(fill in extra theme)*
- Ask the child whether he or she would like to add anything else.

6. ROUNDING UP

At the end of the interview, ask the parents and the child if there is anything else they would like to add.

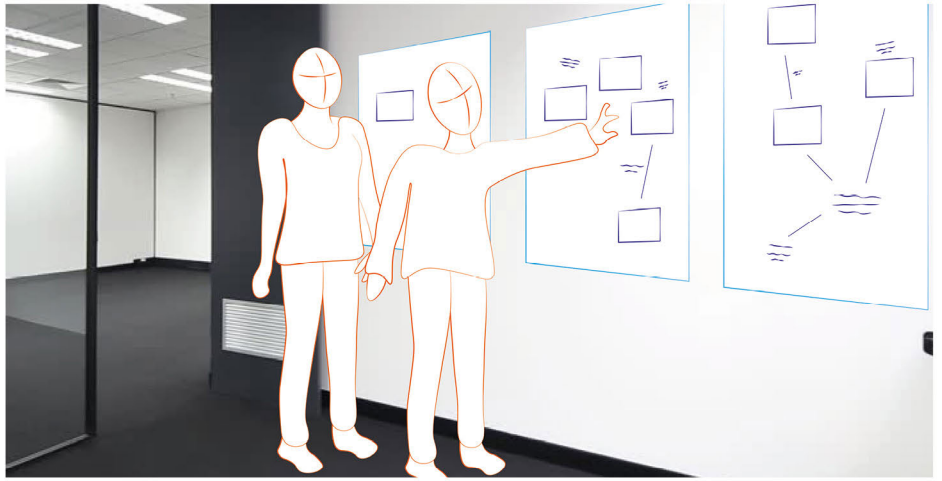
Thank the participants by giving them a small give-away.

THE VISITORS RETURN HOME

At this point, the visitor completed al his/her tasks. They feel like they made a meaningful addition to the museum and are proud on the special Museum-tester badge they got.
The family can decide to go home, but may also continue the museum visit.

PROCESSING THE DATA

Right after the interview, it is time to fill in the finding cards that are also in the tool-box. Write down all interesting findings you did during the interview. Use the notes that were made during the interview for this.
New idea's might arise from this. Make sure to also note these ideas.
New themes to focus on during the interview with the next family might be decided on.



After every interview, a short analysis will take place. During this analysis, you will use the data which was gathered during the interview to try to find patterns, generalize findings to a broader scope and finding evidence to support your conclusions.

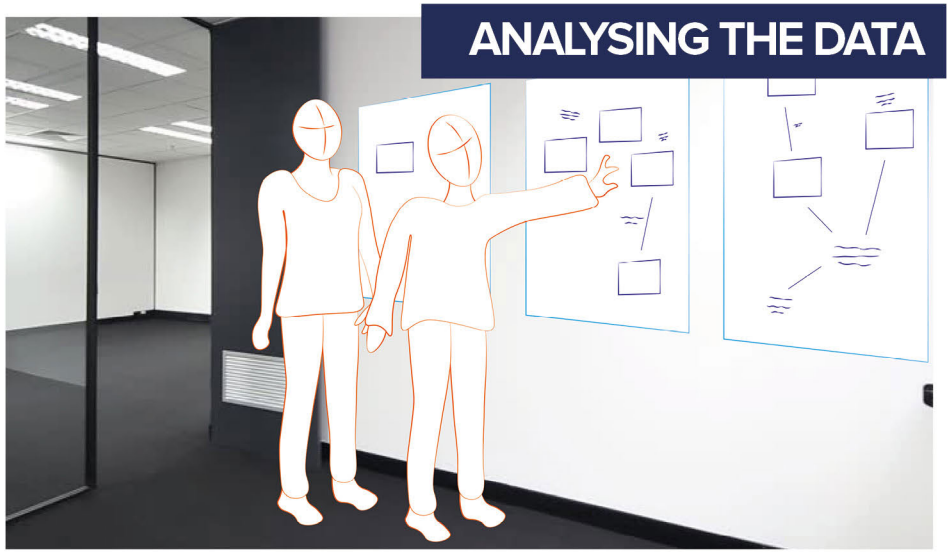
Move yourself to the analysis room. This room should be a different room than the interview room, since you do not want to effect families during that will be interviewed later.
Here you hang several flip-overs on the wall. On the top of the flip-overs, write down the themes which you defined during the defining of the research. For example "interaction between child and parent". Leave some flip-overs open to create space to come up with new themes or to park finding-cards which do not belong to any specific theme.
Use some tape to stick the finding-cards to the flip-over with the matching.
When new idea's arise, write these down on the papers. You might want to use sticky-notes to write things down and add to the flip-overs. Feel free to draw and write whatever and wherever you want.

If new themes or questions arise, make sure to write these down on the interview-guide. During the next interview, you can pay extra attention to whether the participants tell you thing that belong to the themes.

VERSION 2: AFTER THE TEST DAY

Part 1 gave you quantitative information about how visitors rate your exhibition. It gave you a view on what parts visitors like, which parts they like less, what exhibits they spend a lot of time with and on what exhibits they spend less time, or even skip completly. Part 2 will help to gather quantitative data to figure out why visitors feel and behave like they do.

ANALYSING THE DATA



After all interviews were done, take a look at the flip-overs you created one more time. See whether new connections and idea's can be developed.

Take a look at the research questions you made at the beginning of the evaluation. Can you answer them? Draw conclusions and write them down on the flip-overs.

Next, one of the interview conductors will take the responsibility to create a poster out of these insights cards. He of she will make a raw set-up of the poster, containing insights and recommendations for the future. Feel free to add pictures of the exhibition. The professional graphic designer within the museum can be asked to make the poster look perfect. This poster should be hung in the canteen, so all employees of the museum can see the result. This likely will cause conversations to take place between employees of the museum during lunch-breaks, which helps to spread the information between the different employees.

CONCLUSION

PRESENT AND DISCUSS

After the data is processed and the insights are gathered, present the poster to the project-group who realize the exhibition and all project-leaders. This way, the insights will be shared among all employees of the museum.

SHOW AND SHARE

This poster should be hung in the canteen, so all employees of the museum can see the result. This likely will cause conversations to take place between employees of the museum during lunch-breaks, which helps to spread the information between the different employees.

F. FORM OF CONSENT

Toestemmingsformulier

Hierbij verklaart ondergetekende, ouders/verzorger van ……..

Dat foto's gemaakt door het Maritiem Museum Rotterdam tijdens de testdag op 8 januari 2019 gebruikt mogen worden op de volgende manieren.

Ik geef toestemming voor het delen van foto's van mijzelf en hierboven genoemde gezinsleden intern binnen het Maritiem Museum Rotterdam.
Kruis aan wat van toepassing is
☐ Ja
☐ Ja, maar alleen als de gezinsleden niet herkenbaar in beeld zijn (van achteren gefotografeerd of het gezicht onherkenbaar gemaakt)
☐ Nee

Ik geef toestemming voor het delen van foto's van mijzelf en hierboven genoemde gezinsleden op communicatiemiddelen van het Maritiem Museum Rotterdam.
Kruis aan wat van toepassing is
☐ Ja
☐ Ja, maar alleen als de gezinsleden niet herkenbaar in beeld zijn (van achteren gefotografeerd of het gezicht onherkenbaar gemaakt)
☐ Nee

Ik geef toestemming voor het gebruik van foto's van mij en hierboven genoemde gezinsleden in het afstudeerverslag van Ellis Bots.
Kruis aan wat van toepassing is
☐ Ja
☐ Ja, maar alleen als de gezinsleden niet herkenbaar in beeld zijn (van achteren gefotografeerd of het gezicht onherkenbaar gemaakt)
☐ Nee

Datum: .....

Naam ouder/verzorger: .....

Handtekening ouder/verzorger: .....

DESIGN FOR our future

TU Delft

IDE Master Graduation

Project team, Procedural checks and personal Project brief

This document contains the agreements made between student and supervisory team about the student's IDE Master Graduation Project. This document can also include the involvement of an external organisation, however, it does not cover any legal employment relationship that the student and the client (might) agree upon. Next to that, this document facilitates the required procedural checks. In this document:

- The student defines the team, what he/she is going to do/deliver and how that will come about.
- SSC E&SA (Shared Service Center, Education & Student Affairs) reports on the student's registration and study progress.
- IDE's Board of Examiners confirms if the student is allowed to start the Graduation Project.

USE ADOBE ACROBAT READER TO OPEN, EDIT AND SAVE THIS DOCUMENT

Download again and reopen in case you tried other software, such as Preview (Mac) or a webbrowser.

STUDENT DATA & MASTER PROGRAMME

Save this form according the format "IDE Master Graduation Project Brief_familyname_firstname_studentnumber_dd-mm-yyyy".
Complete all blue parts of the form and include the approved Project Brief in your Graduation Report as Appendix 1 !

family name
initials
student number
street & no.
zipcode & city
country
phone
email

[redacted]

Your master programme (only select the options that apply to you):

IDE master(s): ( ) IPD ( ) DfI ( ) SPD

2nd non-IDE master: Hanne Marckmann

individual programme: - - (give date of approval)

honours programme: ( ) Honours Programme Master

specialisation / annotation: ( ) Medisign
( ) Tech. in Sustainable Design
( ) Entrepeneurship

SUPERVISORY TEAM **

Fill in the required data for the supervisory team members. Please check the instructions on the right !

** chair _____ dept. / section: ID

** mentor Dr. ir. Vermeeren, A.P.O.S. dept. / section: IDE

2nd mentor Hanne Marckmann

organisation: Maritiem Museum Rotterdam

city: Rotterdam country: the Netherlands

comments (optional)

Chair should request the IDE Board of Examiners for approval of a non-IDE mentor, including a motivation letter and c.v..

Second mentor only applies in case the assignment is hosted by an external organisation.

Ensure a heterogeneous team. In case you wish to include two team members from the same section, please explain why.

APPROVAL PROJECT BRIEF

To be filled in by the chair of the supervisory team.

chair _____ date ____-____-____ signature _____

CHECK STUDY PROGRESS

To be filled in by the SSC E&SA (Shared Service Center, Education & Student Affairs), after approval of the project brief by the Chair.
The study progress will be checked for a 2nd time just before the green light meeting.

Master electives no. of EC accumulated in total: _____ EC

Of which, taking the conditional requirements into account, can be part of the exam programme _____ EC

List of electives obtained before the third semester without approval of the BoE

YES all 1st year master courses passed

NO missing 1st year master courses are:

name _____ date ____-____-____ signature _____

FORMAL APPROVAL GRADUATION PROJECT

To be filled in by the Board of Examiners of IDE TU Delft. Please check the supervisory team and study the parts of the brief marked **.
Next, please assess, (dis)approve and sign this Project Brief, by using the criteria below.

- Does the project fit within the (MSc)-programme of the student (taking into account, if described, the activities done next to the obligatory MSc specific courses)?
- Is the level of the project challenging enough for a MSc IDE graduating student?
- Is the project expected to be doable within 100 working days/20 weeks ?
- Does the composition of the supervisory team comply with the regulations and fit the assignment ?

Content: APPROVED NOT APPROVED

Procedure: APPROVED NOT APPROVED

comments

name _____ date ____-____-____ signature _____

Initials & Name E. P. L. Bots Student number 4208803

Title of Project A feedbackproduct for visitors of the Maritiem Museum Rotterdam

A feedbackproduct for visitors of the Maritiem Museum Rotterdam

project title

Please state the title of your graduation project (above) and the start date and end date (below). Keep the title compact and simple. Do not use abbreviations. The remainder of this document allows you to define and clarify your graduation project.

start date 29 - 06 - 2019 23 - 11 - 2019 end date

INTRODUCTION **

Please describe, the context of your project, and address the main stakeholders (interests) within this context in a concise yet complete manner. Who are involved, what do they value and how do they currently operate within the given context? What are the main opportunities and limitations you are currently aware of (cultural- and social norms, resources (time, money,...), technology, ...).

ABOUT THE MUSEUM

In the Maritime Museum Rotterdam (MMR), you can discover the enormous effect that shipping has on our daily lives. Go on a journey through the maritime past and present in modern exhibitions for adventurers large and small. Listen to the stories, admire the prize exhibits from the leading collection or join in some of the numerous activities. The museum is in one of the oldest and largest museum harbours of the Netherlands, where you can visit historic vessels and cranes and experience how the world's leading port of Rotterdam began at this spot.

ABOUT THE PROJECT OFFICE

At the project office, four project leaders and a project supporter create new exhibitions for the core target groups of the MMR : children, parents and grandfathers, grandmothers and tourists. This can be large, interactive exhibitions, but also smaller exhibitions . A project leader leads a team of internal experts (curators, marketing / communication, education, technology) and external designers (3D, interaction and graphic). This team devises and realizes the exhibition. Project leaders often have a creative-organizational background.

INTEREST OF THE PROJECT OFFICE

The MMR is already asking visitors what they think of our exhibitions. The outcome of this is a score. The scores are often high, but the reason behind the score often remains unclear. The project office would like to get to know various research and evaluation methods to better monitor the results of the exhibitions, so they can use these methods in the future themselves.

TEST CASE: SEA MONSTERS

As a test case for the research, the Sea Monsters exhibition, opened in March 2019, will be used. At the Sea Monsters family exhibition (from age 4), you get to discover the worlds of six water creatures. You will be taking an in-depth look at Nessie, the Loch Ness Monster, meet Kraken the mega-octopus, a giant crab and mermaids. And then there is the huge turtle, so big it was believed to be an island. There is even the whale that swallowed Jonah! Figments of your imagination? Or could they really exist?

TARGET GROUP

The family exhibition about sea monsters is focused on our core target group of three generations: families with (grand) children from the age of 4 living in Rotterdam and surroundings. The parents are around 35 years old, the grandparents are 60-plus. The target group likes the combination of doing something fun together with the family while learning something about the world of sea monsters.

space available for images / figures on next page

introduction (continued): space for images

image / figure 1: Family expo Sea Monsters (4+)

image / figure 2:

PROBLEM DEFINITION **

Limit and define the scope and solution space of your project to one that is manageable within one Master Graduation Project of 30 EC (= 20 full time weeks or 100 working days) and clearly indicate what issue(s) should be addressed in this project.

Currently, the MMR hires an external party to send a survey to their visitors, containing question about how they feel and think about the museum. The museum gets valuable information from this survey, but the museum is mainly assessed in total instead of the exhibitions separately. Visitors are giving the exhibitions one grade. From this information it is impossible for the projectoffice to know what parts in particulary were succesfull or not.

Valuable questions, to which the answer remains unclear are for example: How are the exhibitions assessed by the different age categories? Are the educational goals that were set at the start of a project achieved? Which parts of the exhibition are the ones that are moste interesting, fun or teaching for the visitors? Which factors are making the exposition to a success that we can learn for the next exhibition? And also, which parts aren't important at all!

There are various techniques and methods for evaluating. However, it is difficult to choose the right one and apply it to exhibitions. Important information is lost as a result.

ASSIGNMENT **

State in 2 or 3 sentences what you are going to research, design, create and / or generate, that will solve (part of) the issue(s) pointed out in "problem definition". Then illustrate this assignment by indicating what kind of solution you expect and / or aim to deliver, for instance: a product, a product-service combination, a strategy illustrated through product or product-service combination ideas, ... In case of a Specialisation and/or Annotation, make sure the assignment reflects this/these.

Design an interactive product that helps to gather feedback from visitors of the exhibitions of the MMR. The design must be suitable for various exhibitions.

The project will consist of:
- Research into various evaluation techniques
- An elaboration of a product or installation in which these techniques are used to gather feedback.

The subjects being investigated:
- Have the educational goals previously set for the project been achieved?
- What makes the exhibition a success and where are areas for improvement?
- Insight into what is valuable about the exhibition for the different age categories.

In addition, it is important that the visitor gets the feeling that his / her opinion matters and that giving feedback feels like an addition, instead as an interruption to the museum visit.

Initials & Name E. P. L. Bots Student number 4208803

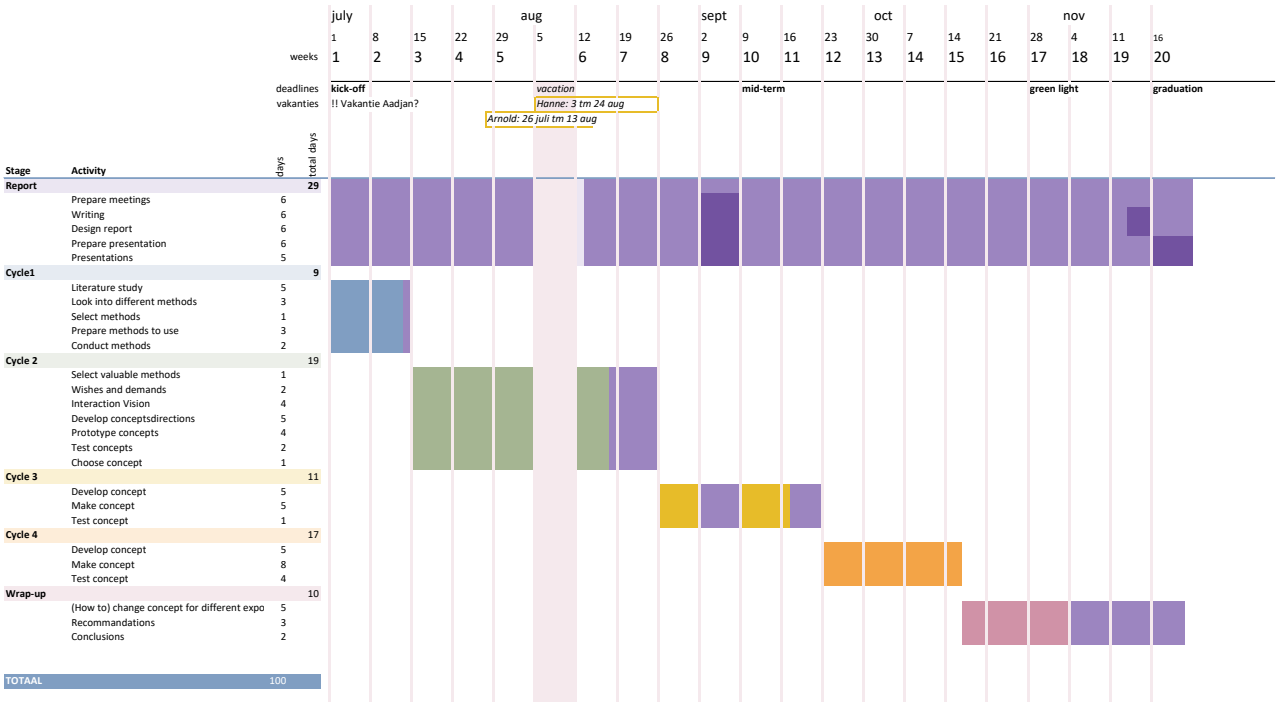
Title of Project A feedbackproduct for visitors of the Maritiem Museum Rotterdam

PLANNING AND APPROACH **

Include a Gantt Chart (replace the example below - more examples can be found in Manual 2) that shows the different phases of your project, deliverables you have in mind, meetings, and how you plan to spend your time. Please note that all activities should fit within the given net time of 30 EC = 20 full time weeks or 100 working days, and your planning should include a kick-off meeting, mid-term meeting, green light meeting and graduation ceremony. Illustrate your Gantt Chart by, for instance, explaining your approach, and please indicate periods of part-time activities and/or periods of not spending time on your graduation project, if any, for instance because of holidays or parallel activities.

start date 29 - 6 - 2019

23 - 11 - 2019 end date



Every monday, there is a museumFuturesLab meeting, that I will regularly attent. Arnold Vermeeren is attending these meetings too.

I planned one week of holidays after week 5.

Directly after week 20, at the 23th of november, my parents will go on a holiday for 10 days. In the case that my graduation can not be planned before the 23th of november, I would like to plan my final presentation in December.

Important dates:
Kick-off: june 28th
Mid-term: around september 9th
Green-light: around october 28th
Graduation: around november 16th

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MOTIVATION AND PERSONAL AMBITIONS

Explain why you set up this project, what competences you want to prove and learn. For example: acquired competences from your MSc programme, the elective semester, extra-curricular activities (etc.) and point out the competences you have yet developed. Optionally, describe which personal learning ambitions you explicitly want to address in this project, on top of the learning objectives of the Graduation Project, such as: in depth knowledge a on specific subject, broadening your competences or experimenting with a specific tool and/or methodology, ... Stick to no more than five ambitions.

One year ago, I had no idea what subject to graduate in. I started traveling and was extra alert about what inspired me.

While traveling, I realised I often am the one who knows some fun facts about things we come across. I just love to dive in to new stuff and google questions I gather during the day. The world just gets so much more interesting when you know a story behind what you see! And how nice is it to share this knowledge so other people can experience the same?

I just I visited an interactive museum in Hong Kont and there it began to grow on me... I realized that this is a direction that really suits me. Not the design of one specific products or subject, but the dissemination of knowledge by designing interactive musea and exhibitions. While doing this, I am able to continuously dive into another subject and come up with original ways to inspire people and give them a broader view of the world.

By graduating at the MMR, I like to get a better understanding of how an exhibition comes to exist and what parties are involved in this process. From this knowledge I hope to get a better vision on what part of this project fits me the best an therefore what kind of company I would like to work in the future.

My design vision is as folows:
"I want to create memorable experiences that awake people's senses and give them a richer view on the world."

With this specific project, I will get valuable insights in what factors add to this vision and how to design and evaluate museum experiences. I can use this knowledge in my future career.

FINAL COMMENTS

In case your project brief needs final comments, please add any information you think is relevant.

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