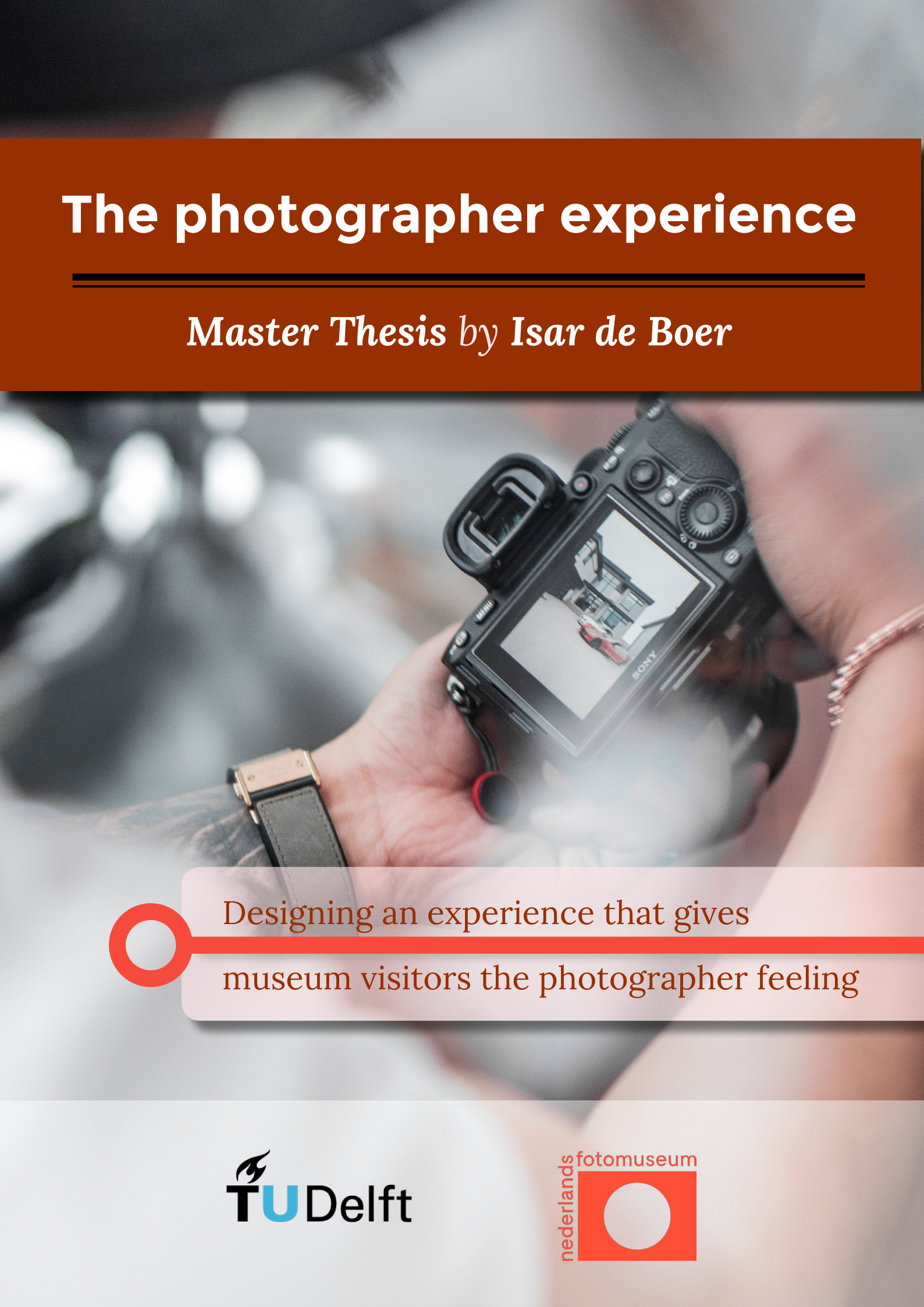


The photographer experience

Master Thesis by Isar de Boer



Designing an experience that gives
museum visitors the photographer feeling

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*Designing an experience that gives museum
visitors the photographer feeling*

Preface

For the last seven months I have been working on a project related to one of my passions: photography. Having the opportunity to dive deep into the world behind something I love to do was amazing. Apart from learning more about cameras, photographers and museums, it has been great to explain people about photography and the way an image is made from catching light. To explain something to people and see them receiving the information is something I really enjoy. In the last eight years I have been involved in projects and situations that offered a similar situation, ranging from being a snowboard instructor to introducing freshmen to Delft in the introduction week, teaching kids about redirecting forces with serious gaming in my bachelors end project, and finally in this graduation project.

To design a product that is able to educate people about the world of photography has at times been a challenge, but my passion for photography and explanation have kept me going all the way through the end.

I would like to thank the following people:

Olav van den Brekel for believing in this project and taking on this challenge together with me, but most of all for his never-ceasing believe in me.

My supervisory team: Maarten Wijntjes en Michelle Kuipers. The personal moments of input, feedback and discussion were very valuable for me and always happened to be around a cup of coffee. Spontaneous meetings at the superior coffee machine on the second floor, at the coffee star in front of the faculty or even a “havermelk” cappuccino at Lebkov & Sons in Rotterdam.

Johan Nieuwenhuize, Melanie Samat and Hans Wilschut for taking the time to tell me about their work and letting me observe their work.

My friends, family and fellow students for moments of inspiration, brainstorming, prototyping, visualization, fussball or a cup of coffee.

Abstract

The Nederlands Fotomuseum is the Dutch national museum for photography and its archive has the biggest collection of photographic material in the country. Currently, the visitors of the museum have a rather passive role and are merely subjected to the visual artworks in the museum. The museum desires to give the visitors more insight in the world behind photography, such as the photographic process, the invention and developments of the photo camera or the process of developing photographs in the dark room.

This project explores the possibilities to let the visitors of the Nederlands Fotomuseum experience the world behind photography in an active, co-participatory way.

First an analysis of the context is made:

- The museum’s vision, goals and ways of working.
- The way other museums handle interactive, educative installations.
- The desires of the visitors and motivation for coming.
- The way photographers work and what they desire.
- The principles of the photo camera.

This is followed by an exploration of three promising scopes.

Resulting from the analysis, the design goal is re-defined as:
“Design an educational interactive experience for the visitor of the Nederlands Fotomuseum with a rechargers motive and no experience with photography. This experience needs to make this target group take a longer and better educated look at photographs to let them experience what it is like to be a photographer and what it takes to make a photograph”.

The developing stage shows the creative process towards coming up with a design proposal fulfilling the design goal and meeting the requirements. This is done through a process of ideation, conceptualization and validation.

Next, the design proposal is given, consisting of a presentation of the total design, an explanation of the envisioned co-participatory interaction, and a more detailed design of the mechanical part of the design proposal.

Finally, the project is concluded by evaluating the design proposal on the requirements, discussing the feasibility, desirability and viability, and posing the recommendations for further research and development.

Table of Contents

Project Structure

| | |
|---|-----------|
| 1 Introduction | 8 |
| 1.1 Project origin | 10 |
| 1.2 Problem definition | 11 |
| 1.3 Design goal | 12 |
| 1.4 Methodology | 12 |
| 2 Analysis | 14 |
| 2.1 The museum | 16 |
| 2.2 Interactivity in other museums | 20 |
| 2.3 The visitors | 26 |
| 2.4 The photographers | 30 |
| 2.5 The camera | 32 |
| 2.6 Exploring valuable directions | 34 |
| 3 Define | 36 |
| 3.1 Main insights from analysis | 38 |
| 3.2 Re-definition design assignment | 40 |
| 3.3 Main requirements | 41 |
| 4 Develop | 42 |
| 4.1 Ideation | 44 |
| 4.2 Conceptualization | 46 |
| 4.3 Validating concepts | 52 |
| 4.4 Concept choice | 54 |
| 4.5 See-through camera | 58 |
| 5 Deliver | 72 |
| 5.1 Bring the light! | 74 |
| 5.2 The interaction | 78 |
| 5.3 Demophoto | 80 |
| 6 Conclusion | 88 |
| 6.1 Evaluation of requirements | 90 |
| 6.2 Feasibility, desirability & viability | 92 |
| 6.3 Recommendations | 94 |
| 6.4 Wrap-up | 96 |
| References | 97 |

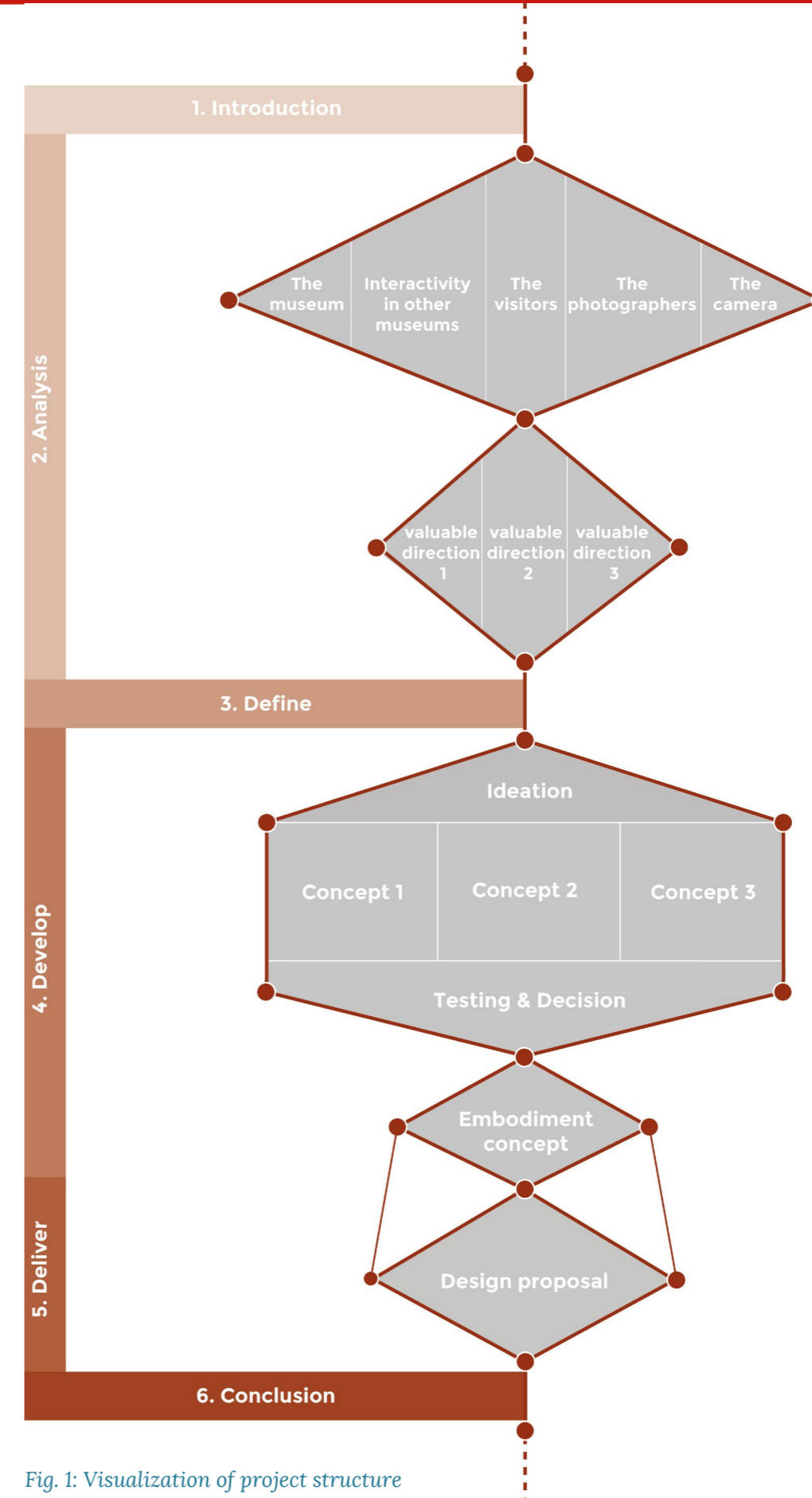


Fig. 1: Visualization of project structure

Stage 1

Introduction

In this first stage the origin of the project and the problem definition are explained. Also, the design goal and project approach are described.



1.1 Project origin

This project originates from my passion for photography, understanding technology, educating physical principles and having an embodied final result. In my search for a graduation opportunity that would fit these four personal elements I decided to take matters own hands and propose an assignment myself: designing and building an interactive installation that educates people on the working principles of a camera. After formulating this assignment the search started for a third party that recognizes the relevance of this project. I spoke with Arnold Vermeeren, coordinator of the Delft Design Lab Museum Futures, a lab that explores how museum experience design can lead to long-term engagement of audiences with museums or their collections. Through Arnold I came in contact with Olav van den Brekel, head of education of the Nederlands Fotomuseum in Rotterdam (NFM). He shared my enthusiasm towards such a project and in his opinion there is not enough education in the NFM or other Dutch photography museums about what goes behind a photograph.

1.2 Problem definition

Museum

The Nederlands Fotomuseum is the national museum for photography and its archive has the biggest collection of photographic material in the country. In half-yearly exhibitions the museum shows works from its own collection and makes exhibitions with works from outside the collection. Their goal is to exhibit a reflection of Dutch photography and “be the undisputed knowledge and debating centre for collection management, presentation and discussion of and about photography in the Netherlands.” (“About the museum”, 2019).

However, the visitors of the museum currently have a rather passive role and are merely subjected to the visual artworks in the museum. The NFM desires a possibility to give its visitors an experience with the world behind all the displayed work and giving more insight in what they are

looking at. This could be about the history of photography, the technological developments in cameras, a look into the life of a photographer or even explaining the chemical process of producing a photograph. Besides from their main target group, consisting of adults, the museum also has a desire to be more approachable for children and teenagers.

Visual culture

In this modern day and age we are overloaded with visual information and images. We look at screens most parts of the day and are submitted to images constantly. The biggest example of this is the enormous use of Instagram and the speed users swipe through hundreds of photographs and images. This has made us oblivious to what an image or photograph actually is and what it takes to make it.

The visitor needs a better trained eye for looking at photographs.

This leads to the following problem definition:

The visitor of the Nederlands Fotomuseum has a passive role in exhibitions and often knows too little about how a photograph is made

1.3 Design goal

The vision of the NFM is to debate about photography and all the topics that photographers question. Right now the visitors of the museum have a rather passive role in this story and undergo the art in the museum as it is. To give them the opportunity to mix in the debate the museum wants to hand them some tools to have a better educated way of looking at photographs

The design goal is:

—
Design an educational experience that gives the visitor of the Nederlands Fotomuseum an educational, yet playful and interactive way of learning what it takes to make a photograph
 —

The end result of this project should provide the NFM with an interactive experience that gives the visitor an active role in discovering what it takes for a fine-art photographer to make a photograph.

1.4 Methodology

This project has an educational point of view. That is why the methodology in this project is based on the constructive alignment theory (fig. 2).

The constructive alignment theory (CAT) is a theory that directly addresses the learning outcome. In this method the outcome is stated beforehand, followed by a way to teach this outcome (the activity) and the testing of the new knowledge (assessment). The constructive alignment theory was formulated by Professor John Biggs and shows a combination between constructivist understanding of the nature of learning, meaning people construct their own knowledge through experiencing things and reflecting on them, and the outcome based teaching education.

The analysis in this report shows the search for the **intended learning outcome**. By researching the main stakeholders their desires and interests are found. These findings are then distilled, resulting in the intended learning outcome. The development stage shows the creation of the **learning activity** that needs to be applied to reach the before mentioned learning outcome. In this development stage the concepts and designs are tested in multiple iterations to **assess** if the learning outcome is reached by asking for **feedback** from test subjects.

However, the CAT is not always useful in this project, since the theory is proving to be better suited for smaller educational learning goals. Next to the CAT, the methods generally used in the project show big resemblances with the Base Cycle of Designing.

The base cycle of designing is the cycle stated in the book "Productontwerpen, structuur en methoden" (Roozenburg e.a., 1998) and shows the 5 basic steps in designing: analysis, synthesis, simulation, evaluation and decision. The multiple iterations in this project, big and small, have been made by going through these five steps, where one cycle of steps can be called an iteration.

These two methods combined form the general methodology used in this project.

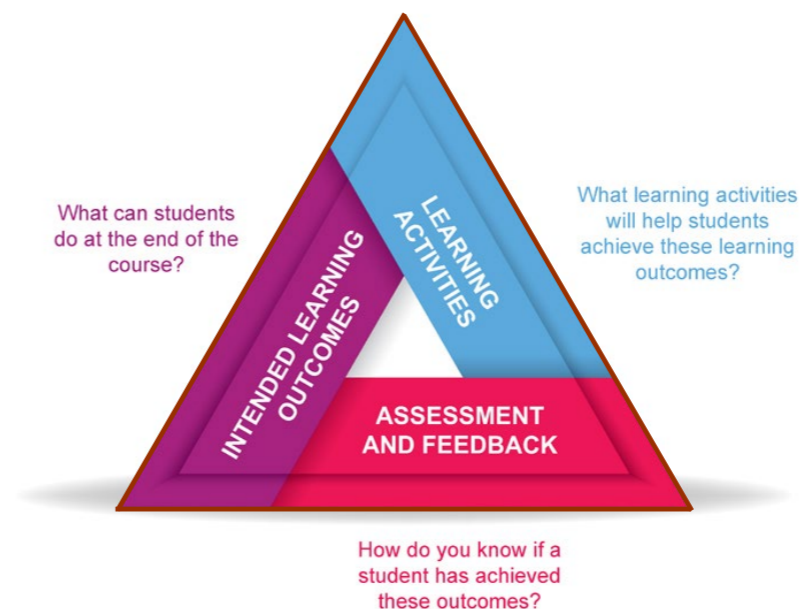


Fig. 2: Visualization of constructive alignment theory

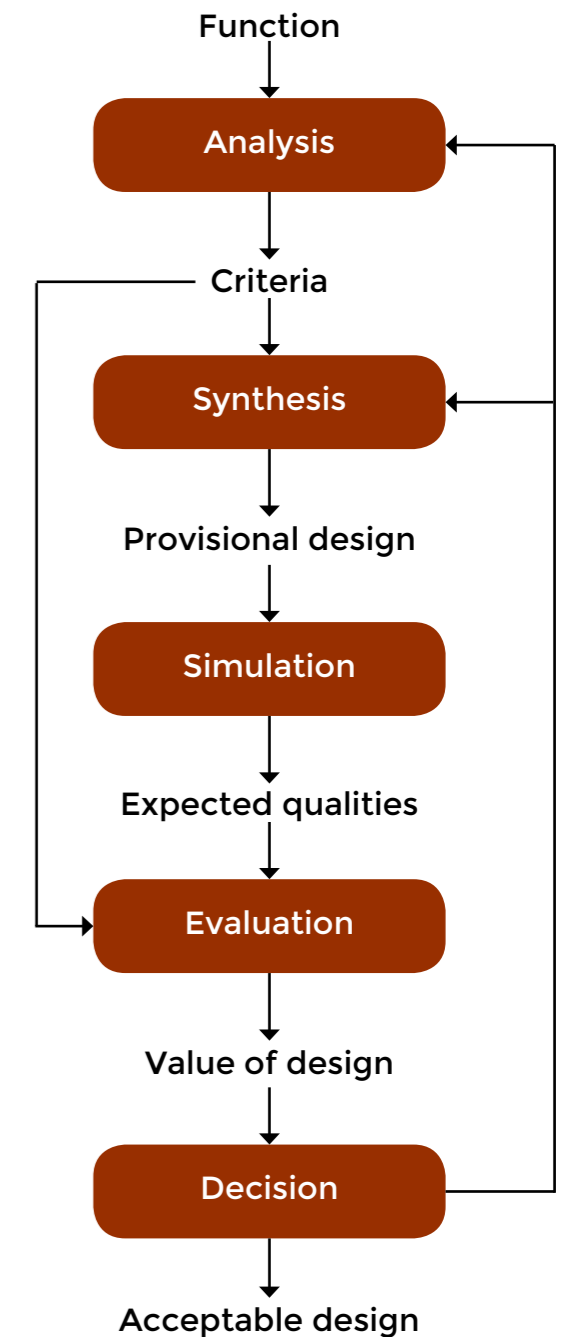


Fig. 3: Visualization base cycle of designing

Stage 2

Analysis

The goal of the second stage is to create a greater understanding of the context in order to formulate the requirements for the design. The following questions are answered:

- What is the NFM and what is their goal?*
- How do other museums approach educational interactivity?*
- Who are the visitor of the NFM and what are their desires?*
- How do autonomous photographers work and what do they want?*
- What are the camera variables a photographer gets to work with?*

Resulting in an exploration of three valuable directions.



2.1 The museum

What is the Nederlands Fotomuseum, what is their goal and how are exhibitions created? These questions are answered in this chapter in order to find the core values needed for the design.

The Nederlands Fotomuseum in Rotterdam is the national museum for photography and is in possession of the biggest photographic collection in the country, consisting out of more than 160 archives containing more than 5 million photographic items such as photographs, negatives, slides and photo cameras. The museum came from an aggregation of the Nederlands Foto-instituut, the Nationaal Fotoheraastatieatelier and the Nederlands Fotoarchief. It was commissioned by the Amsterdam-based academic professor, lawyer and amateur photographer Hein Wertheimer, who bequeathed the Prins Bernhardfonds with 22 million guilders to found a national museum of photography. This museum opened its doors in 2003 and resides in a former working facility of the Holland-Amerika line at the Wilhelmindakade in Rotterdam since 2007.

Mission

Their mission states: “We safeguard the Netherlands’ current and future photographic heritage and make it relevant to today’s international context. In doing so, we exhibit photography that reflects the world we live in and share it with society in order to enrich people’s lives with visual stories that matter. We

also bring the photography of the past to the present, in order to understand the present and conquer the future”. (“About the museum”, 2019).

Vision

“Our goal is to become the number one international platform for photography from the Netherlands; the undisputed knowledge and debating centre for collection management, presentation and discussion of and about photography from the Netherlands. We want our unique collection to be a reflection of Dutch photography. In order to achieve that, we collect, register, restore, and manage photographs with the utmost care and with the use of innovative techniques. We want everybody to feel welcome and understand the significance of what the museum does, even with those who are not typical visitors of the museum. We select those photographers who are distinctive, who question the world. We want to offer and keep offering these photographers a platform where they can share their stories with the public through exhibitions, debates. We are the ambassadors for photographers from the Netherlands in our own country and abroad”. (“About the museum”, 2019).

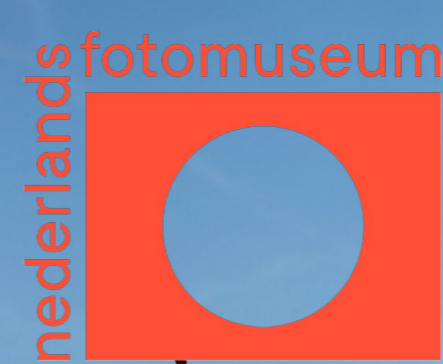


Fig. 4: Nederlands Fotomuseum in Rotterdam © Studio Hans Wilschut

In conversation with chief curator Frits Gierstberg

The museum holds half-yearly exhibitions showing a wide variety of artists. The design of exhibitions start by taking a good look at the policy plan which is stated four years in advance and contains their mission and ambitions. These exhibitions are made with balance in mind, exhibiting both living and deceased photographers, renowned or upcoming and established or experimental techniques. The exhibitions are made with a clear story they want to tell or message they have in mind. A selection of photographic works are selected for this story and what follows is the design of the

exhibitions. This happens either in-house or is done in collaboration with design agencies. Some exhibitions have a clear routing, others can be experienced in multiple different ways. The conclusion from this is that there is no clear repeating structure in these designs. Having a flexible experience means this project can fit and move with the changes of these exhibitions. This makes the experience have a longer lifespan. Furthermore, because the experience should fit multiple exhibitions it can be something unique, standing out from the exhibitions. However, the experience should not disturb the exhibitions.

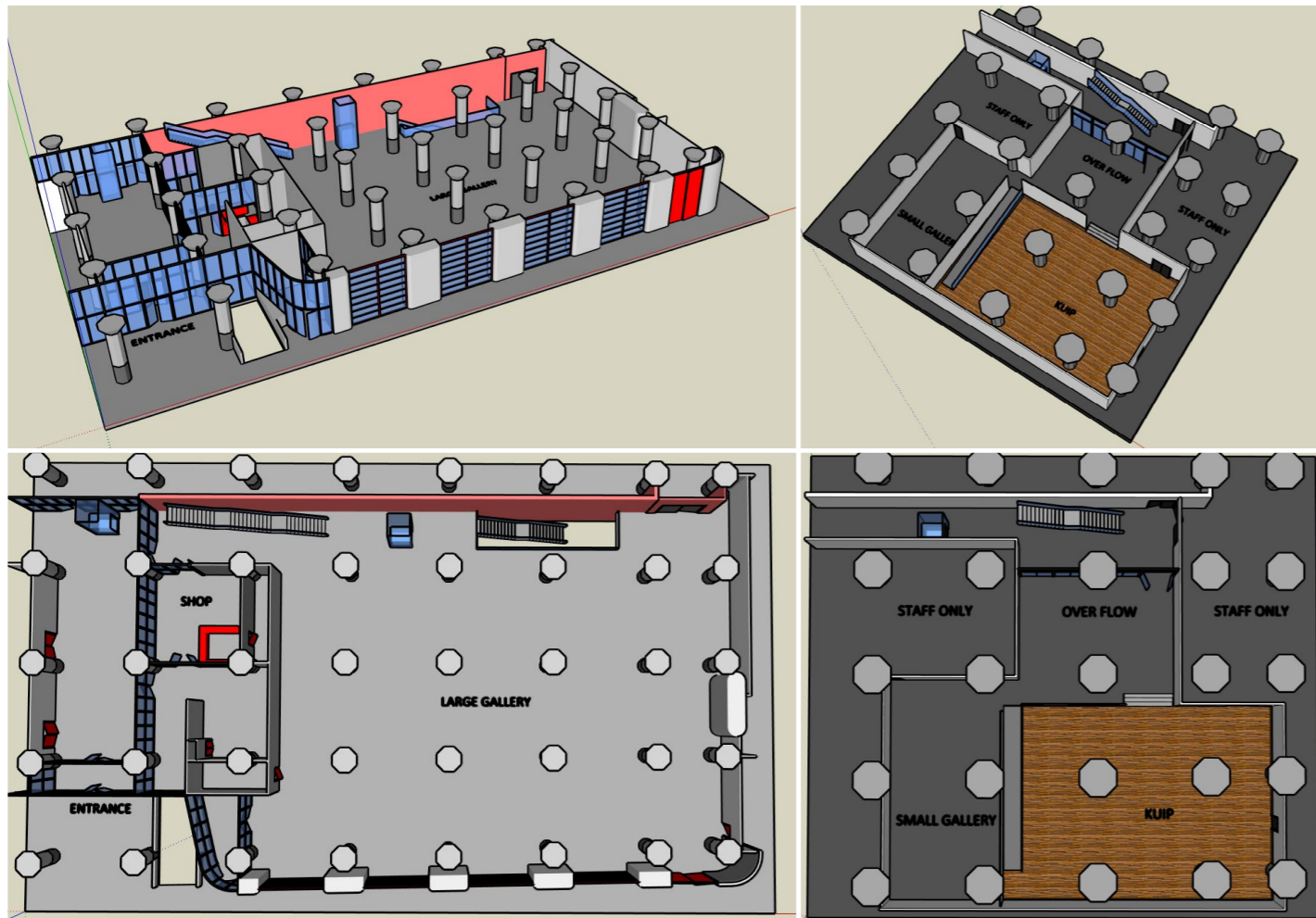


Fig. 5: Floor plan ground floor and basement NFM

Lay-out museum

The museum consists of three floors: the ground floor, basement and first floor (fig. 5). The main exhibitions are given on the ground floor, the biggest area. The basements often is used for smaller exhibitions showing upcoming artists or passion projects. The first floor contains the library, some educational rooms and an exhibition space called "The collection illuminated by...". This last space invites renowned photographers to make a personal selection of works from the museum's rich and varied collection. The building contains a big amount of pillars which are all 5 meters apart from each other.

The Dark Room

The dark room is an exhibition that took place in the museum in 2011 (fig. 6). In this exhibition the young history of photography is explained through twenty-two interesting stories with photographs, film and music. The stories are recorded by photographers, friends, family, experts and famous Dutch people and are supported by objects such as camera's, original and new prints and special attributes owned by photographers. By putting a white sheet into the developing trays the story appears slowly, similar to a real dark room. In the years this exhibition was active the museum kept adding "treasures" from the archive, thus constantly renewing the exhibition. Further information about the museum can be found in appendix A.



Fig. 6: Exhibition "Dark Room" in the NFM © Thijs Wolzak

Takeaways

- NFM wants to give photographers a platform to tell their stories.
- The museum wants to make photography relevant to today's international context, e.g. the visual culture we live in.
- The museum also wants people that are not typical visitors of the museum to feel involved and be able to mix in the discussion of photography.
- The experience can be something unique, standing out from the other exhibitions, but should not disturb them.
- To fit multiple exhibitions, the experience needs to be moved easily.
- The only size restriction are the concrete pillars, which are 5m apart.

2.2 Interactivity in other museums

This chapter shows what scientific papers say about how interactivity is/should be done in other museums. The main values found in these papers are the starting point for an analysis of interactive experiences and installations in other Dutch museums and some international photography museums.

Scientific Research

In recent years a rise in effort to engage visitors in an interactive way in museums can be noticed. Museums are developing exhibitions that use new forms of participation and interactivity that try to help increase the public's understanding of science and art (Heath & vom Lehn, 2008). A growing interest can be noticed in finding ways to incorporate new technologies that communicate science and enhance learning and engagement (Heath & vom Lehn, 2008). These 'interactive' installations are popping up in various types of museums and range from basic screens that provide basic information and test the public's knowledge on a particular subject, to highly advanced, multi-player installations that enable discussion among visitors about contemporary scientific advancements and social questions. It is believed that this new form of interactivity in the museum on which these installations rely enhance the visitor's understanding of science and art.

"Collaboration and communication are critical in this regard, since it is argued that informal learning arises in and through social interaction, interaction that enables people to mutually engage in cooperation and co-participation and

to become familiar with and understand seemingly technical and complex issues and problems" (Heath & vom Lehn, 2008).

Furthermore these statements are welcomed, suggesting that when visitors have a more active role in the museums and are participating and engaging with the art, their perceptions of these places as "old" and "dust" could be changed (Falk e.a., 2004). But there is a bit of a self-fulfilling prophecy in this way of thinking: Visitors who perceived interactivity as an essential component of their learning were able to report significant educational benefits and diverse (Falk e.a., 2004).

Another notable thing in the research is that 'hands on'-installations are noticeably better engaged with and have a much longer time-span in which visitors engage with the science or art. "Most successful in terms of attracting many visitors and long interaction sessions proved to be the hands-on exhibits, which engaged all types of visitors, and installations that required active participation" (Hornecker & Stifter, 2006). Hornecker also found that touching objects creates a sense of ownership among the visitors and

enables cognitive and emotional appropriation (Hornecker, 2005). This can also be found in conclusions made in other research, that with a cabinet of curiosities it is needed to have some of its drawers left open to have the visitor comfortable in opening others, and this should encourage exhibition designers to think about creative ways to encourage the visitor to interact with the tactile exhibitions (Macdonald, 2007).

Also Meisner et al state that in shared experience the performative actions seem to be an effective way to create engagement and participation with museums and exhibits and therefore enable the understanding of the content in a more natural way (Meisner e.a., 2007). They come to the same conclusion as Hornecker & Stifter, that a tangible experience provides a fruitful way of understanding the matter at hand, but also state that this development in museums has led to a more detailed understanding of the way observation plays an important role in shared museum experiences. Observing fellow visitors engage with an interactive part of the museum lowers the threshold to also engage with it noticeably. The study reveals that this social interaction is significant in the navigation through galleries, the discovery of exhibits and the conclusions and understanding people draw through this social interaction (Ciolfi & Bannon, n.d.)

However, some criticism on the new 'interactivity' in museums can be found. This interactivity, usually found in computer and screen based installations that trigger a relation between the visitor and the information that is provided is conflated with social interaction.

"Many computer-based 'interactive' exhibits deployed within these new exhibition areas rely upon, or create, a model of the user and interaction, that, as we have suggested, prioritizes the individual's 'interactivity' with the system without regard to the real-time contributions on participation of others." (Heath & vom Lehn, 2008) These 'interactives' create situations in which co-participation and mutual engagement are undermined, because they only enable one on one interaction with the system. This conflicts with the notion that co-participation and performing/observing aids the understanding of the content in the museums. It seems that there is a misunderstanding that the term 'interactivity' gives on co-participation, as if they are equivalent or that one automatically gives rise to the other. Simultaneous interaction gives room for a more swift engagement and focuses on tasks that incorporate issues that need negotiation and shared understanding of the challenges. It also gives room for less vocal group members to be active and present, instead of having to wait on a free slot in the installations or the need to interrupt

(Hornecker, 2005). Furthermore a set of guidelines for interactive installations with co-participation is given:

- (a) Employing constraints that require groups to distribute the task, to help each other out and to coordinate action,
- and (b) providing shared 'transaction spaces'. The concept of Multiple Access Points makes us consider systems in terms of how many people can see what is going on and lay hands on the objects of interest.
- (c) giving multiple points of interaction,
- (d) allowing simultaneous action and (e) giving equal access, not privileging some users. Tailored Representations take account of users' experiences and skills, inviting and empowering them.
- (f) building on experience and (g) making interaction intuitive enough for easy access, but
- (h) allowing the semantics to rely on specific knowledge (Hornecker, 2005).

Lastly, A main issue in the communication strategy for art museums is to avoid disturbing the pure art experience with the communication means chosen (Kortbek & Grønb, 2008). This means that there is a notable difference in the way science centers and art museums use their technologies to educate the visitor. The installations in science museums can be much more explicit and "in your face" to get the message across, whereas in art museums the overall vibe of the environment is much more formal and quiet.

Based on this research a set of attention points are made to do an observative research on how dutch museums incorporate interactivity and co-participation in their exhibits:

- Is the installation engaging one or multiple visitors at the same time (1-on-1 interactivity vs. co-participation).
- Is the installation screen based or physical (Screens vs. hands-on)?
- Can the installation be joined at all times / easily be repeated?
- How is the information given? Text, audio/visual, by watching active visitors, useque height, layers.

Visited museums:

NEMO science museum, Science Centre Delft, Rijksmuseum, Naturalis Biodiversity Center and Space Expo.

Further information about the field research in dutch museums can be found in appendix B.

Insights museum visits

Interactivity

Most "interactive" installations in the museums offer interaction between one visitor and the installation. Some installations consist of a game that offers the possibility to play with or against each other but are not well thought through. NEMO does offer some successful co-operative installations. Their waterworks installation shows that the children learn

from each other and collaboration pays off. The dinosaur-bonehunt in Naturalis benefits from working together, it is clear that the visitors help one another.

Hands-on works

Multiple museums show that the hands-on installations are far more popular than the screen based one's. The attention span was longer with hands-on and making mistakes or starting over proofs hard with screen based installations. Most screens are also not user friendly of very static, which makes the visitor quit sooner.

Ways of information

Most museums appear to have thought about the height of the information. NEMO displays the complex information

higher than the simple information and physics experiments. Also there often is some extra and longer information about a subject shown on a higher level, for instance in NEMO, Space Expo and the Rijksmuseum. The science centre appears to choose to have the information at a medium height, both readable for children and adults. Multiple museums give information through the 5 senses. This seems to be done to make the information more accessible for all visitors.

Atmosphere of subject

Every museum tries to design it's spaces in the atmosphere or vibe of the subject that is displayed. For instance, sound and lights are placed in such a way in Naturalis that the visitors gets te feeling to be underwater or on safari.

Fig. 7: Visits to NEMO science museum, Naturalis Biodiversity Center & Space Expo





Fig. 8: Virtual reality environment "Thresholds" © Graham Carlow



Fig. 9: Visitors exploring Thresholds © Jody Hartle



Fig. 10: Pinhole camera workshop

Education on photography other photography museums

To see how other photography museums handle education on "what goes on behind photography" an online research has been done on the following museums by reaching out to them by mail and analysing old exhibitions:

Science & Media Museum (GB) | Brandts (DK) | Museum of Contemporary Photography Chicago (US) | International Center of photography NY (US) | Multimedia Art Museum Moscow (RU) | Deichtorhallen (DE) | Photographers gallery (GB) | Sala Parés Barcelone (ES) | Camera Work Berlin (DE) | SEDF Central European House of Photography (SK) | Les Douches la Galerie Parijs (FR) | Thessaloniki Museum of Photography (GR) | FOAM Amsterdam (NL).

Showing photography history through historic images

Museums tend to explain the history of photography through iconic photographs, showing improvements in the field of photography. The Science and Media Museum in the United Kingdom, for instance, made a virtual exhibition, giving the visitors the opportunity to re-live the first major

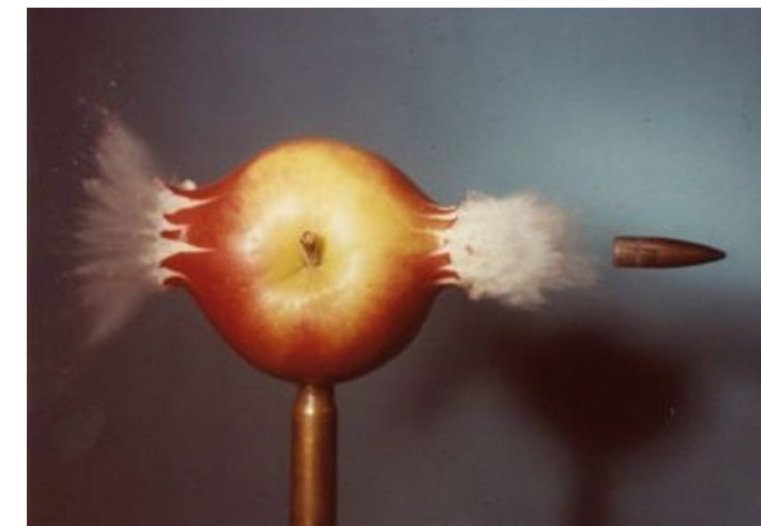


Fig. 11: Bullet through apple (1964), Harold E. Edgerton

photography exhibition in the world by William Henry Fox Talbot. Other exhibitions display iconic photographs such as "Bullet through apple" by Harold Eugene Edgerton, showing the improvements in shutter speed times.

Pinhole workshops

Various museums and galleries offer pinhole workshops to children, educating the way an image can be made by capturing light on a piece of light-sensitive material.

Dark room

In line with the pinhole workshops, museums offer workshops or information about how dark rooms work and how photographs are developed.

Takeaways

- Hands-on installations work better than screen based installations.
- Co-participation offers a better understanding of the subject, through sharing knowledge.
- Museums design their exhibitions in the atmosphere of the subject.
- Museums educate about the history of photography, focussing on analog photography, but do not show what a photographer deals with in modern times.

2.3 The visitors

Research is done on the visitors of the NFM, to find out who they are, why they visit the museum and what kind of behind the scene information about photography excites them

The research has six focus points that form the parts of a questionnaire conducted with visitors of the NFM:

Demographic information

Age, gender, educational level.

Reason for museum visit

Why does the visitor go to the museum and who are they visiting together with. By looking at the reason for visiting we can classify the type of visitors based on the 5 visitor-types stated by J.H. Faulk. More information on these types of visitors can be found in appendix C.

Experience with photography

Does the visitor have experience with photography, how long has he/she been practicing it, how would they classify their skill level and do they own a certain type of camera. The hypothesis is that visitors with less experience with photography are more interested in the world that goes behind photography and especially the technical side of photography. The more experienced visitor is expected to know more about photography in general and has a better trained eye when looking at photographs.

View on good photography

The visitor is asked to state which elements they think are important in order to make a good photograph,

ranging from the technical settings in a photograph to composition, post-production, story behind the photograph or fame of the photographer. This is done to find out which parts the visitors pay attention to or find important.

Knowledge about technical aspects of photography

The base knowledge of the visitors about photography is tested by asking questions about ISO, shutter speed and aperture, the base triangle of photography. These are open questions to give the visitor room to fill in the question with or without detail, so a more balanced judgement about their knowledge can be made.

Desired content in museum

The visitors are asked which parts of photography they would like to see in the museum in the future. This way it can be decided which type of visitor is interested in the stories behind photography.

By conducting this research it can be determined which type of visitor is interested in the stories behind photography and which kind of stories they are interested in.

The questionnaire can be found in appendix C

Valuable results

The questionnaire was conducted with 34 visitors of the museum. The participants are divided in 2 groups: With no/little experience with photography and with experience with photography (fig. 12).

How experienced in photography are you?

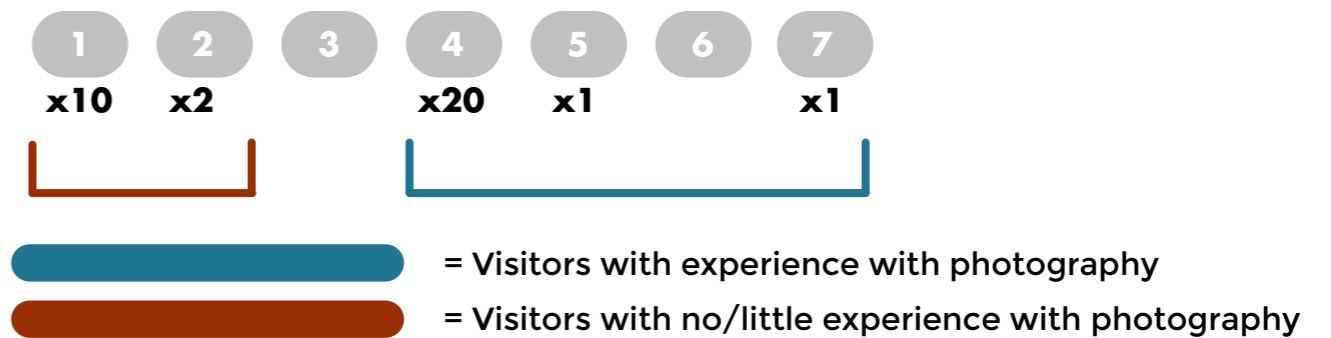


Fig. 12: Experience level visitors with photography

How important are the following variables for making a good photograph

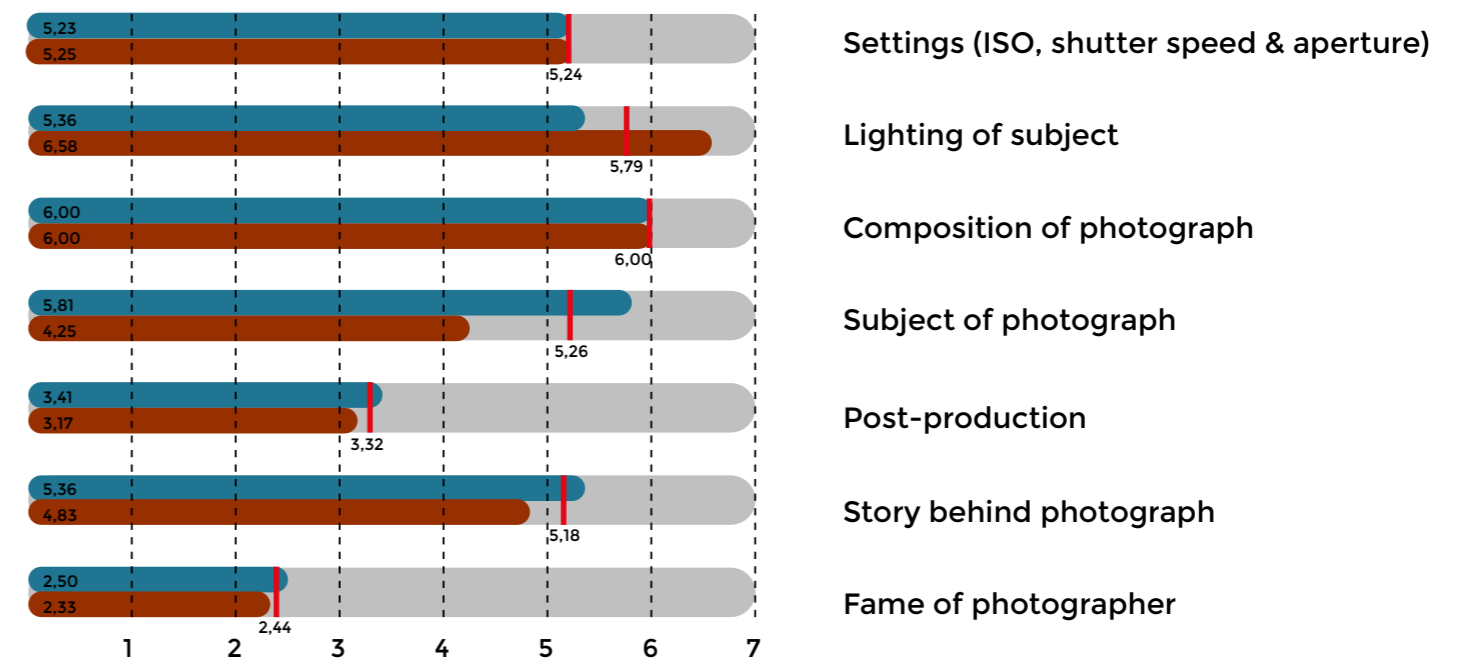


Fig. 13: Results about the importance of different variables for making a good photograph

- Post-production and fame of photographer is perceived as less important.
- Composition is considered the most important variable.

Which aspects of photography would you like to see in the museum in the future?

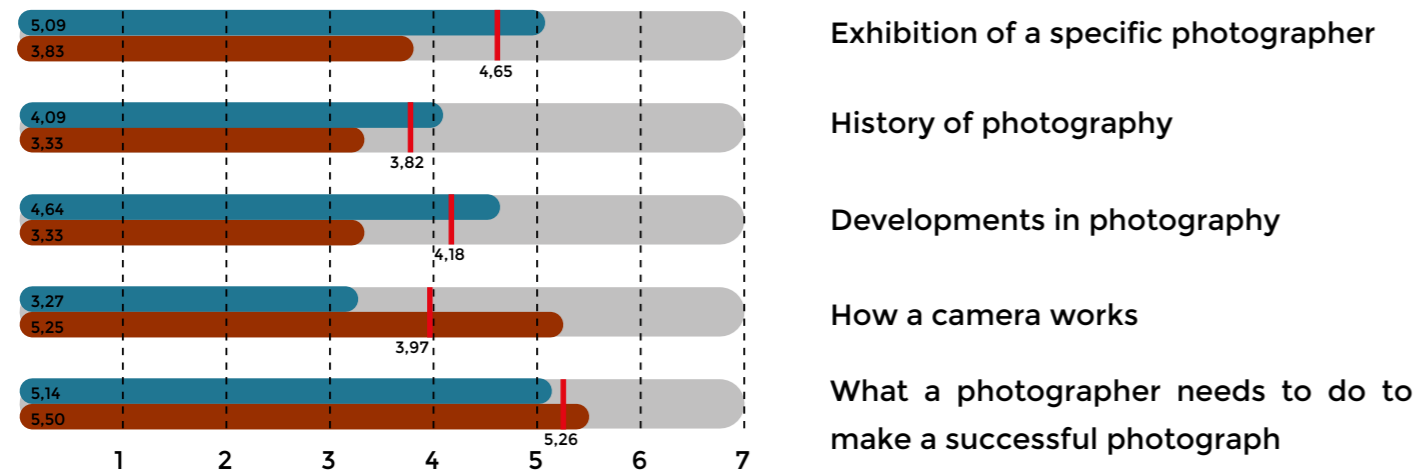


Fig. 14: Results of what visitors would like to see in the museum in the future

- Visitors with no/little experience with photography are more interested in how a camera works than visitors with experience.
- Visitors with experience are more interested in an exhibition of a specific photographer.
- Both groups are most interested in what a photographer needs to do to make a successful photograph.
- An unexpected result is that the visitors are least interested in the history of photography.

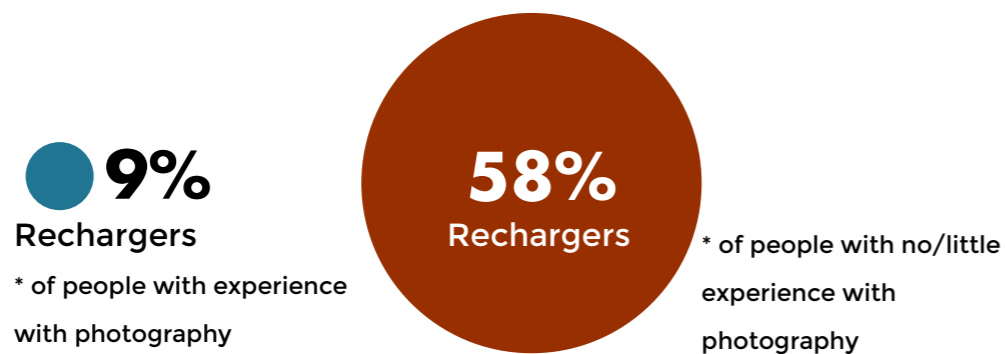


Fig. 15: Percentage rechargers per visitor group

58% of the visitors with no/little experience come to the museum with the following incentive: “Because I wanted to have a nice day out, to get away from the everyday life”. This is why we call this part of visitors “day-trippers” or “Rechargers”(fig. 16), looking for a day away from their daily life, making the

museum a possible destination and not the specific museum they were wanting to visit for quite some time. Because of this it is to be expected that these type of visitors have a lower knowledge level of photography in general. **This is why daytrippers/rechargers are the main target group for the experience.**

Explorers: Visitors who are curiosity-driven with a generic interest in the content of the museum. They expect to find something that will grab their attention and fuel their learning.

“I remember thinking I wanted to learn my science basics again, like biology and that stuff. ... I thought [before coming], You’re not going to pick up everything, you know, but you are going to learn some things.”

Facilitators: Visitors who are socially motivated. Their visit is focused on primarily enabling the experience and learning of others in their accompanying social group.

“[I came] to give [my] kids a chance to see what early life was like ... it’s a good way to spend time with the family in a non-commercial way. They always learn so much.”

Professional/Hobbyists: Visitors who feel a close tie between the museum content and their professional or hobbyist passions. Their visits are typically motivated by a desire to satisfy a specific content-related objective.

“I’m starting to put together a salt-water reef tank, so I have a lot of interest in marine life. I’m hoping to pick up some ideas [here at the aquarium].”

Experience Seekers: Visitors who are motivated to visit because they perceive the museum as an important destination. Their satisfaction primarily derives from the mere fact of having ‘been there and done that’.

“We were visiting from out-of-town, looking for something fun to do that wouldn’t take all day. This seemed like a good idea; after all, we’re in Los Angeles and someone told us this place just opened up and it’s really neat.”

Rechargers: Visitors who are primarily seeking to have a contemplative, and/or restorative experience. They see the museum as a refuge from the work-a-day world or as a confirmation of their religious beliefs.

“I like art museums. They are so very quiet and relaxing, so different than the noise and clutter of the rest of the city.”

Fig. 16: Museum visitors categorized by J.H. Faulk (Understanding museum Visitors’ Motivations and Learning,

Takeaways

- Composition and lighting of the photograph are deemed important.
- Post-production and fame of photographer are deemed not important.
- Visitors without experience are interested in how a camera works.
- All visitors are interested in what a photographer needs to do to make photographs.
- 58% of the visitors without experience are rechargers / daytrippers.
- Visitors often come in pairs .

2.4 The photographers

If the envisioned experience has to show the process of a photograph, a better understanding has to be created towards the way photographers think and work. A qualitative analysis has been done with three professional photographers, to get a better sense of how photographers work, think, act, and also how they look at photography as an art and craft.

Of course every photographer has its own ways of working but the hypothesis is that there is a general view on the basics of photography and consensus on what the collective goal of professional autonomous photography is.

Photographers Johan Nieuwenhuize, Melanie Samat and Hans Wilschut were interviewed and observed while they were photographing.

The main themes addressed in the interviews:

- Goal of their work
- Ways they are able to have control over a photograph
- Role of post-production in photography
- Preparation
- Types of photography
- What makes a photograph a good photograph?

Further results of the interviews can be found in appendix D.

Insights interviews

The interviews give the following main insights:

1. Photographers want to tell a story or convey a message with their work.
2. They want to be in control of the variables as much as possible.
3. They want to be as prepared as possible.
4. They think people should take a longer look at photographs if they want to understand the message.
5. Much more time goes in to preparation than people might think.
6. Post-production is usually 50% of the work.

To invigorate these findings they are double checked in a follow-up questionnaire, conducted with eight colleague-photographers. In the questionnaire the focus is on insight 1, 2 and 3. These are the insights that need more research. The other three insights are believed to have enough basis as they are.

Participated photographers:

- **Thomas Nondh Jansen**
- **Eddy Seesing**
- **Jaap van den Beukel**
- **Rens Horn**
- **Jitske Schols**
- **Suzanne Liem**
- **Danielle Kwaaitaal**
- **Carel van Hees**

Results questionnaire

1 Message conveyed with photographs

The photographers want to have the viewer experience emotions in photographs, see themselves in these photographs emotions, something to recognise. Also showing them world, how they see the world and have the viewer resonate with these images. They want the viewer to be touched by the photographs.

2 Control of variables

The variables these photographers named as important ones ranged from very technical ones to social soft skills. Apart from the classic triangle (aperture, shutter speed and ISO) there is a vast world of variables photographers deal with and train themselves in.

- Social skills with subjects
- Post-production skills such as sharpening, white balance, manipulating light, darkroom techniques, colour correction.
- Fantasy and working with an open mind, trusting intuition.

3 Preparation / being prepared

Most of the photographers want to be as prepared as possible when it comes to the equipment and knowledge of the subject and location. On the other hand chance is a big thing in making a special photo and they want to be surprised. So preparation is important from a technical view, but not from an artistic view.



Fig. 17: Melanie Samat at work



Fig. 18: Johan Nieuwenhuize in his studio

Takeaways

- Photographers want to tell a story or convey a message with their work.
- Want to be as prepared as possible when it comes to technical aspects.
- Soft skills are just as important, like interaction with models, following intuition and finding that special sparkle in someone's emotions
- Preparation takes more time than people might think.
- Post-production takes more time than people might think, about 50%.
- They think people should take a better and longer look at photographs.

2.5 The camera

In photography, the most important tool of the photographer is the camera. This chapter shows the most important variables a photographers encounters with respect to the camera. A more detailed explanation of the possible variables can be found in appendix E.

Shutter speed

Inside the camera the shutter opens and closes for a given amount of time. This is called the shutter speed. This variable decides how long the light-sensitive material inside the camera is subjected to light. This could be a fraction of a second or even hours in some instances. A long shutter speed is needed for instance in night photography. Because there is not a lot of light the camera needs some time to collect enough light rays to show a distinguishable result. However, this means that any movement in the picture won't be sharp because the camera captures the moving object at multiple positions (fig. 19A). This is why a faster shutter speed is used when capturing moving objects. This is also called "freeze frame". Vice versa, when the shutter speed needs to be fast, the camera has less time to collect enough light, so this needs to be compensated with another variable: aperture.

Aperture

The size of the opening in the lens is given by the aperture, or F-number. A lower F-number, for instance 1.8 tells you that the opening is big, which means a lot of light is able to enter the camera at the same time. A high

F-number means the opening in the lens is small and not a lot of light can enter the camera at the same time. Just like the shutter speed, this variable says something about how much light reaches the sensitive material inside the camera. Too much light gives a overexposed (bright) photograph and not enough light gives a underexposed (dark) photograph. The additional effect a bigger or smaller aperture can be seen in the picture. The depth of field changes (fig. 19B). This means that the range in depth in which objects are sharply projected on the light sensitive material can change.

ISO

When the right balance between shutter speed and aperture cannot be found, ISO comes in to play. ISO says something about how sensitive the sensitive material inside the camera is. Usually photographers want the ISO to be as low as possible, because this gives the best results when looking at quality and sharpness. However, when the shutter speed and aperture don't allow enough light into the camera and the photograph becomes too dark the ISO could be raised, thus making the material more sensitive to light. This way a well

exposed photograph can be made. Unfortunately, when raising the ISO too high, imperfections in the capturing of the light also are amplified, which result in so called noise or grain (fig. 19C). **These three variables together form the base triangle of photography.**

Other important variables are: composition, framing, focal length, frame size, post-production, preparation, white balance, extra light sources, analog or digital, interaction between photographer and model, planning in combination with weather, sunlight or time of day, appointments,

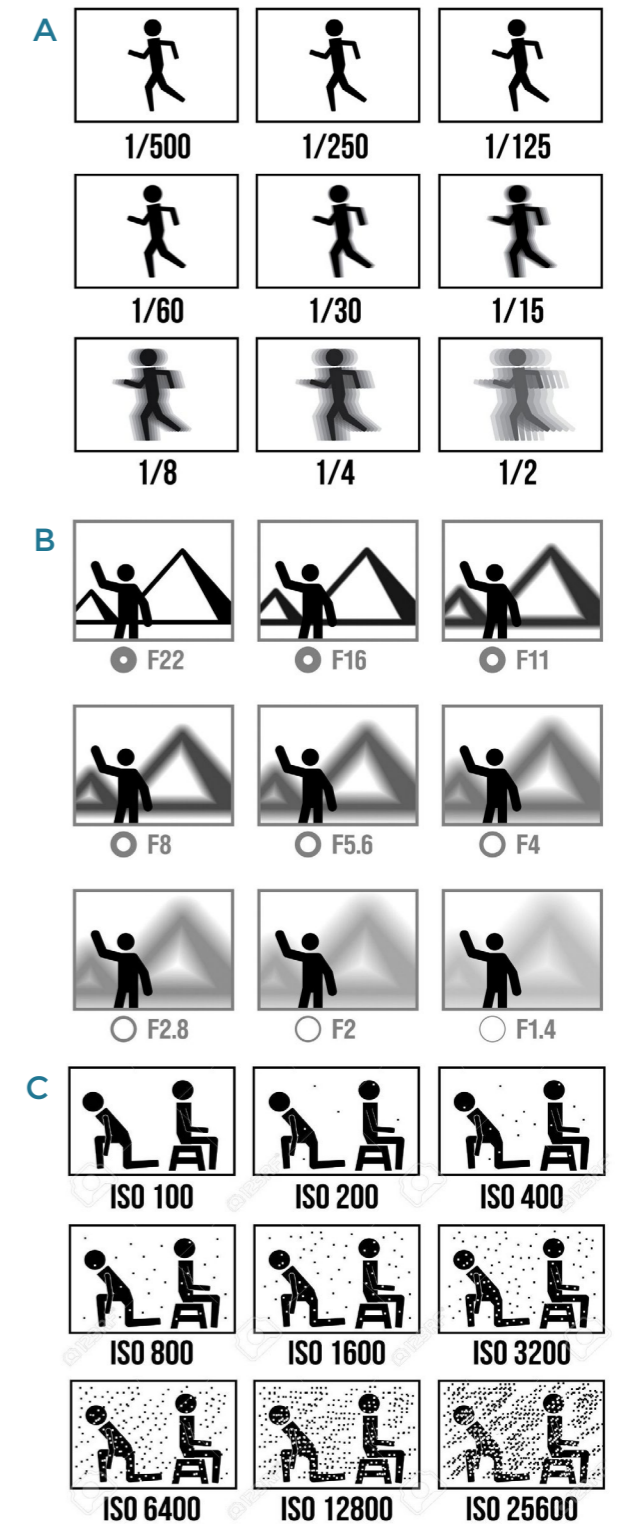


Fig. 19: Visuals showing the effect of settings (A) shutter speed, (B) aperture and (C) ISO

Takeaways

- Shutter speed, aperture and ISO form the classic triangle in photography.
- Other important technical variables are: composition, framing, focal length, framesize, post-production, preparation, whitebalance, extra light sources, analog or digital.

Stage 3

Define

In this third stage the main insights gained from stage 2 are stated. These main insights form the basis for the re-evaluation of the design goal and the main requirements.



3.1 Main insights from analysis

The Museum (2.1)

- The museum wants people that are not typical visitors of the museum to feel involved and be able to mix in the discussion of photography.
- The experience can be something unique, standing out from the main exhibition, but should not disturb.
- Exhibitions usually last 6 months and are always different in lay-out, routing and subject.

Research in other museums (2.2)

- Interactive installations are often interaction between one user and the installation, but interaction between users prompts sharing of knowledge.
- Museum visitors are more interested in hands-on installations than screen-based installations.
- Museums often try to support the art by simulating the atmosphere of the subject in the room.
- Extra information in photography museums is usually about the history of photography or explanation about analog photography and dark room techniques.

The Visitors (2.3)

- Visitors without experience with photography are interested in how a camera works.
- All visitors are most interested in what a photographer needs to do to make his/her work.
- 58% of the visitors with no/little experience with photography are rechargers/day-trippers.

- Visitors think composition and lighting in a photograph the most important, fame of the photographer and post-production are least important.

The Photographers (2.4)

- Photographers want the viewer to understand their message in the photograph or recognise something of their own life.
- Want to be in control of the variables as much as possible (settings, equipment, location, planning etc).
- Post-production is a much bigger part of the job, about 50%.

The Camera (2.5)

- The classic variable triangle (ISO, shutter speed and aperture) is the basis of photography.
- Other important variables are: composition, framing, focal length, preparation, post-production and soft skills like interaction between photographer and model and timing.

Exploring valuable directions (2.6)

- Preparation and post-production are interesting directions, but not able to stand on their own. They need to be combined with the part where a photograph is taken.
- Puzzles or challenges are experienced positively by test subjects.
- A clear challenge or goal is beneficial for the overall experience and satisfaction.

A full list of insights can be found in appendix G.

3.2 Re-definition design assignment

Based on the insights gained from the analyse stage, the design goal is evaluated and re-defined. This is done to have a better defined guideline, tailored to the scope of the project.

Old design goal

“Design an educational experience that gives the visitor of the Netherlands Fotomuseum an educational, yet playfull and interactive way of learning what goes behind making a photograph.”

New design goal

“Design an educational interactive experience for the visitor of the Netherlands Fotomuseum with a **rechargers** motive and **no experience** with photography. This experience needs to make this targetgroup take a **longer and better educated look** at photographs to let them **experience** what it is like **to be a photographer** and **what it takes to make a photograph.**”

3.3 Main requirements

From all the insights gathered in the analysis stage, the following serve as the main requirements for the next stages. A complementary list of requirements can be found in appendix H

1. Can be easily moved when changing exhibitions. (2.1)
2. Design has atmosphere or vibe from cameras. (2.1&2.2)
3. Is accommodated to the knowledge level of rechargers, visitors with no/little experience with photography. (2.1&2.3)
4. 75% of the actions need to be physical. (2.2)
5. Requires sharing of knowledge by users. (2.2)
6. Offers the ability to make mistakes, making mistakes should not be punished. (2.2)
7. Accommodates at least 2 visitors at the same time. (2.3)
8. Lets the user(s) experience part of the work of a photographer. (2.3)
9. Gives insight in the work of a photographer. (2.3)
10. Gives the visitors a better trained eye when looking at photographs. (2.4)
11. Gives experience with important variables such as: ISO, shutter speed, aperture, composition, framing or soft skills. (2.5)
12. Has a clear goal or challenge. (2.6)

Stage 4

Develop

This next stage shows the creative process towards a solution that lets the museum visitors experience what it is like to be a photographer.

This consists of ideating and testing the possibilities of three different stages of photography, brainstorming, creating concepts, and deciding the best concept direction after extensive testing.



4.1 Ideation

The develop stage is initiated by two weeks of ideation. The goal of this ideation is to discover the possibilities within the scope of the re-defined assignment and requirements. Three main values have been stated and explained to guide this process. The pinnacle of this ideation is the creative session conducted with six test subjects. The full brainstorm can be found in appendix I, together with some other ideation material.

Main values for creative ideation

Co-participatory sharing:

Interaction between the users evokes sharing of pre-acquired knowledge and understanding of the to be understood matter.

Photographer's feeling: Gives the users shortly the feeling of being a photographer.

Altering view: Changes the way the user looks at photographs.

To guide the creation of ideas and testing of validity these three values are stated. This is also the case for the creative session conducted with six participants.

Creative session : "experience like a photographer"

The creative session consists of 3 rounds:

1) All test subjects discuss which variables a photographer might get to deal with in his work.

2) Test subjects are divided in to pairs and are asked to create a storyboard of two people discovering a few of these variables together and present it to the other pairs.

3) Pairs are asked to create a concept/ drawing that translates the values of their storyboard into an experience and present it to the other pairs.

For the storyboarding the creative tool "scenes" (fig. 21) is used, a creative tool that helps create storyboards by providing pre-made visuals that can easily be altered or combined.

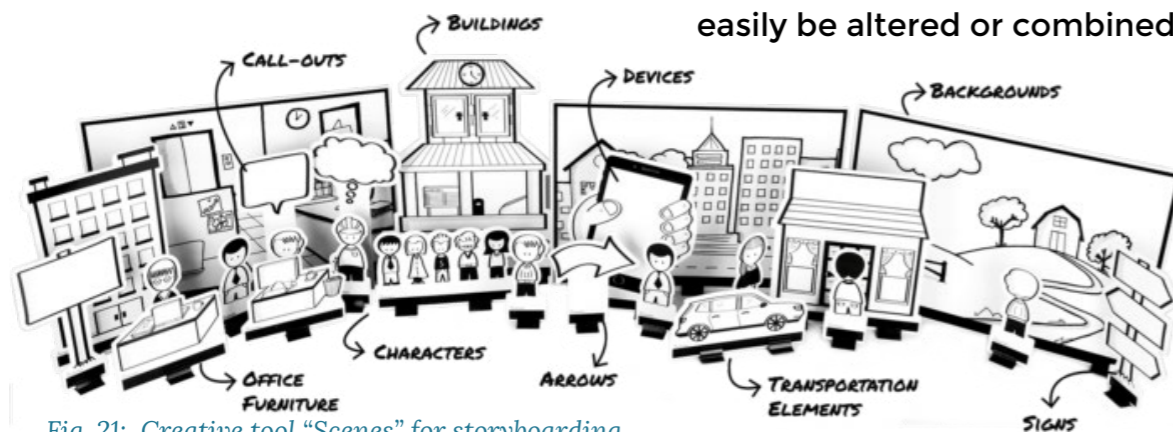


Fig. 21: Creative tool "Scenes" for storyboarding



Fig. 22: Creative session using "scenes"

4.2 Conceptualization

Resulting from the analysis and ideation three concepts are made. For these concepts the main values are leading. Does the concept evoke sharing of knowledge? Do the users get the feeling of being a photographer for a minute? Does the experience change the way they look at a photograph? From the analysis the following sets of variables a photographer has to deal with when taking a photograph are chosen:

1: Composition (2.3) and framing (2.5)

2: The classic triangle of photography of shutter speed, aperture and ISO (2.5) and

3: Interaction between photographer and subject (2.4)

Concept 1: Composition & Framing

This concept lets the users experience the importance of composition and framing. The way a photographers places the camera relative to the subject is very important. By choosing what is within the borders of the photograph and how the depicted subjects relate to each other the photographer can sometimes completely control the message carried out by the picture (fig. 23).



Fig. 23: Two ways of photographing an event

Explaining concept 1:

User 1 and user 2 get the assignment to make two photographs.

1: Photograph with a positive and happy story or message.

2: Photograph with a negative and sad story or message

The challenge is to have one subject from the table appear in both photographs.

User 1 has control over the position, orientation and zoom of the camera.

This way he can control what is in the photograph and from which viewpoint

the photograph is taken. However, user 1 is not able to see the result of taking the photograph, for this he has to rely on user 2.

User 2 is looking from another point of view but is able to see the result of the photograph. She will have to communicate what she sees with user 1, so they can accomplish the challenge together. By giving the users relatively much freedom to fill in their way of telling a positive or negative story, they are given the possibility for storytelling.

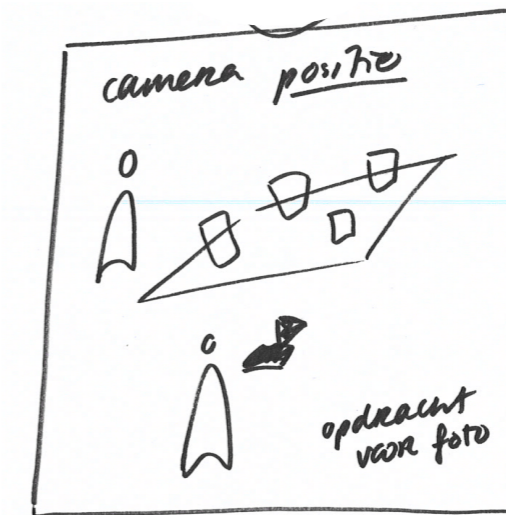


Fig. 24: Visual concept 1 - Composition & Framing

Concept 2: Shutter speed, aperture & ISO

The second concept is an experience with the classic triangle of photography. This concept is an iteration on the second exploring direction in the analysis (2.6 - taking the picture). This test setting contained 6 variables of which the concept uses shutter speed, aperture and ISO (and focussing), leaving light orientation and camera position out of the equation. The test setting in chapter 2.6 shows great enthusiasm about a puzzle vibe and figuring out what changing the variables does to the photograph.

Explaining concept 2:

The concept contains 2 sides: a camera side and a photo-booth side.

- User 1 is behind the camera,
- User 2 is standing in the photo-booth.

In this concept the responsibilities are again divided.

- User 1 has control over the three settings,

- User 2 sees the effect of changing these setting and appears in the photograph (for a more personal connection with the photograph).

Together they get the assignment to make a photograph with a specified part of the photo booth in focus and “freezing” a moving object or have it appear moving in the photograph

The photo-booth incorporates depth, which gives the opportunity to see a difference in depth of field when changing . For seeing the effect of shutter speed a moving object like a falling apple or moving blades of a ventilator are put in the concept.

The idea for user 2 to be standing in the photo booth originates from the WONDR Experience in Amsterdam. This is a museum that exists of instagrammable rooms and settings, to let people experience the art of play (fig. 25).



Fig. 25: WONDR experience



2

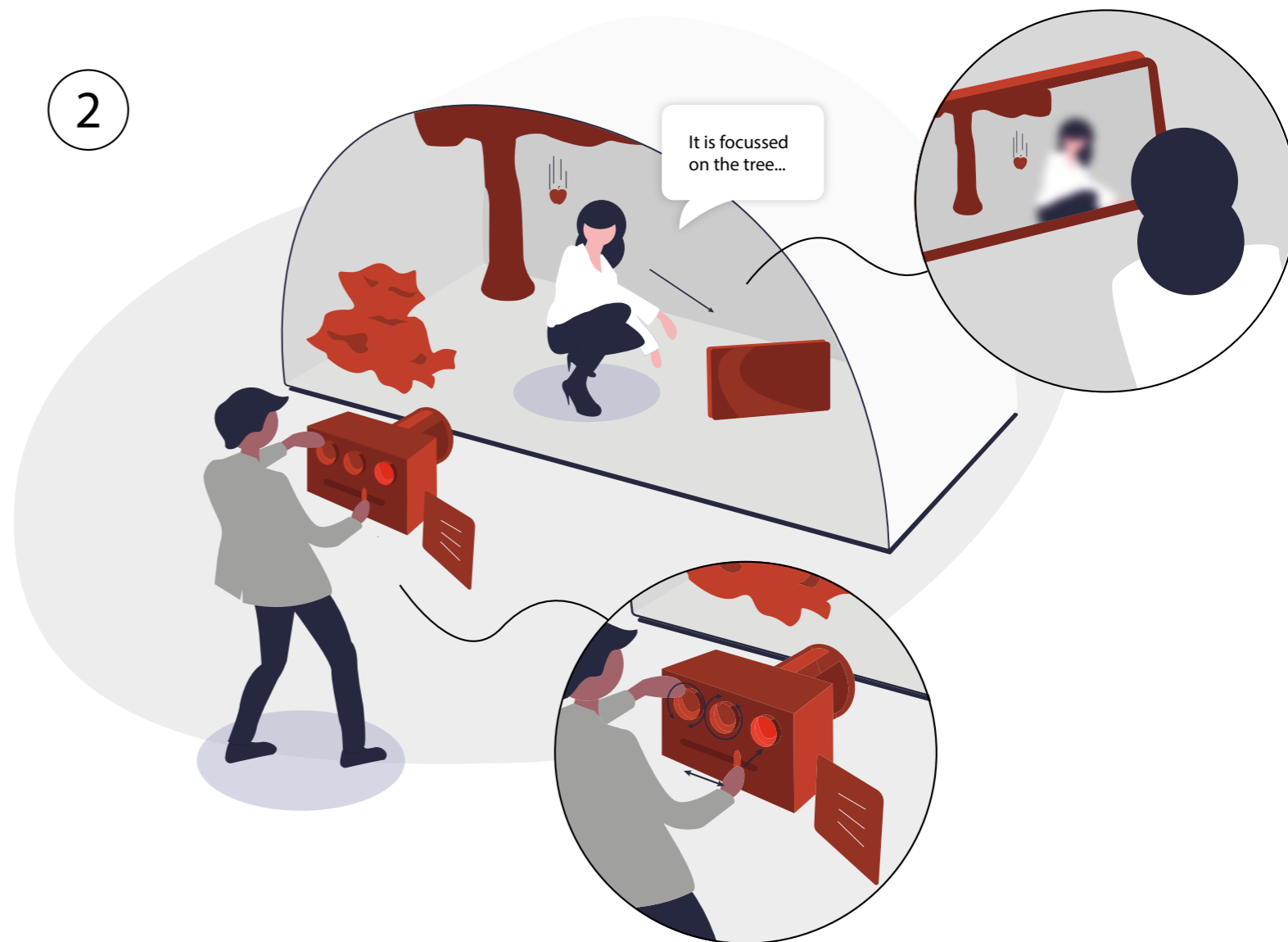


Fig. 26: Visual concept 2 - Shutter speed, aperture and ISO

Concept 3: Interaction between photographer and model

The last concept is about the interaction that takes place between a photographer and his/her model. Photographers often explain that having all the equipment set up and choosing the correct settings in the camera is only half of the work. The magic happens when the interaction or chemistry between the photographer and his/her subject is there (fig 27+28). A photograph that is technically correct can still be a very boring image. The skill needed in this occasion is having the model opening up, showing it's fragile and real emotion, combined with timing the shot.

Concept 3 let's the users experience this interaction. User 1 takes the role of the photographer and has access to a set of textual and visual tools that help to evoke a specific emotion. The challenge for user 1 is to use these tools to capture the emotions given in the assignment. User 2 is the model in this experience. Without knowing which emotions the "photographer" needs to capture, he concentrates on the visuals and texts and tries to open up to the emotions. Together the users experience how challenging it can be for a photographer and model to capture emotions and show these emotions in a photograph.



Fig. 27: Still from the Netflix documentary series: Abstract, the Art of Design Interaction between Platon and Robert DeNiro



Fig. 28: Still from the Netflix documentary series: Abstract, the Art of Design

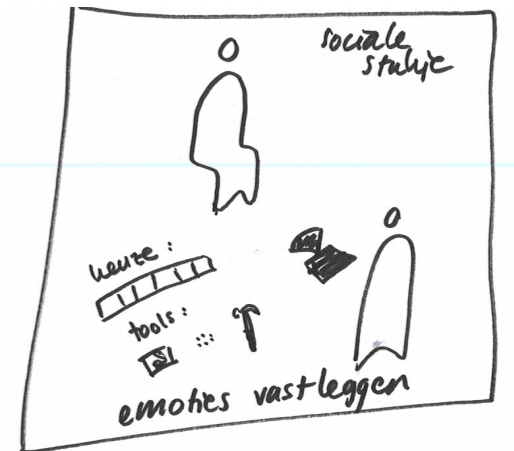


Fig. 29: Visual concept 3 - Interaction between photographer and model

4.3 Validating concepts

The 3 concepts are tested to validate whether they contribute to the main values, which were stated earlier. The tests are done with 16 test subjects in 8 pairs, followed up by a individually filled in questionnaire. The participants all know the other participant paired up with. For all three concepts the general positive and negative points are stated and can be found in appendix J.

Concept 1: Composition & Framing

The set-up of this test corresponds with the concept on most levels. The table is filled with figures and objects which give the possibility for a multitude of stories and “interactions”. User 1 has control over the camera, user 2 receives the taken photographs on the laptop. The assignment is to make a photograph with a happy/positive story and one with a sad/negative story.

Concept 2: Shutter speed, aperture and ISO

This concept makes use of the same table set up, but in this case the camera is locked to one location. The difference with the concept is that in stead of a photo booth, the setting is smaller and user 2 is not in the setting. This is done because of 2 reasons:

- 1) Using this setting makes the possibility for testing much quicker
- 2) The idea for user 2 to be standing in the photo booth comes from The WONDR Experience .This concept of the WONDR experience seems to be working, concluding that people like to be in a setting/photo booth, which makes testing that not the main priority.

User 1 has control over shutter speed, aperture, ISO and focussing. User 2 receives the photograph on the laptop, and together they have to make two photographs:

Photograph 1: As much figures as possible in focus and the fan blades blurred.

Photograph 2: The photographer figure in focus and the fan blades as if they are standing still.

This requires the correct usage of the variables.

Concept 3: Interaction between photographer and model

In this set up participant 1 is the photographer and has access to visual and textual tools for six different emotions: fear, anger, surprise, disgust, happiness and sadness. Without telling which emotion he/she is trying to evoke the user shows or gives these visuals or texts to participant 2, trying to see the chosen emotion and capturing it with the camera.

Further details about the validation of the concepts can be found in appendix J, the concept choice is discussed in the next chapter.



Fig. 30: Set-ups for validating concepts

4.4 Concept choice

The three concepts are evaluated based on the three main values :
 1) co-participatory sharing, 2) photographer's feeling and 3) altering view.
 In the questionnaire the participants were asked to answer questions about each concept followed by three questions evaluating them on the main values. For the entire questionnaire, see appendix K.
 The final concept is chosen following the results of the tests.

Questions testing the three main values in the follow up questionnaire

Question value 1: co-participatory sharing

In which concept did the interaction between you and the other participant add something to the overall experience?

Question value 2: photographers feeling

Which concept made you feel like being a photographer for a minute?

Question value 3: altering view

Which concept could change the way you look at photographs the best?

The results of the questionnaire show concept 2 does best in all the questions, with a slight margin in questions 1 and 3, and with a clear difference in question 2.

* Note:
 since the questions were not multiple choice but open for a more detailed answer, the results per question add up to a number higher than 16.

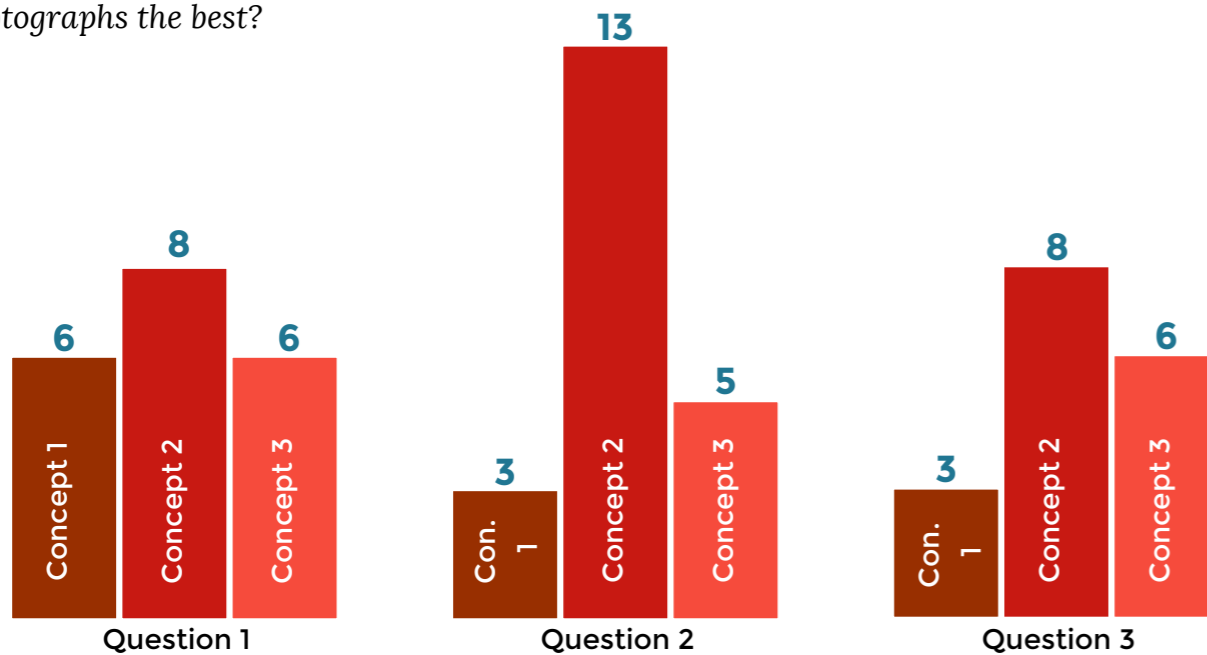


Fig. 31: Results question 1-3

Argumentation per concept

Concept 1

The first concept offers a nice set-up for storytelling. However the challenge in this concept is not really present. Looking at the feedback from participants in chapter 2.6, the personal connection to the setting is missing compared to the other two concepts. Giving the possibility to change the setting and play with the figures is brought forward by the participants of this test and would be interesting for children, but offering this possibility gives less feeling of being a photographer. A street photographer also does not interfere but observes the context.



Fig. 32: Concept 1

Concept 2

This set-up offers a nice personal touch by having one of the users in the photo booth. The tests showed that the interaction between the two users is of great beneficial value to the overall experience. The triggered co-operation opens up the sharing of knowledge which all participants really appreciate. This is a big value for the experience. However, the participants note that changing the settings lacks an overview of what is changed. Having a more visual feedback of what is changed can be positive for the speed and enjoyability of the experience.

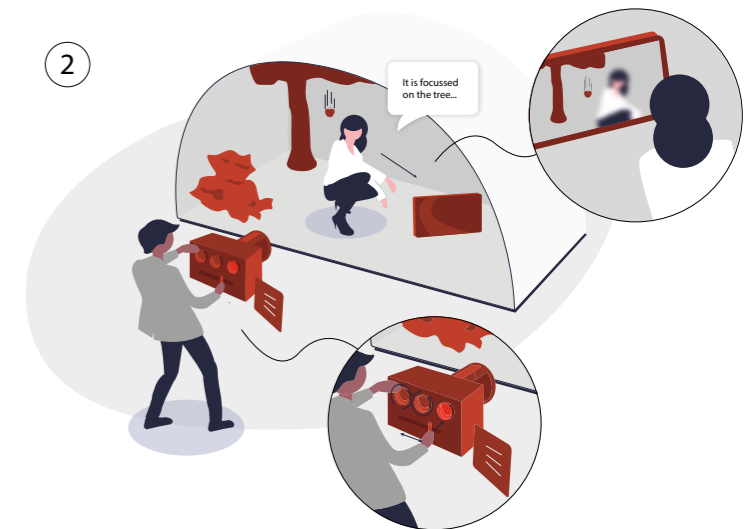


Fig. 33: Concept 2

Concept 3

The last concept lets one user experience what it is like to be a photographer, but user 2 feels a bit left out and gets a passive role. Also evoking certain emotions is a bit too personal or hard to do, for instance anger or fear. So although the concept shows the users how hard it can be to capture the right emotion, it is not the best way to give them a complete enough experience.



Fig 34: Concept 3

Based on the three main values the decision is made to follow through with **concept 2**:

Value 1: Co-participatory sharing

Not only does the concept evoke a nice interaction between the two users, but it also has the users share their knowledge. This is something of great value according to chapter 2.2

Value 2: Photographers feeling

The concept is rated best when looking at this main value. Furthermore, looking at the fact that the target group is users with no/little experience with photography, this concept has them experience a lot of new variables, where as composition or making a portrait has come around in the users life's by making a photograph with their smart-phone. Concept 2 offers more of a partially unknown working principle.

Value 3: Altering view

This value might be influenced the most by concept 2 looking at the fact that the variables used in concept are most unknown to the users, as stated in value 2. This also shows in the results of the questionnaire, however only with a small margin.

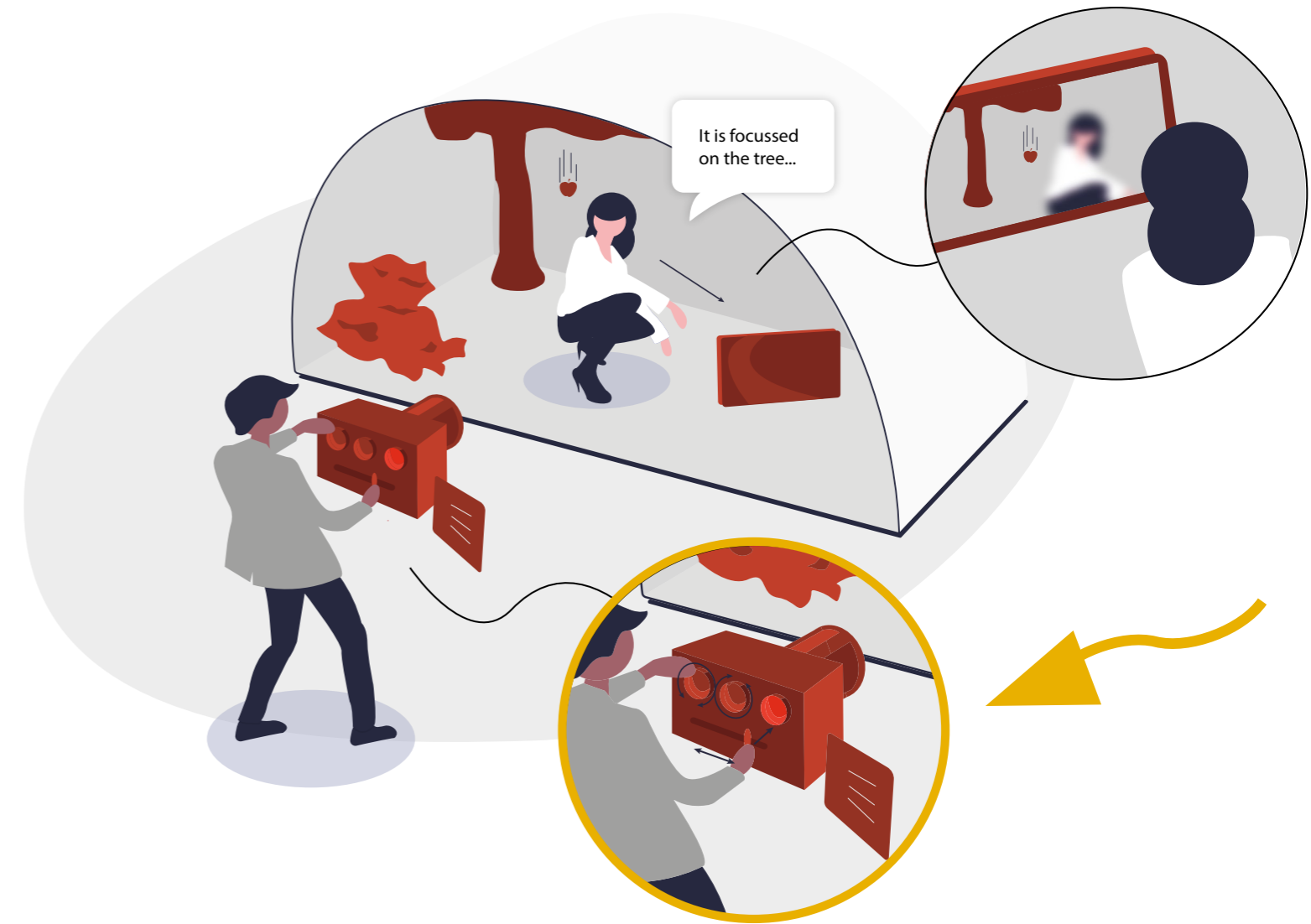


Fig. 35: Focus on camera part

In further developing this concept the focus will be on the camera side (fig x). Testing suggest a visual feedback on what the settings shutter speed, aperture and ISO will improve the overall understanding of these variables. The next chapter will show the process of designing this visual feedback. The decision to focus on one part of the design is made to show the ability to work out a product. Taking the limited time available for the whole project (100 days) in to account, it is not reasonable to work out the whole design.

4.5 See-through camera

Visualizing the three variables shutter speed, aperture and ISO is the focus in this last concept part of the project. This resulted in designing a see-through camera containing these three variables. These three “mechanisms” are placed in the location corresponding with their location in a real camera.

The variable focussing, which was present in the test setting for concept 2 in chapter 4.3, is made automatic, since this is not part of the classic triangle and only slowed down the speed of the experience.

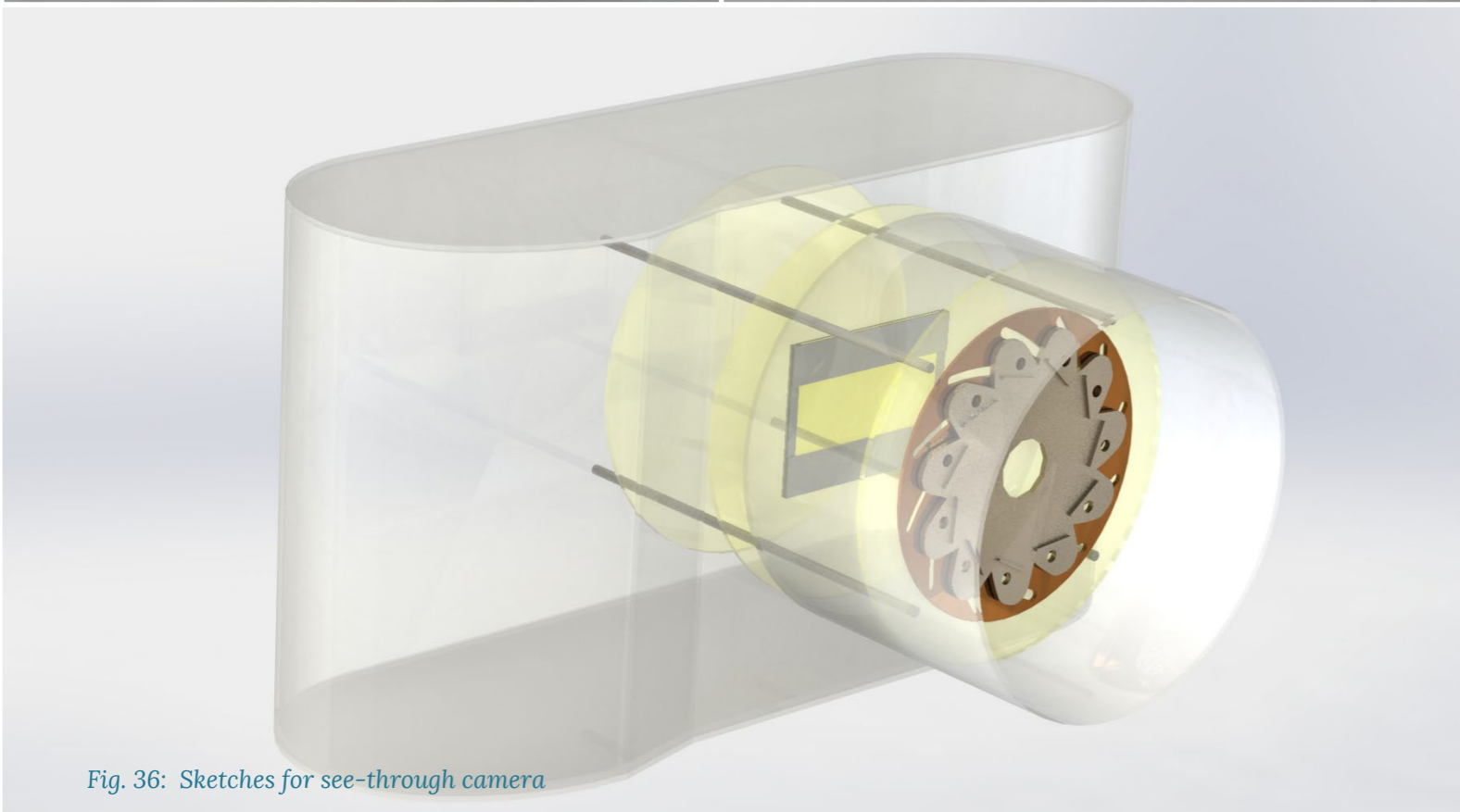
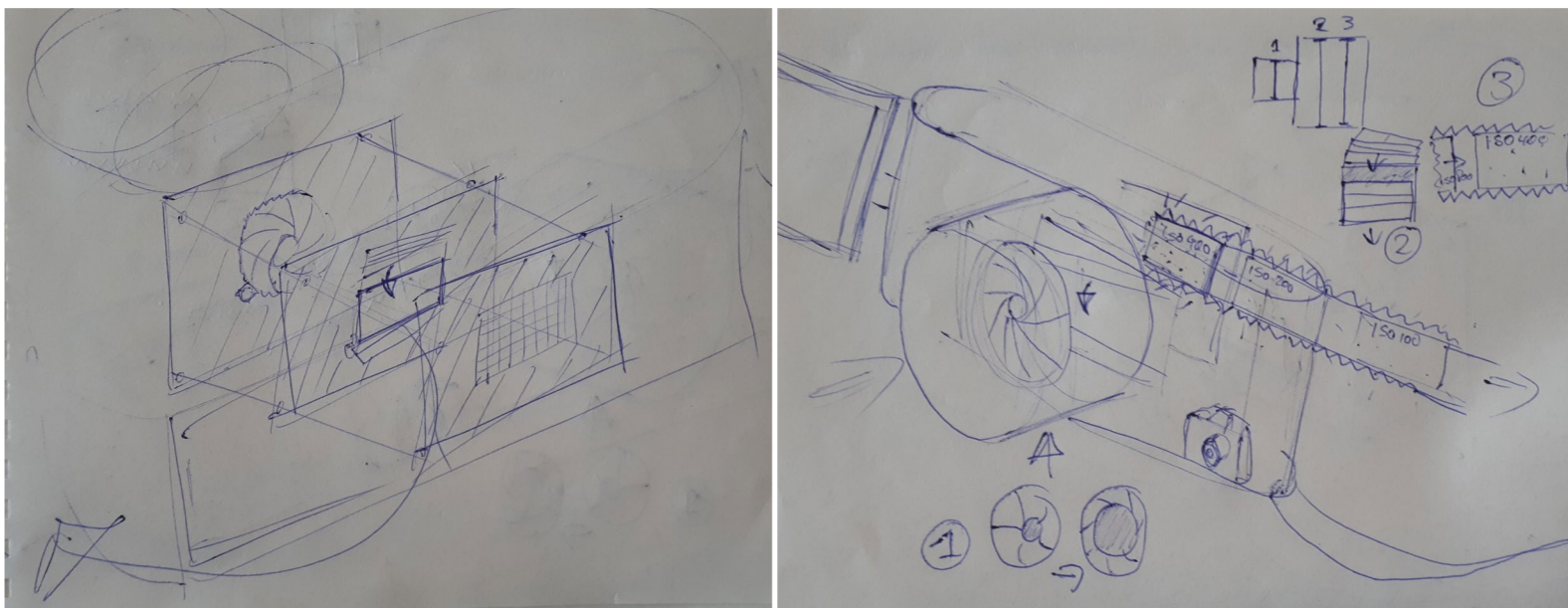


Fig. 36: Sketches for see-through camera

In order to incorporate these three mechanisms further research is done on how these mechanisms work. Patents are analysed, products are tried and adaptations of these mechanisms are found.

Aperture

The mechanism responsible for the aperture is called the diaphragm or iris mechanism. This mechanism consists of intersecting blades that slide from or to each-other when a moveable ring is turned. This mechanism is placed in the barrel of the lens and every lens has a different maximum opening width. The mechanism is opened and closed by a motor in the lens, corresponding with the f-stop setting in the camera.

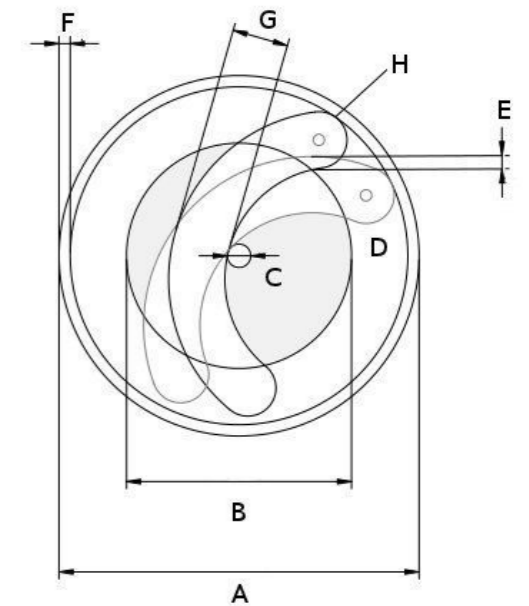


Fig. 37: Examples of diaphragm/iris mechanism

Shutter speed

The most commonly used shutter mechanism is the focal plane shutter, apart from a digital shutter in system cameras. This physical shutter is chosen to visualise the working principle of a shutter mechanism. This mechanism contains two curtains to control the time the sensor is exposed to light. Setting the shutter speed results in the curtains following each other quicker or slower, giving a longer or shorter exposure to light.

As seen in figure 39,

- both curtains are in their top position,
- curtain 1 goes down,
- exposing the sensor to the light/image,
- curtain 2 goes down,
- shielding the sensor from light,
- both curtains reset to their top position.

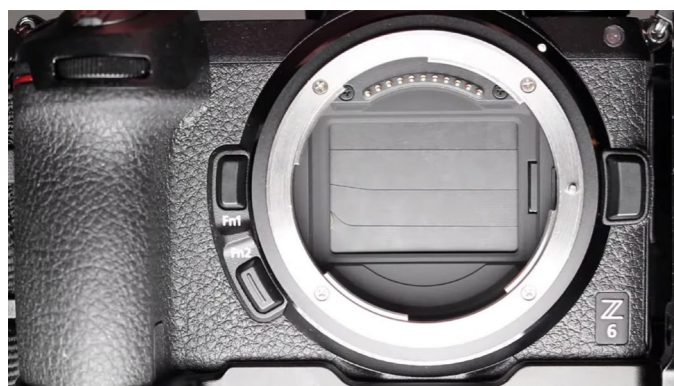
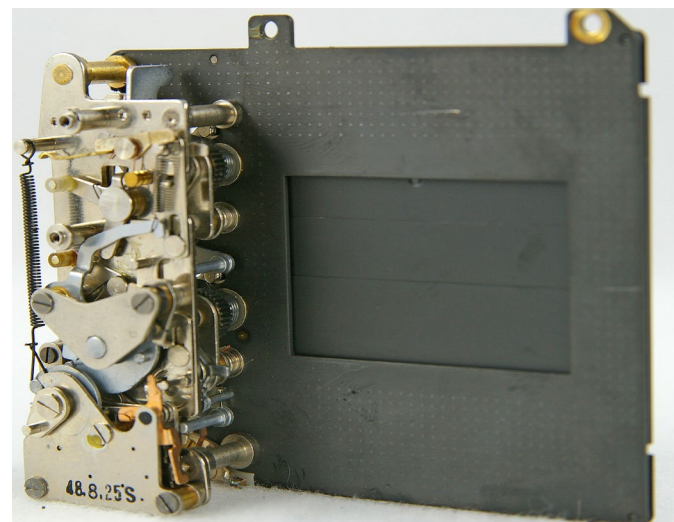


Fig. 38: Focal shutter plane mechanism

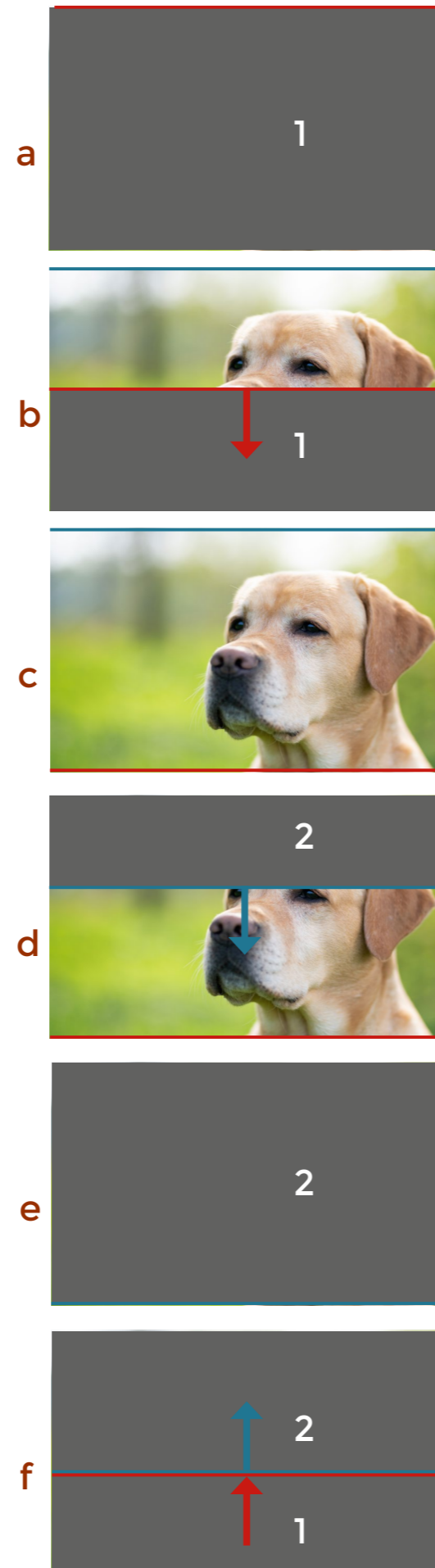


Fig. 39: Steps focal shutter plane

U.S. Patent Nov. 14, 1995 Sheet 2 of 5 5,467,160

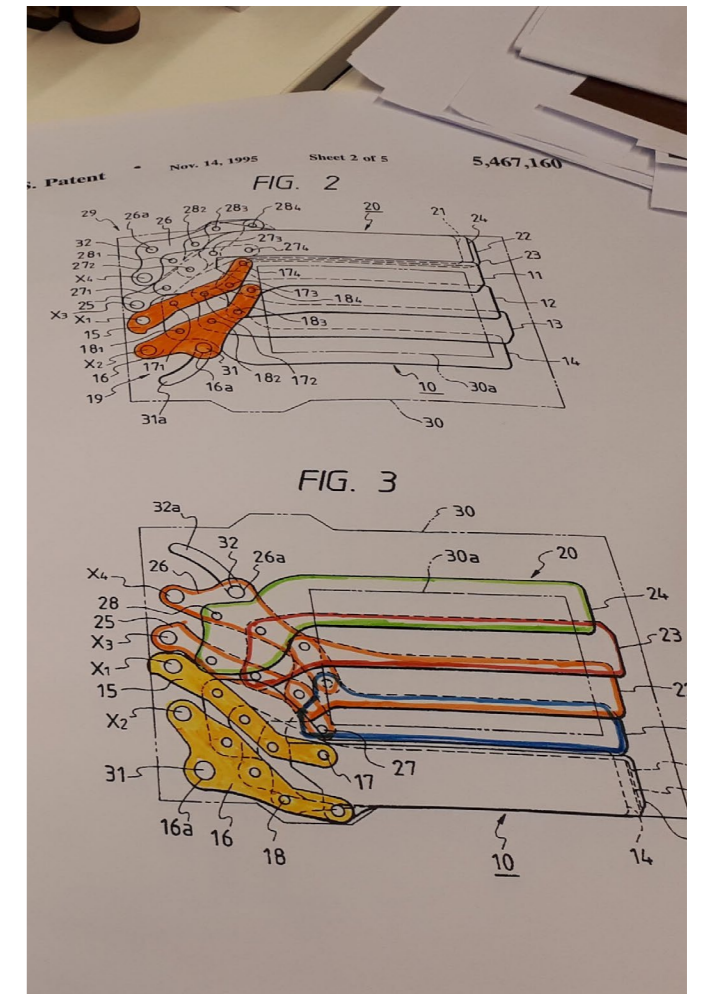
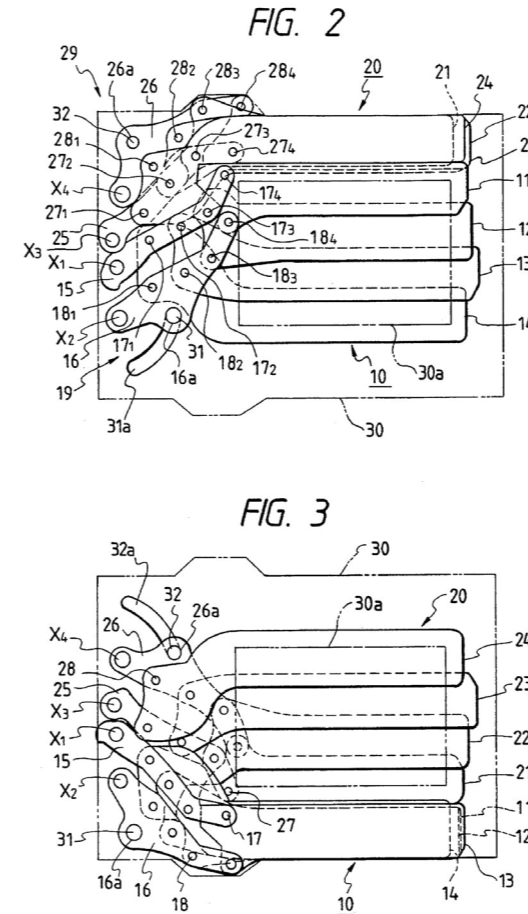


Fig. 40: Analysing patent focal shutter plane mechanism

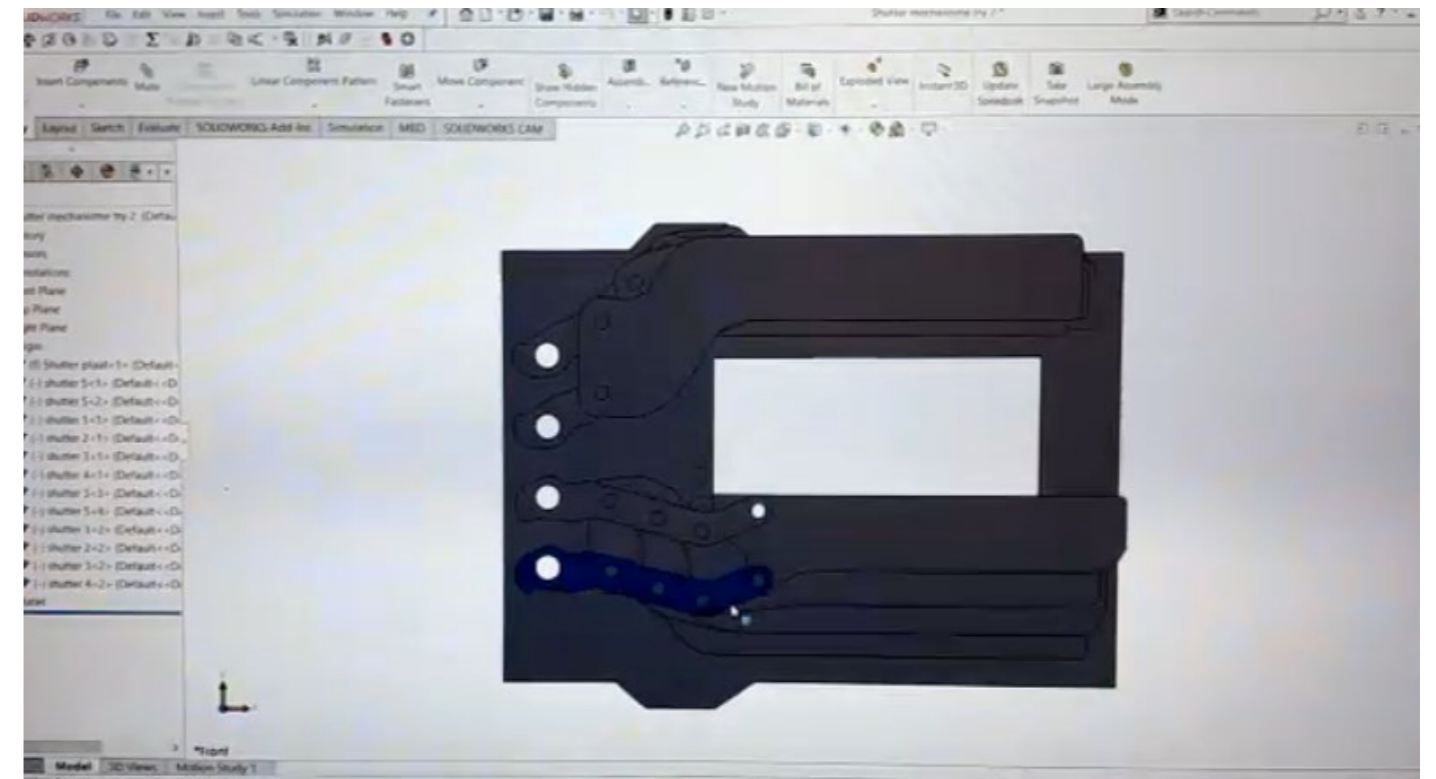


Fig. 41: Creating CAD-file of focal shutter plane mechanism

ISO

In traditional analog photography, ISO means the sensitivity of the material/film put in to the camera (fig. 42). ISO stands for the company standardizing the material: International Standardization Organisation. With a lower ISO-number, the grains are finer in the shots taken.

In digital photography the term ISO has stuck and is still used for the sensitivity of the light sensitive sensor. However, in digital photography the light is converted into a current and digital signal. When raising the ISO, this signal is amplified, making your image brighter. In short, the light rays coming in to the camera are visually amplified. This also means that the little faults that occur when each individual pixel sensor measures the light are also amplified, resulting in noise in your picture (fig 43).



Fig. 42: Examples of film with different ISO

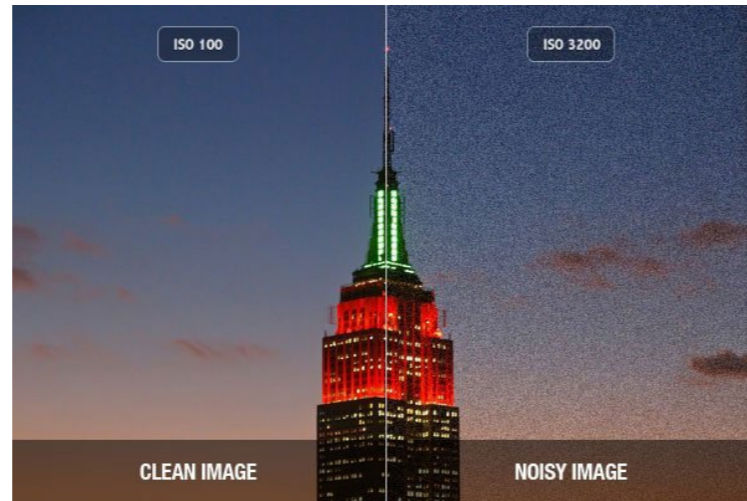


Fig. 43: Example of noise in photographs



Fig. 44: Visualization of ISO

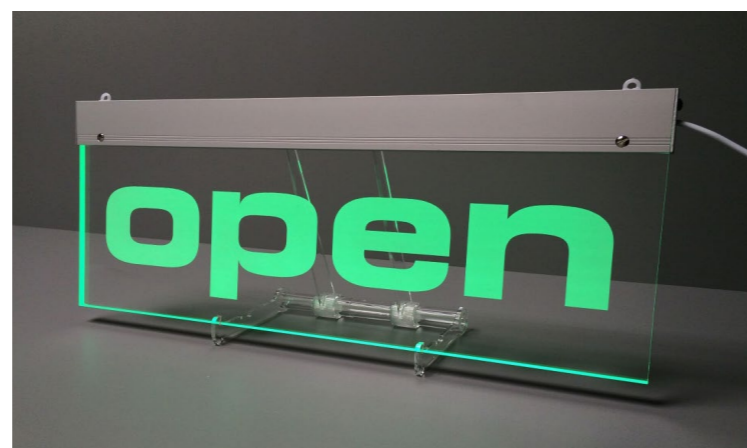


Fig. 45: Example of engraved plexiglas with LED's

Proposed visualization of mechanisms

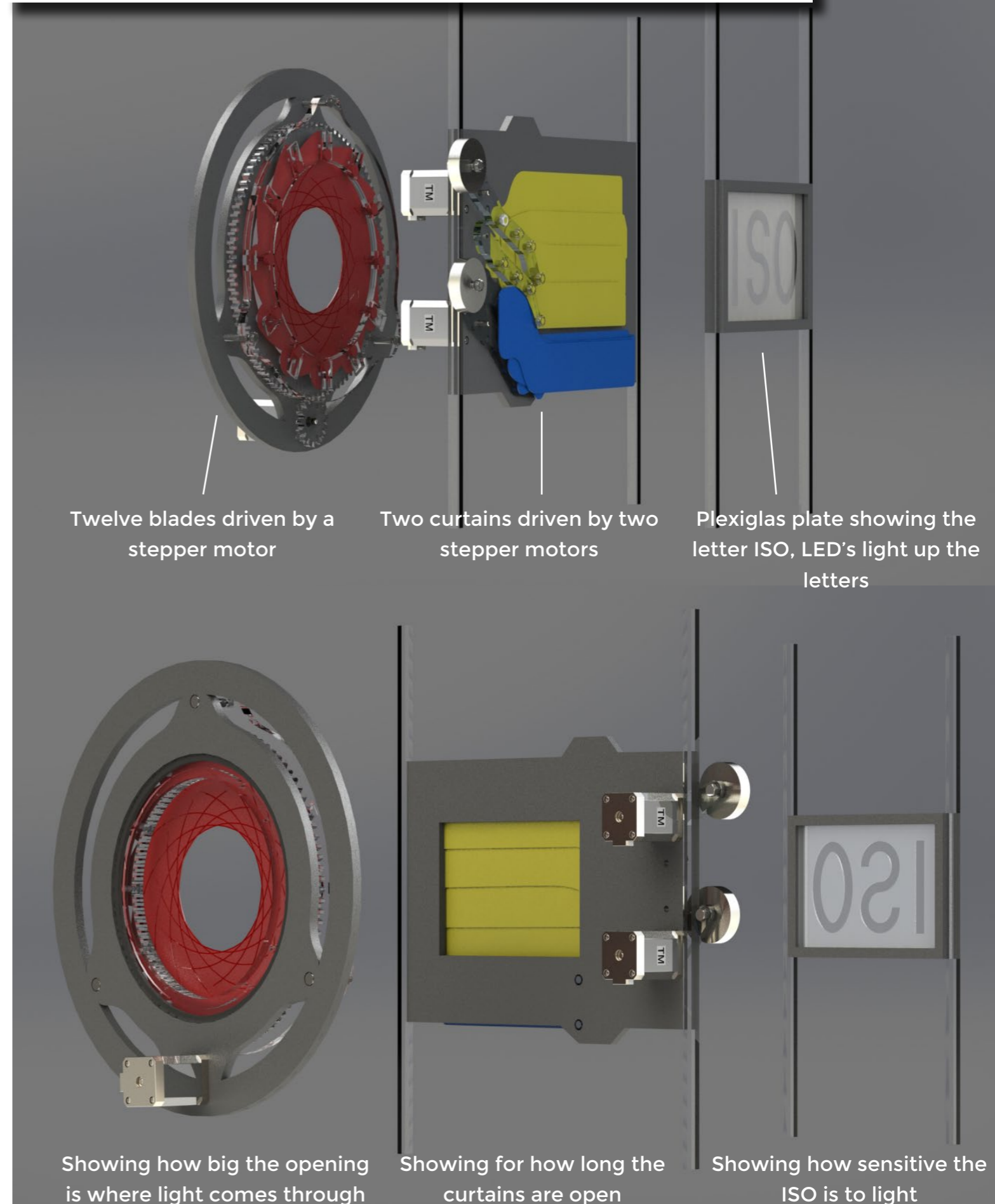


Fig. 46: Mechanisms for aperture, shutter speed and ISO

A proof of concept is made to incorporate the three proposed visualizations into a big camera-shaped installation. In the experience, user 1 has control over the settings shutter speed, aperture and ISO. When changing these settings, not only will the settings change in the real camera, but also in the see through camera.

Three main reasons for a proof of concept

1) To validate if the visualization of shutter speed, aperture and ISO help the visitors of the NFM understand these variables. This would be done by using the set up from concept 2 in chapter 4.3 combined with the prototype (fig. 48). The visitors change the settings by turning three knobs on a control panel, instead of on the camera. Directly they see the changes visually and after making a photograph see the changes made in the image. **Unfortunately the museum is closed due to the coronavirus**, so testing with the visitors of the NFM is no longer possible. With the faculty of Industrial Design closed and the 1,5m restrictions testing would be too risk full and inappropriate.

2) The second reason to make this proof of concept was to have multiple iterations on how the product can be made. In prototyping the model a lot of faults in the design can be taken away or improved, **making the whole design stronger and better founded**. More details about the prototype can be found in appendix K, improvements in the design are found in chapter 5.3

3) The last reason to build the model is to **learn about production techniques**. When building a prototype, the interaction with building experts and staff from the model making lab always offers lots of knowledge and information on production techniques.

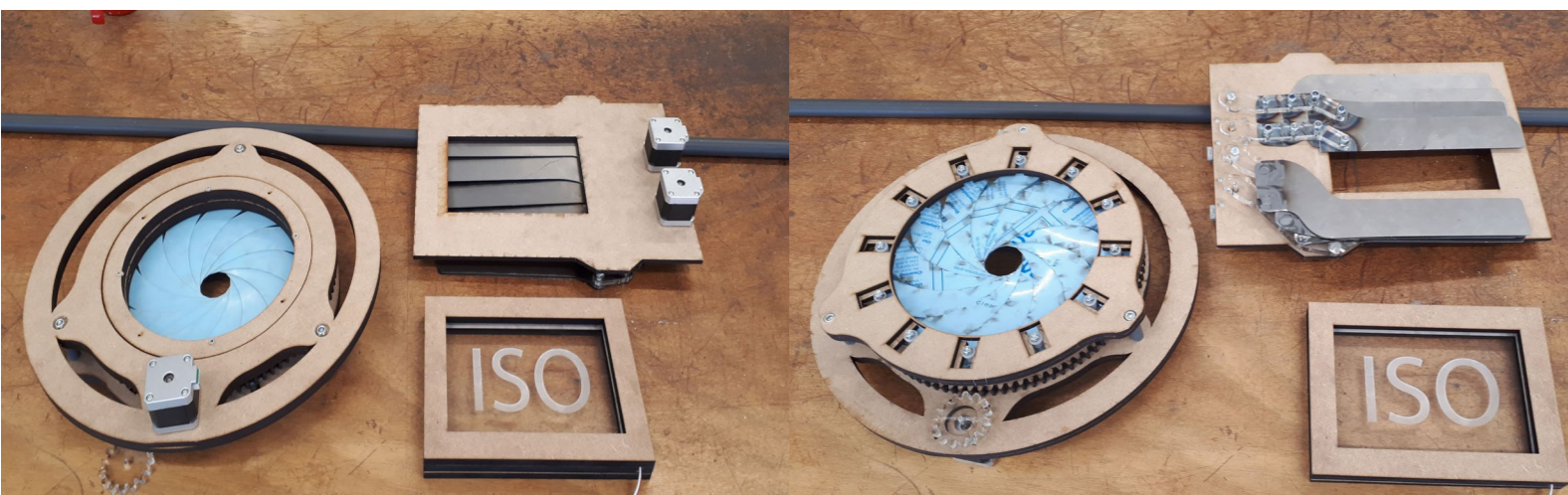


Fig. 47: Prototypes showing shutter speed, aperture and ISO

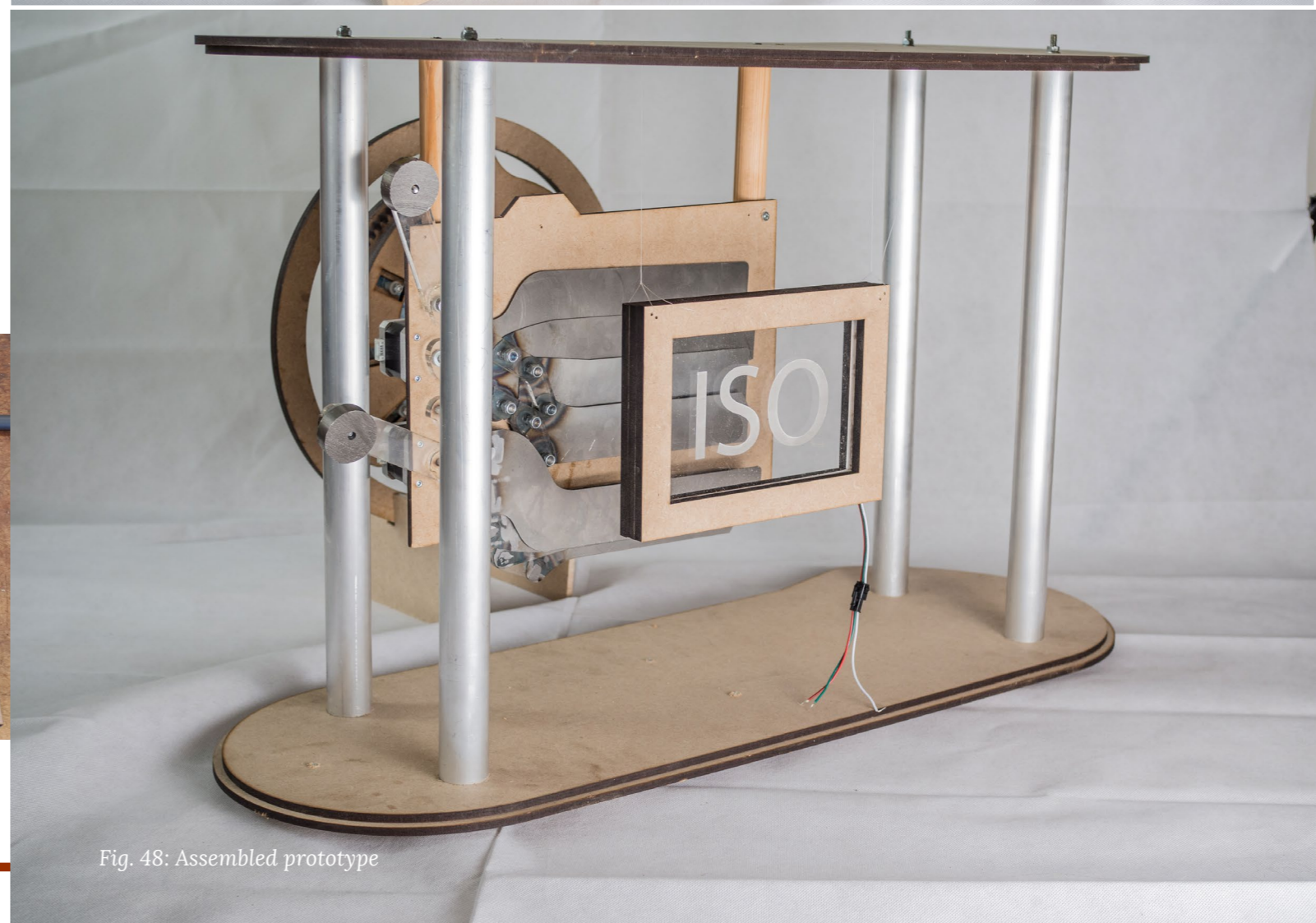
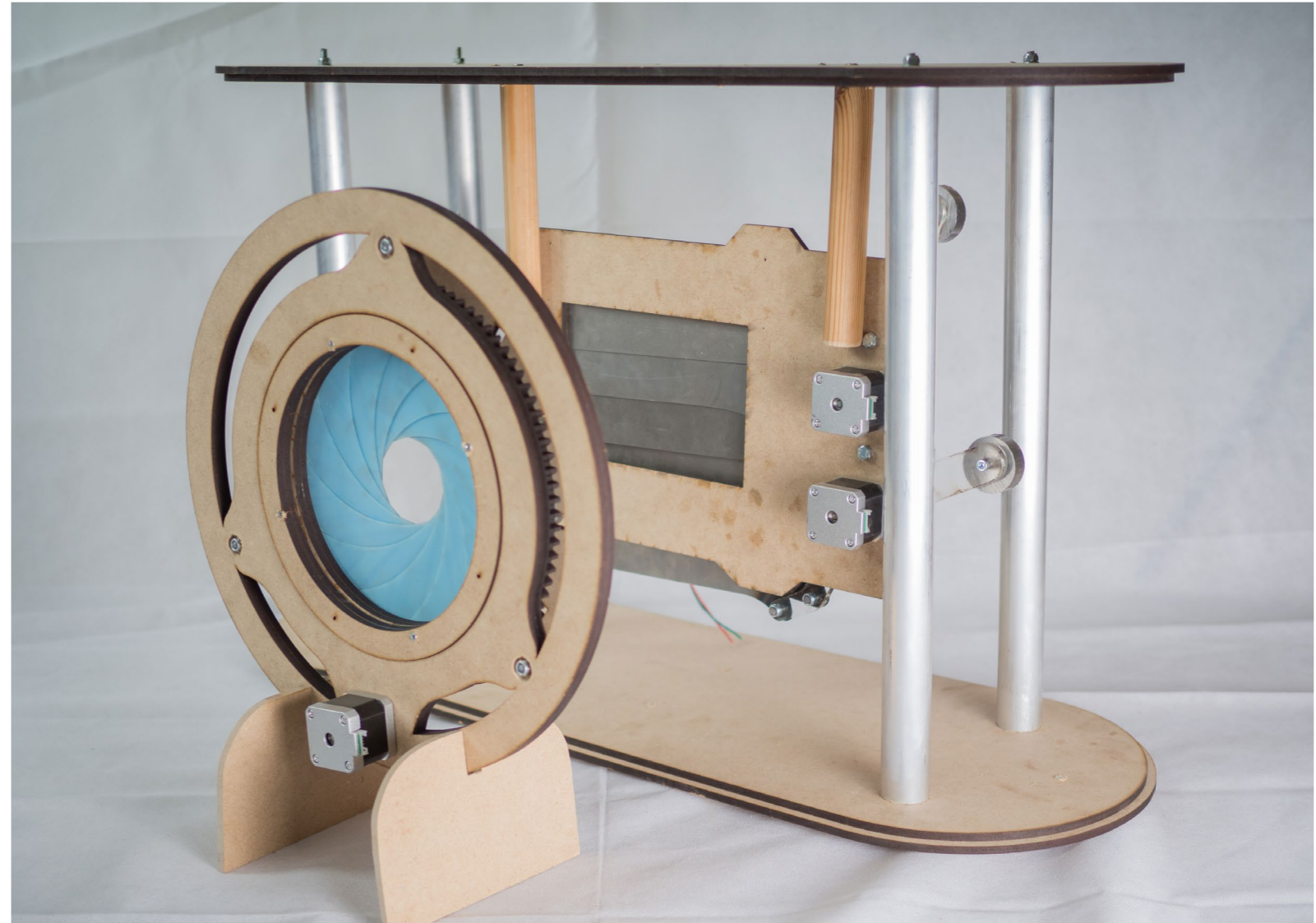


Fig. 48: Assembled prototype

ISO iteration

With the closure of the NFM, testing the model's ability to help the visitors understand the three variables is hard. An extra iteration is done on the ISO mechanism because the ability to transfer the working principle looks less promising.

The current design works as follows: When increasing the ISO on the control panel, the LED in the ISO mechanism shines brighter, making the letters "ISO" light up more, indicating the photograph will be brighter.

This proposal is compared to two other proposals (fig. 50) in a digital test conducted with 13 participants.

Proposal 1: The letters ISO are lit up and shine brighter when the ISO is raised. The brighter the letters are, the more noise is heard from a speaker.

Proposal 2: With the lowest ISO, only the first bar is lit up. When raising the ISO, more bars start to shine and show a higher but more noisy bar.

Proposal 3: At the lowest ISO only the first bar is lit up. Raising the ISO makes more bars light up.

In the questionnaire ISO is explained to the participants, followed by showing the three proposals and the question:

Which solution visualizes the working principle of ISO the best for you?

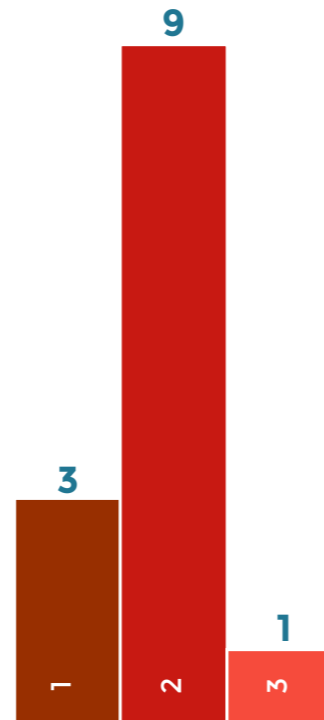


Fig. 49: Results questionnaire

Results

- Participants wonder if the difference in brightness in proposal one can be seen.
- Proposal one was chosen by three participants mainly because of the noise heard when increasing ISO.
- Proposal three shows too much resemblance with a WiFi or sound signal.
- Proposal 2 shows the noise best.
- Clear increase in amount of light in the bars from proposal three.

Decision

A test with the prototype shows the difference in light intensity can actually be seen, like in proposal 1. This increasing intensity is combined with the shape of proposal 2.

Example:

At ISO 400, bar 3 lights up with 11% of the brightness and showing mild noise. Changing the ISO to 25600, bar 9 lights up at 100% of the brightness and showing big amounts of noise.

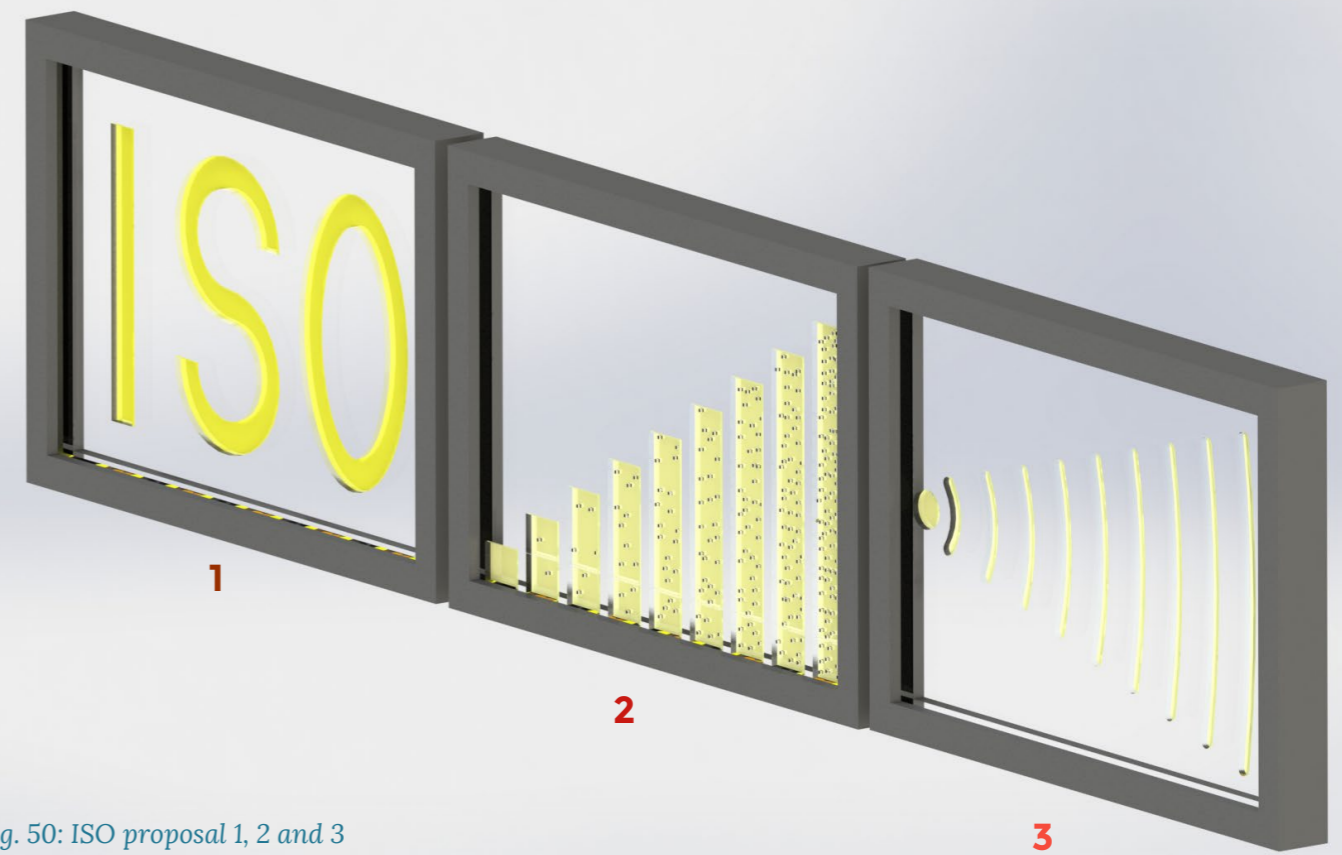


Fig. 50: ISO proposal 1, 2 and 3

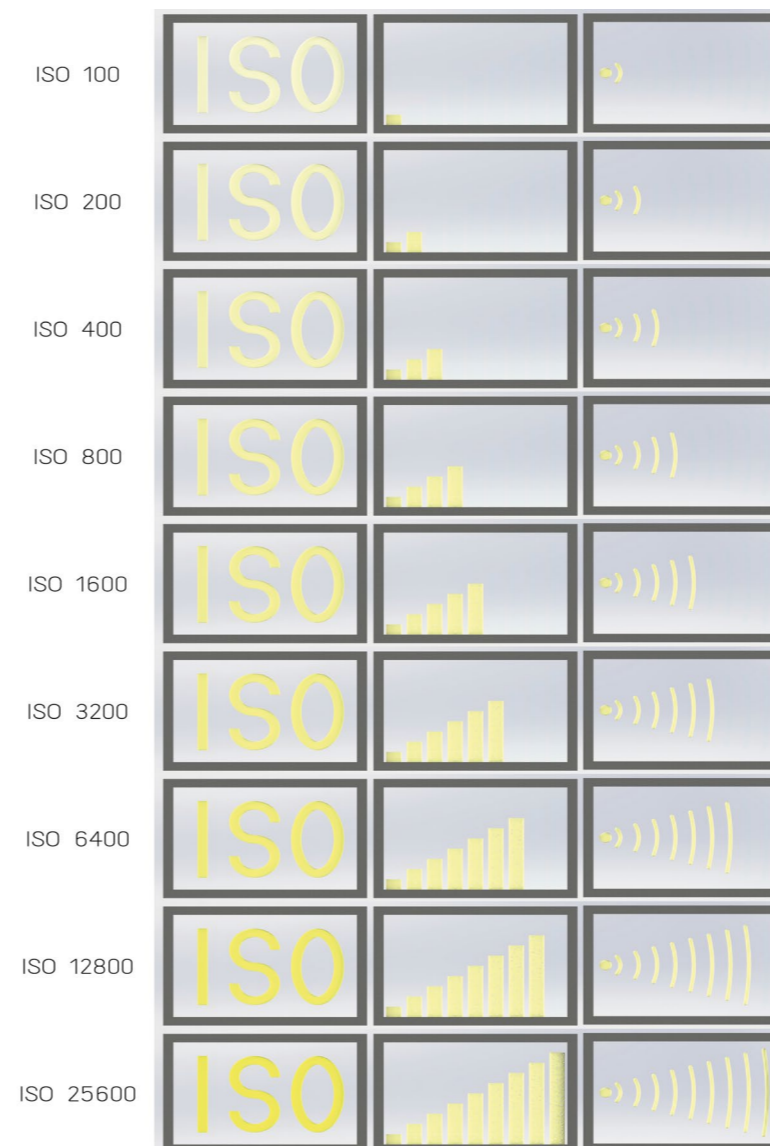


Fig. 51: ISO proposals at different ISO settings

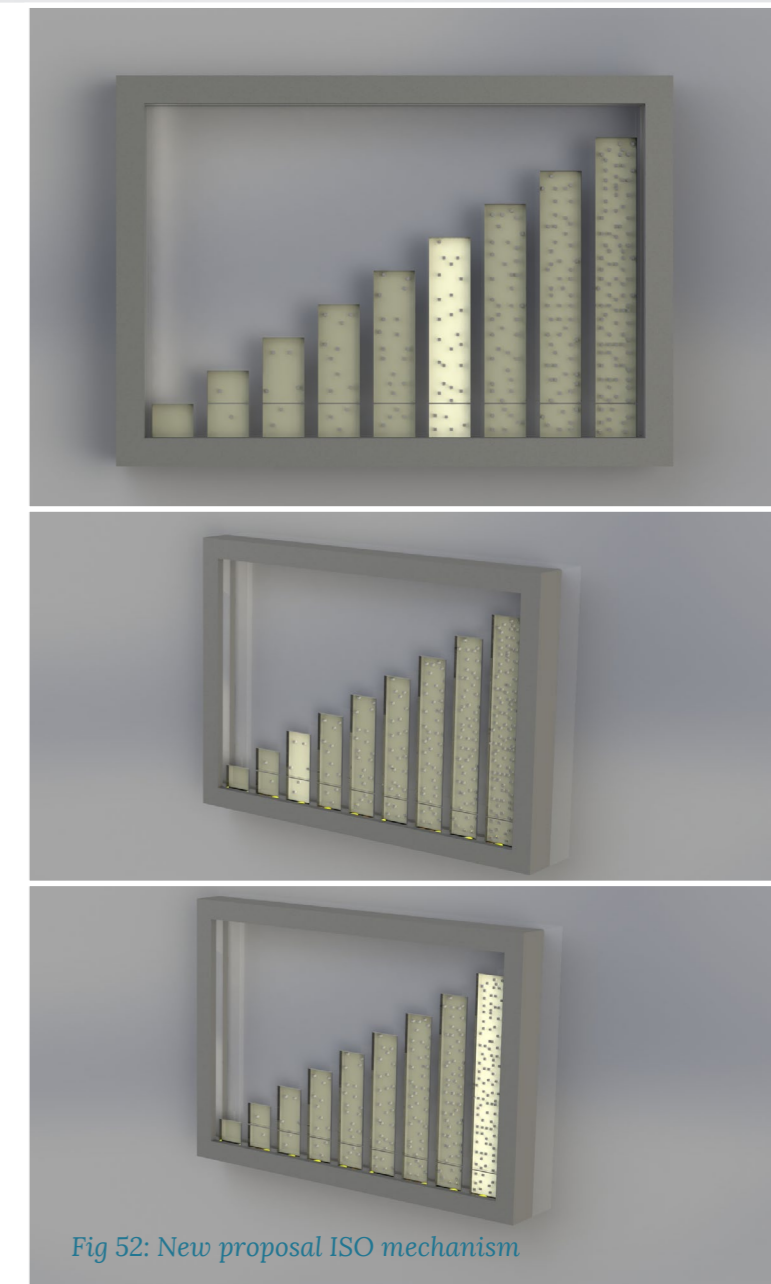


Fig 52: New proposal ISO mechanism

The see through camera needs to resemble a shape and form all visitors recognise as a camera. This is why an analysis of the form language and shape of the archetype camera is made. The shape of the archetype camera is brought back in the body of the see through camera, the form language is brought back in the control panel, containing the knobs to change the three main variables.

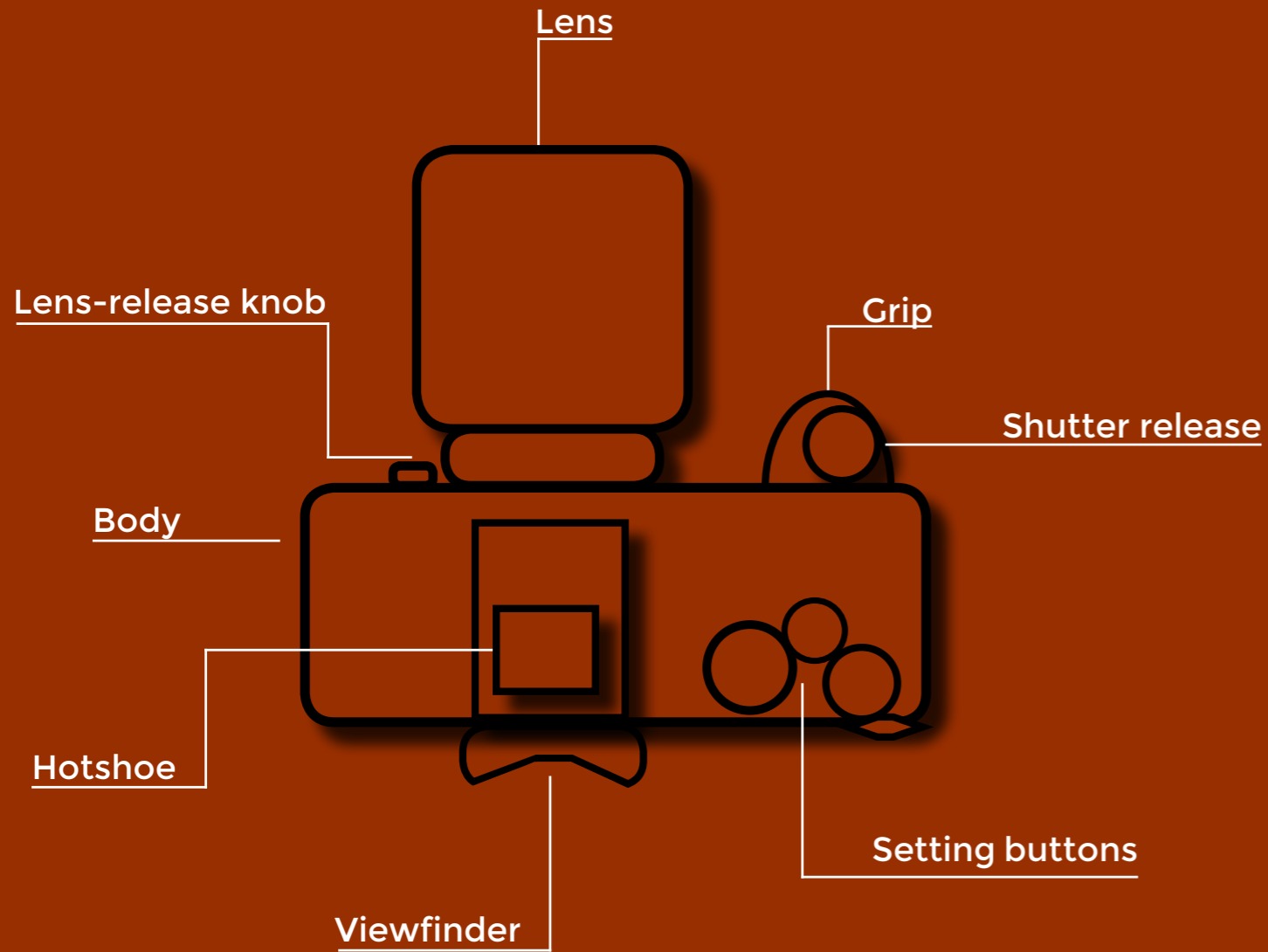


Fig. 53: Analysis of archetype camera



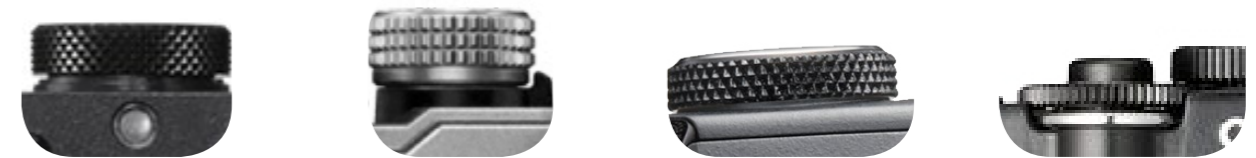
Fig. 54: DSLR and system cameras by different brands



Texture/pattern in camera body for grip and luxurious feel



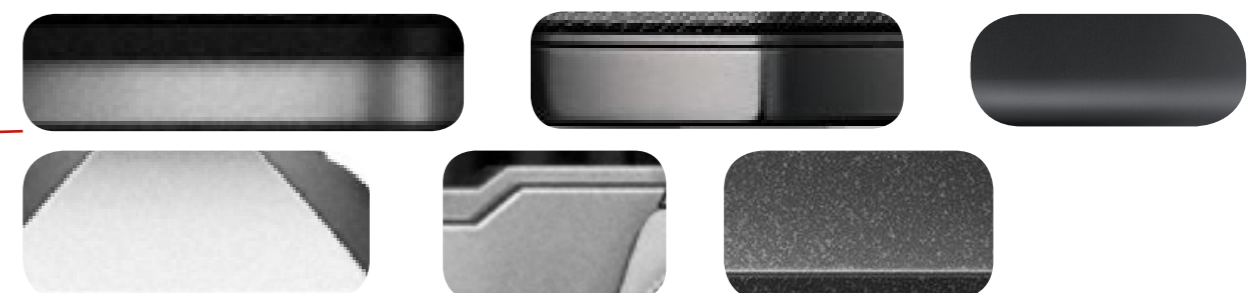
Clear white letters, informative texts e.g. brand, type and technical parameters



Texture/edges on buttons for grip with metal feel. Functional and robust



Red details and accents



Smooth plastic/metal surfaces, edges slightly rounded off



Round shapes in buttons and sensors, smooth surfaces for simplicity

Fig. 55: Analysis of form language cameras

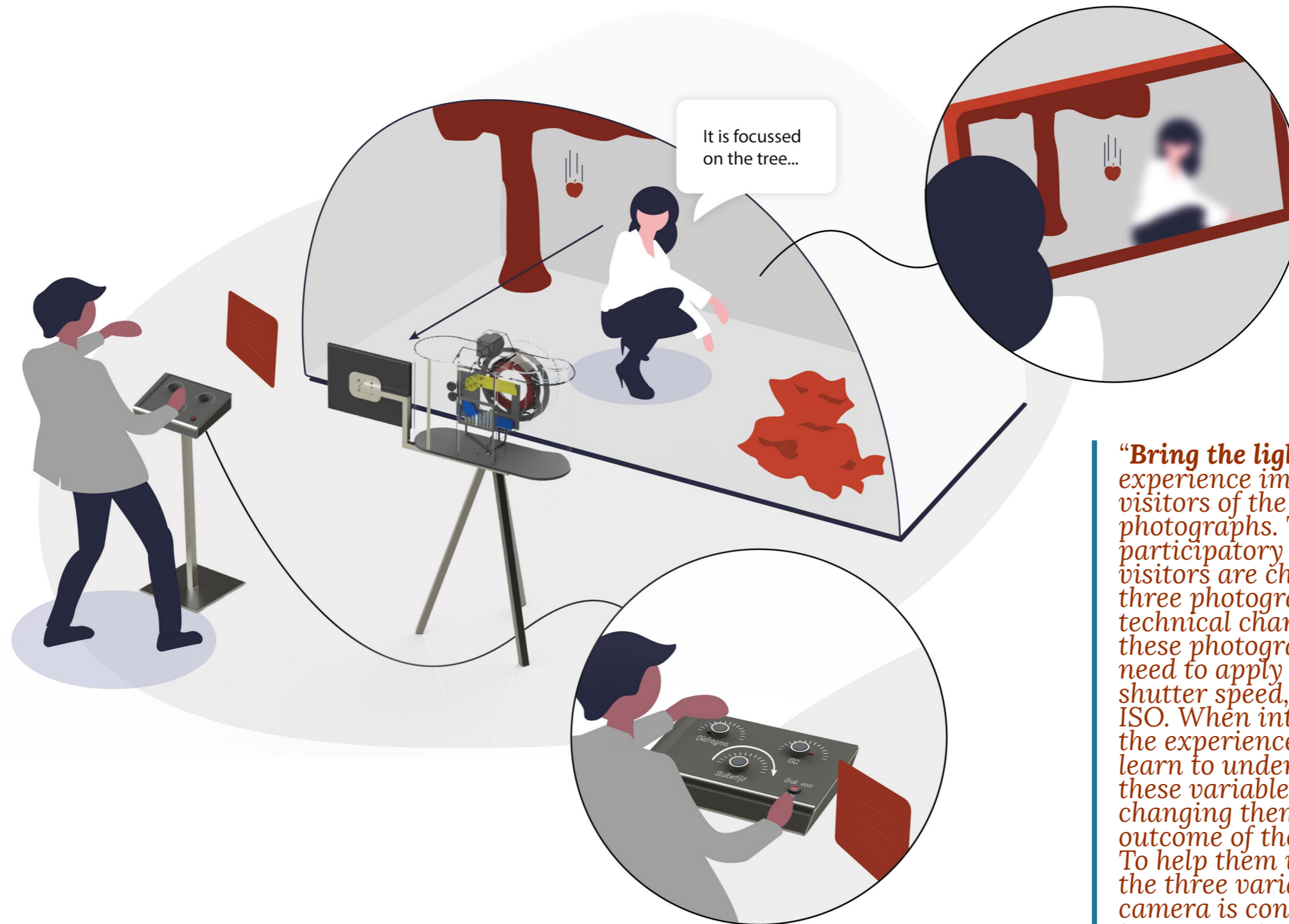
Stage 5

Deliver

*In this next stage a design proposal is made, based on the results from the develop stage. The proposal is called “**Bring the light!**”, and exists of two main parts:
The interaction and Demophoto.*



5.1 Bring the light!



“Bring the light!” is an experience improving the way visitors of the NFM look at photographs. Through a co-participatory assignment two visitors are challenged to make three photographs with specific technical characteristics. In these photographs the visitors need to apply the correct shutter speed, aperture and ISO. When interacting with the experience, the visitors learn to understand what these variables mean and how changing them changes the outcome of the photograph. To help them understand the three variables the camera is connected to a big transparent camera, called **Demophoto**, showcasing the three mechanisms that are responsible for shutter speed, aperture and ISO.

Fig. 56: Design proposal “Bring the light!”

Components

Moving object showing changes made in shutter speed. Short shutter speed “freezes” the object, a longer shutter speed shows a moving object.

Photo screen to see the result of changes made in the camera.

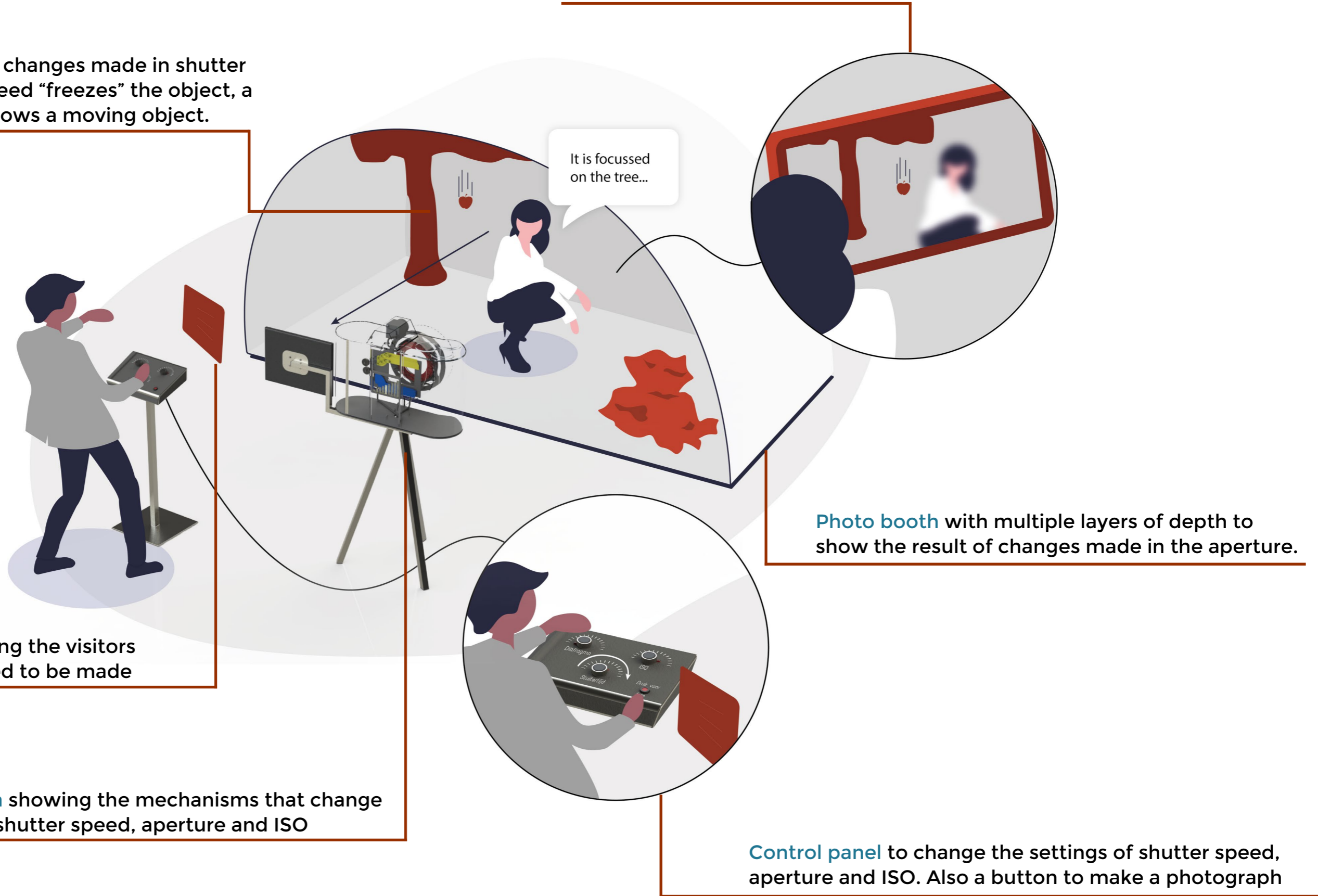
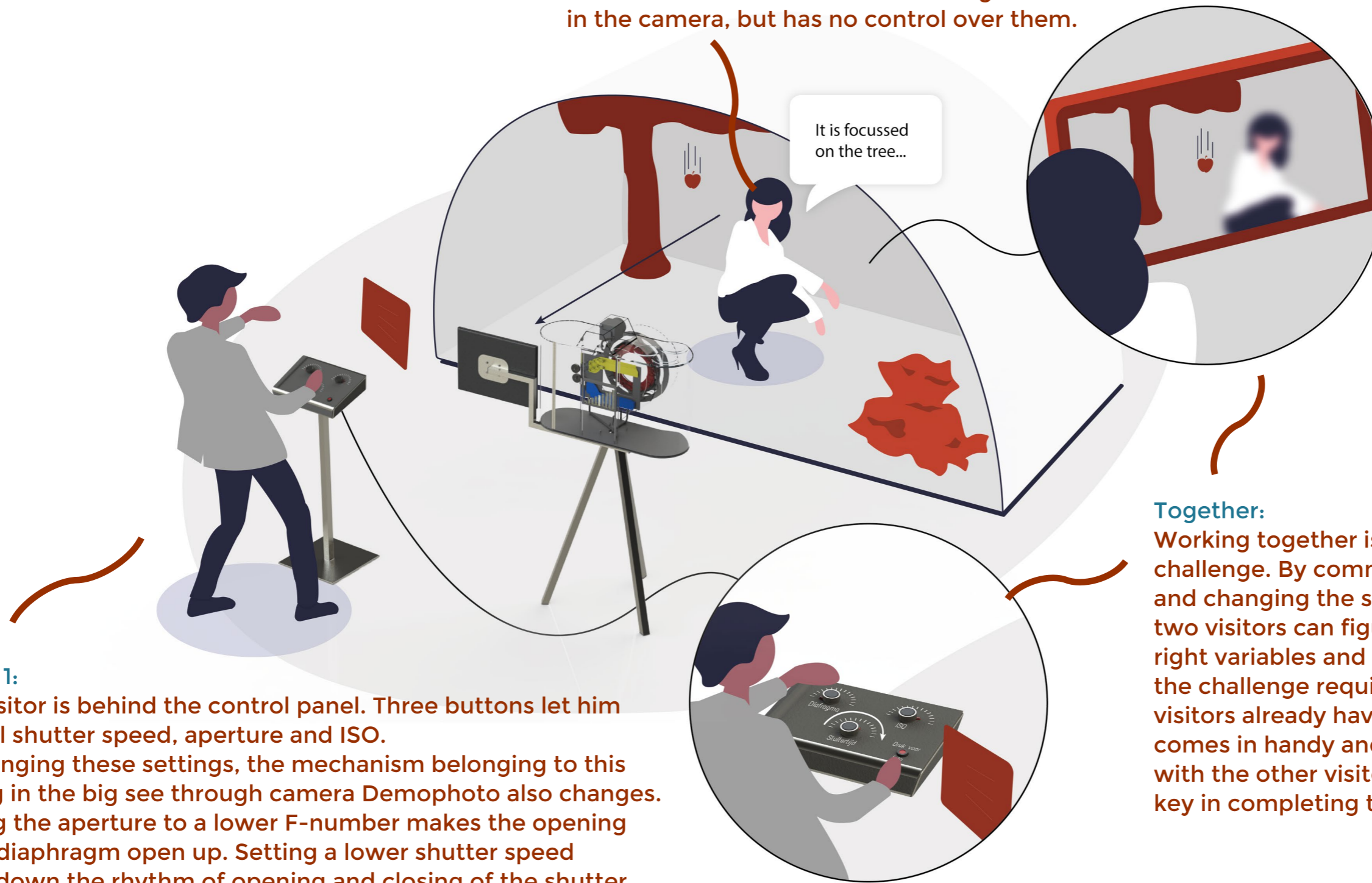


Fig. 57: Components in “Bring the light!”

5.2 The interaction

Visitor 2:

Visitor 2 is standing inside the photo booth. She will be in the photograph and is the only one who can see what changing the camera results in. She can also see the changes made in the camera, but has no control over them.



Visitor 1:

This visitor is behind the control panel. Three buttons let him control shutter speed, aperture and ISO. By changing these settings, the mechanism belonging to this setting in the big see through camera Demophoto also changes. Setting the aperture to a lower F-number makes the opening in the diaphragm open up. Setting a lower shutter speed slows down the rhythm of opening and closing of the shutter mechanism, and raising the ISO results in a bigger bar lighting up brighter in the sensor plate.

Together:

Working together is key in completing the challenge. By communicating what they see and changing the settings accordingly the two visitors can figure out how to set the right variables and make the photograph the challenge requires. Any knowledge the visitors already have about photography comes in handy and is automatically shared with the other visitor, since communication is key in completing the challenge.

Fig. 58: Interaction in "Bring the light!"

5.3 Demophoto

Demophoto is a big transparent camera showcasing the three mechanisms behind shutter speed, aperture and ISO. It is controlled by a panel next to it and has a build in camera and screen attached. This next chapter shows the components of the design in more detail.

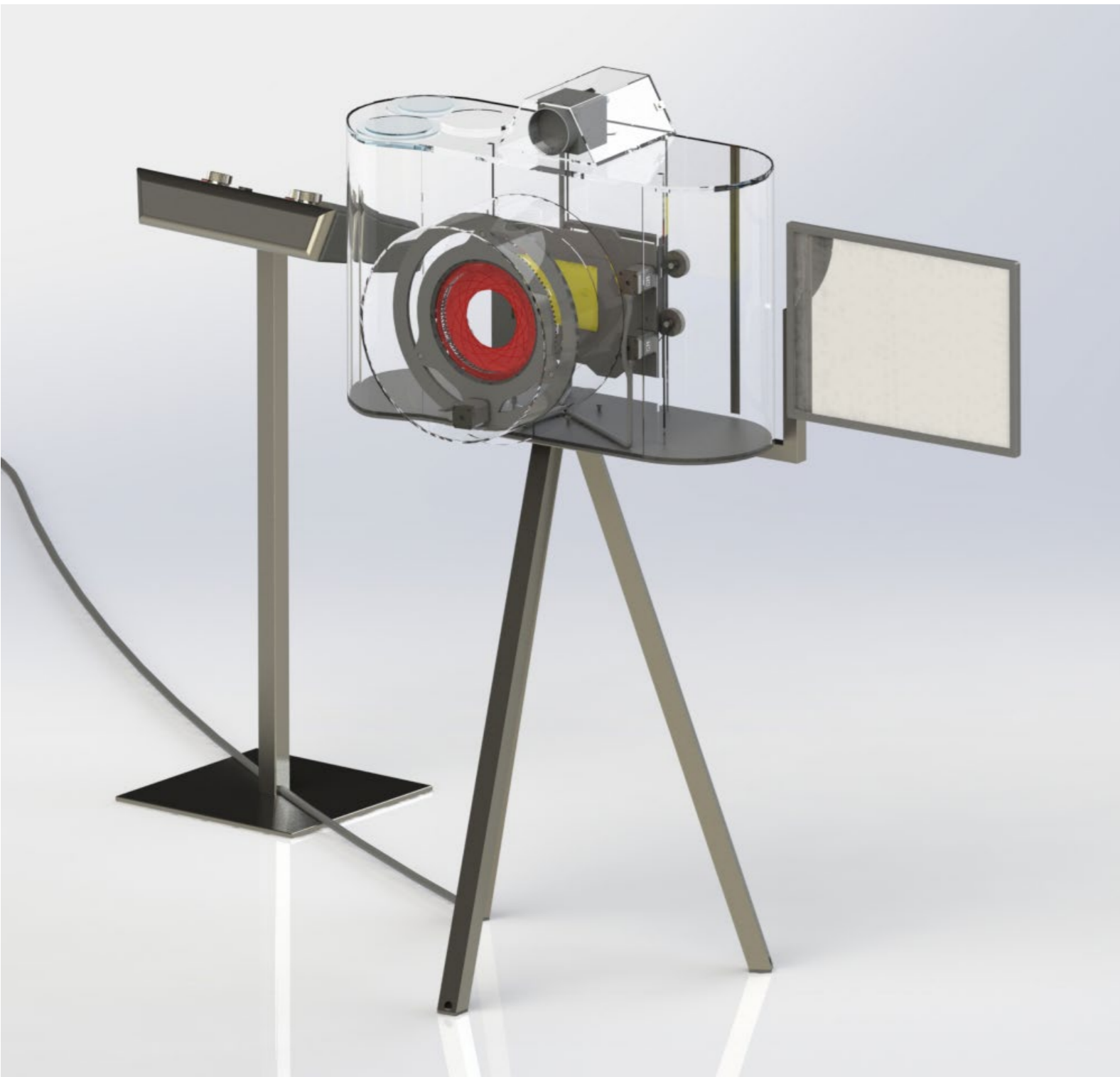


Fig. 59: Demophoto

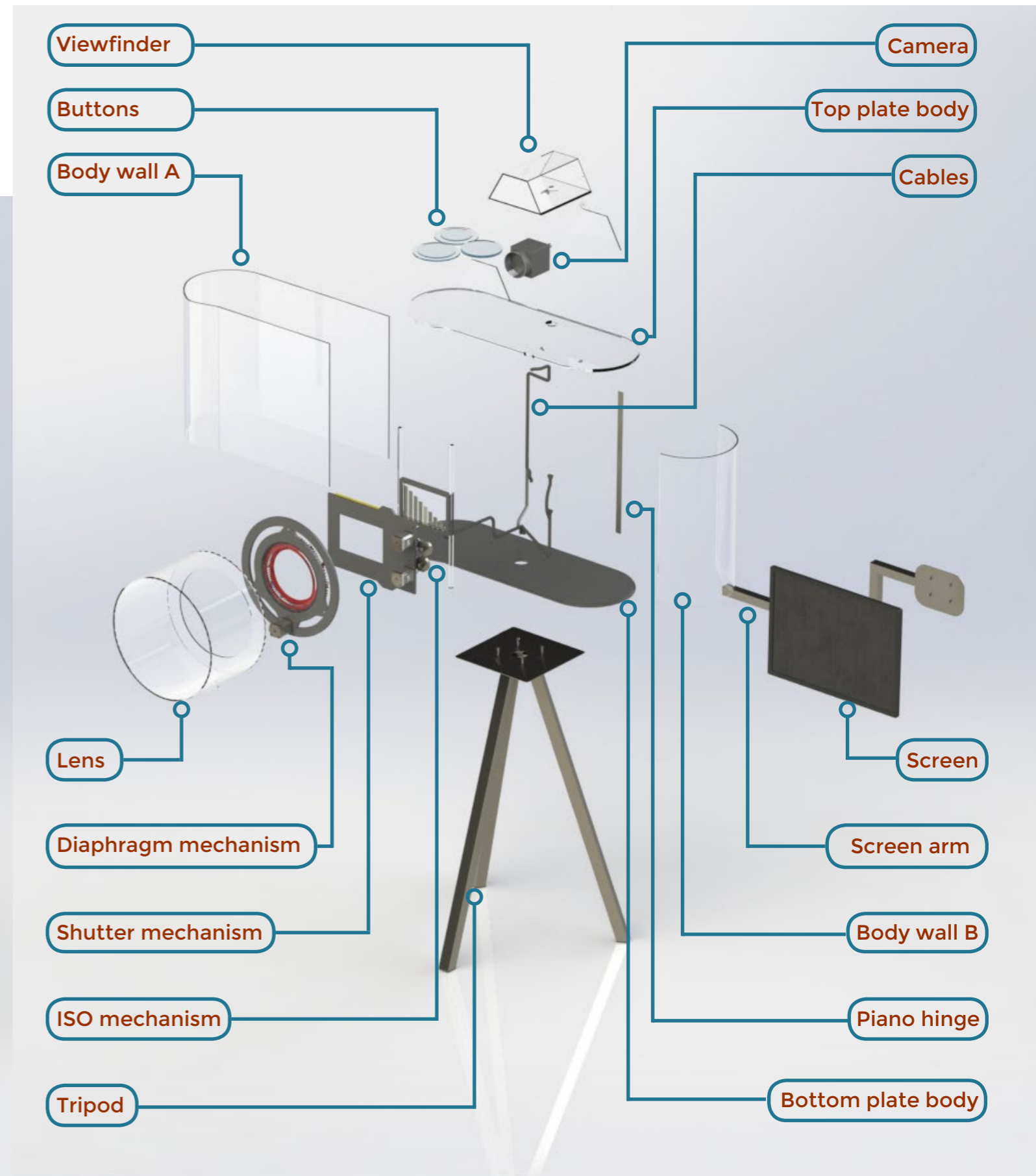


Fig. 60: Components in Demophoto

Body

The body of Demophoto is made mainly out of acrylic sheets. Acrylic can be glued together to make a very strong bond. The material is softened so that they merge. The molecules of the sheets intertwine, literally making it one piece. The shape of the body is based on the archetype analysis (4.5) on cameras. The side of the camera can open up, because a part of the wall is attached to the body with a piano hinge.

On top of the body is the viewfinder shape. This part offers room for the real camera and has a hole in the bottom to accommodate for the cables going to the control panel. The back of the viewfinder can be opened up for maintenance and repairs on the camera. The bottom of the body is made out of grey acrylic sheet. The walls of the body are bended in a big oven over a wooden mold.

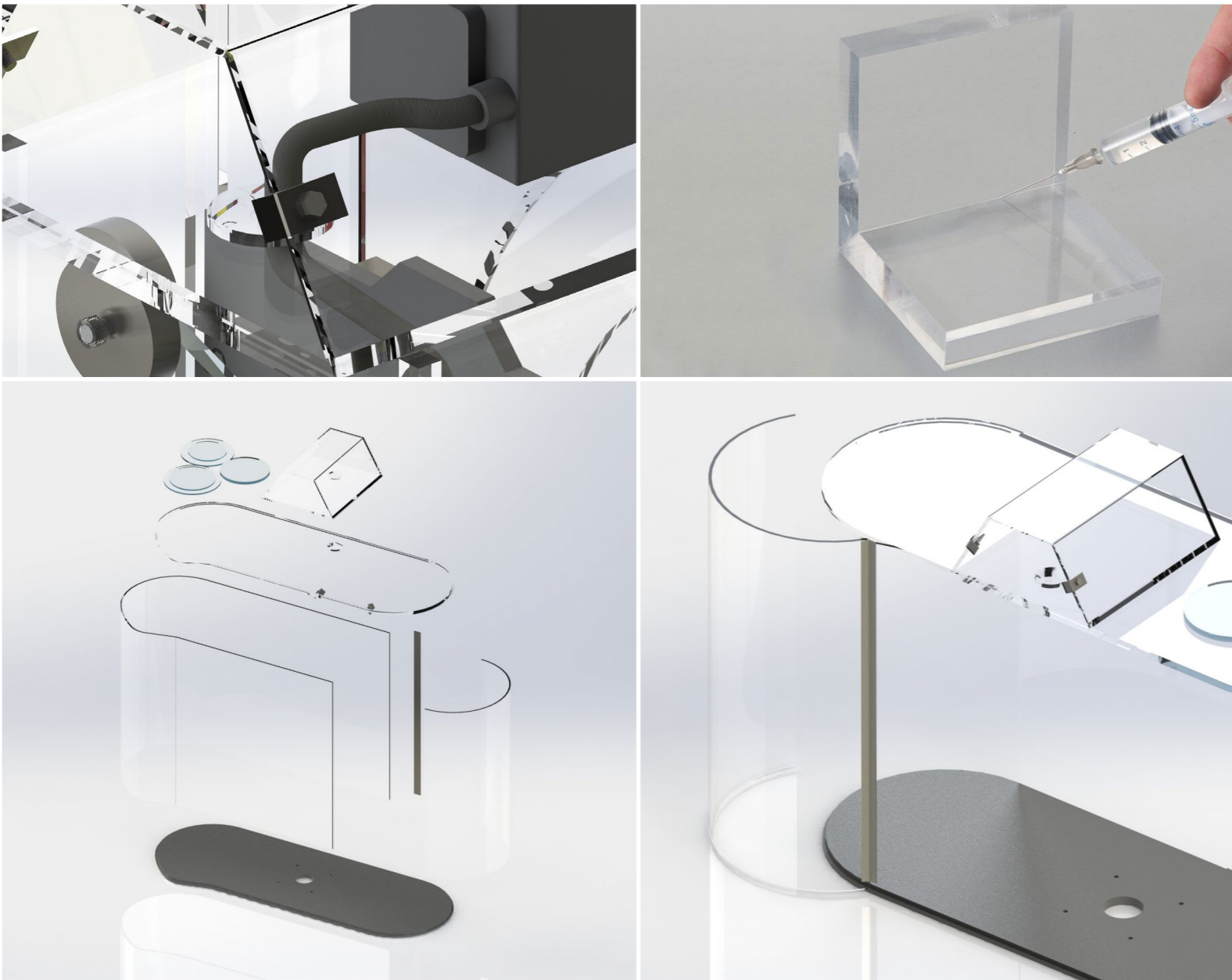


Fig. 61: Visuals and details of the body

Shutter

The shutter mechanism is mainly made from acrylic sheets. The curtains and base are made from colored acrylic, the nuts and bolts from transparent acrylic, just as the levers. Two stepper motors are attached to the levers and to keep the levers in balance two steel plates are attached to the end of the levers as counter weights.

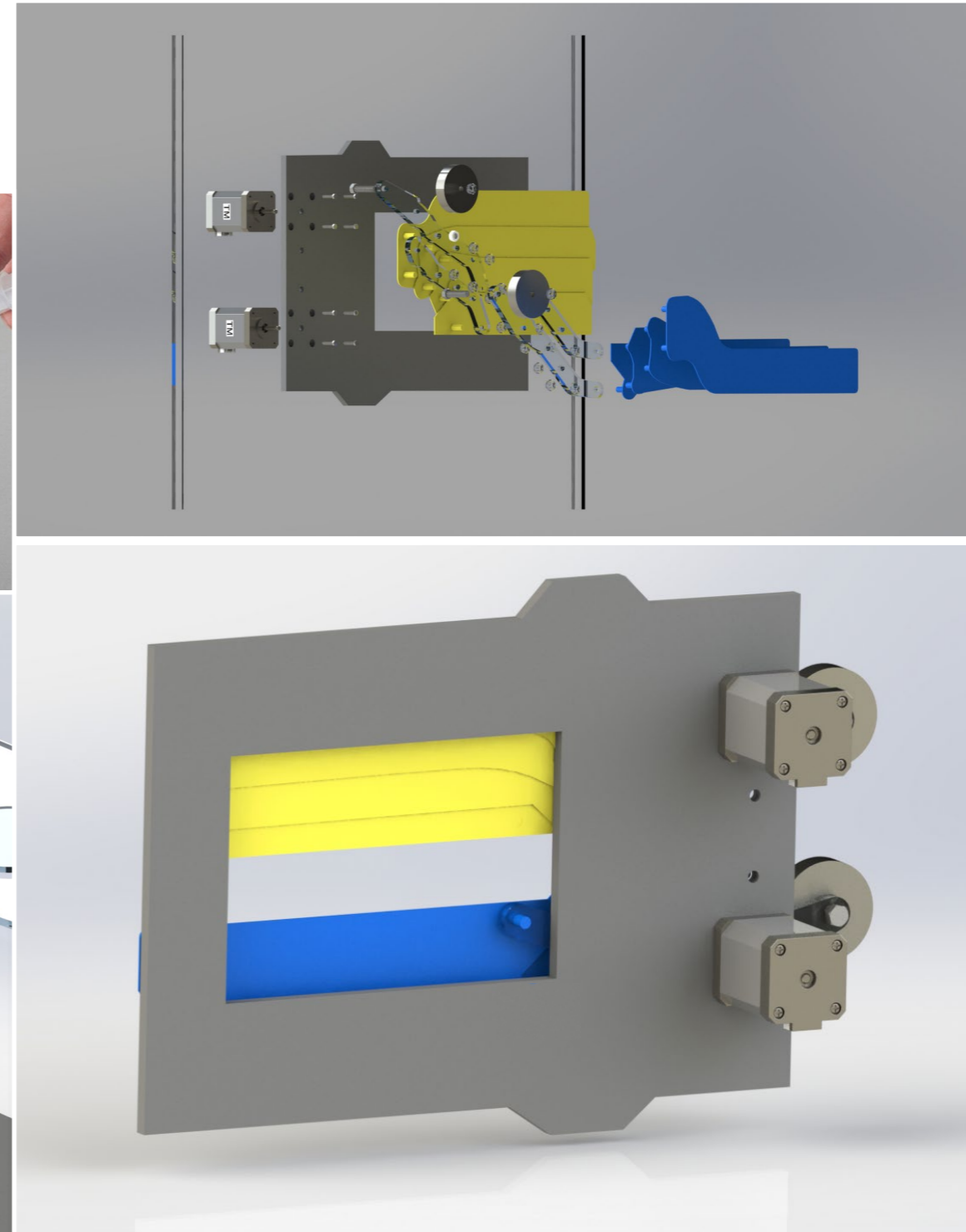
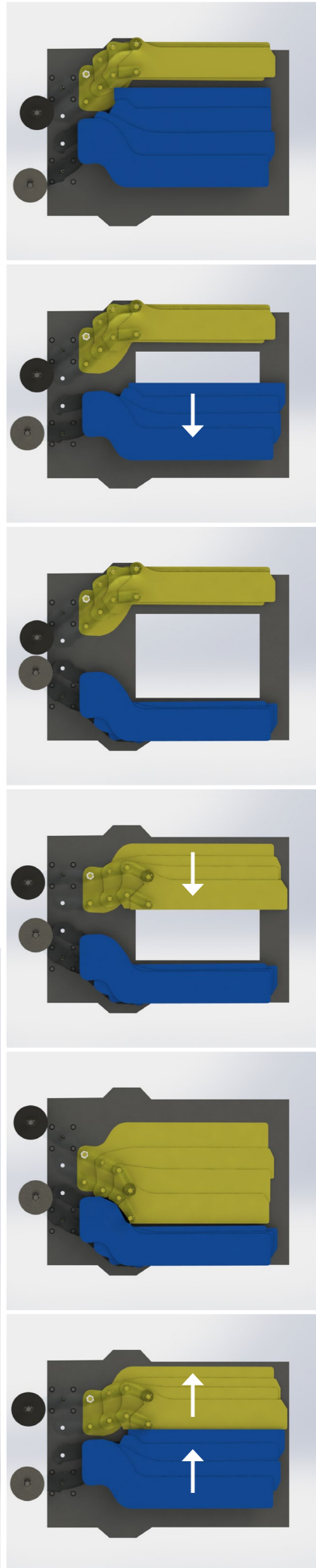


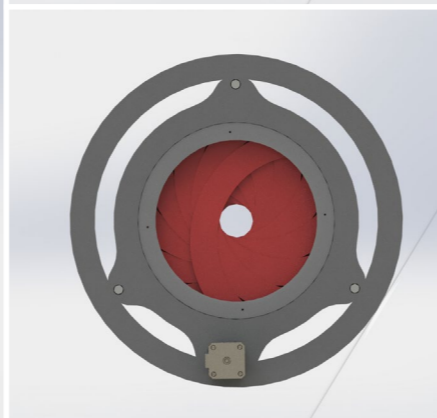
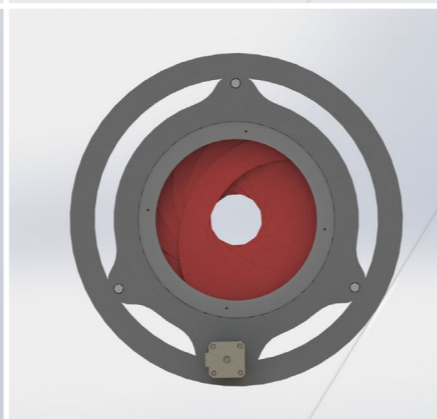
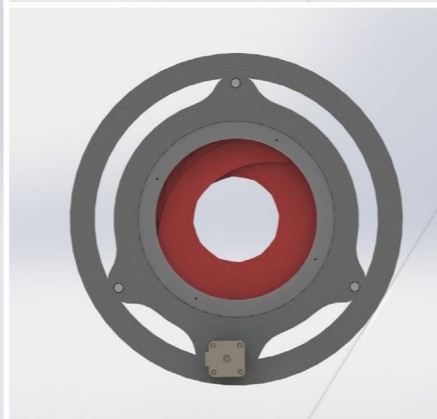
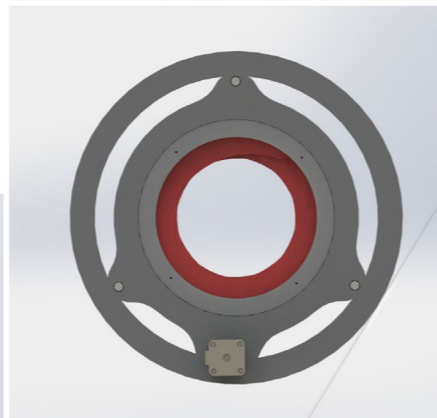
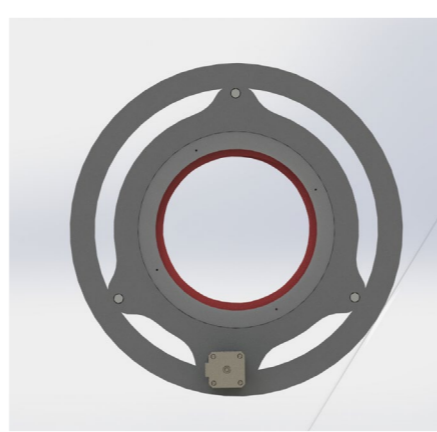
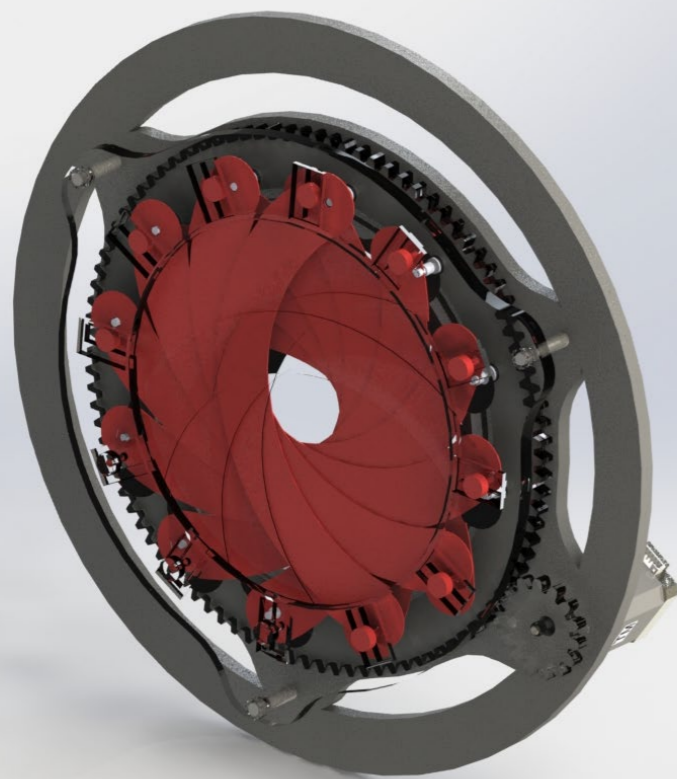
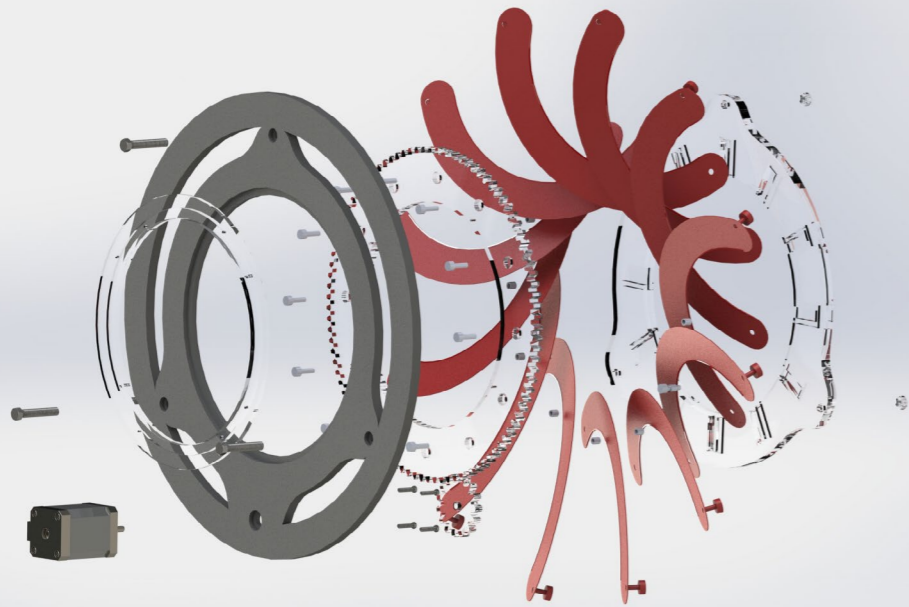
Fig. 62: Visuals of shutter mechanism



Diaphragm

The diaphragm mechanism is also almost entirely made out of acrylic, except for the stepper motor and the blades. The blades are made from Vivak, a plastic material more bendable than acrylic. This is because the blades are overlapping each other and need to bend a little bit in order to slide over the other blades.

Fig. 63: Visuals of diaphragm mechanism



ISO

The ISO plate is made from acrylic sheets and is attached to the body of the camera with two acrylic square beams. In the bottom of the plate a strip of nine LED's is placed, one led for each bar, showing the ISO set on the control panel.

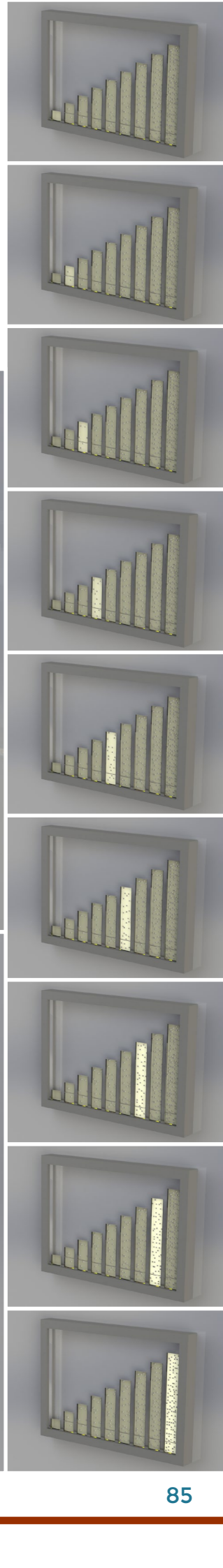
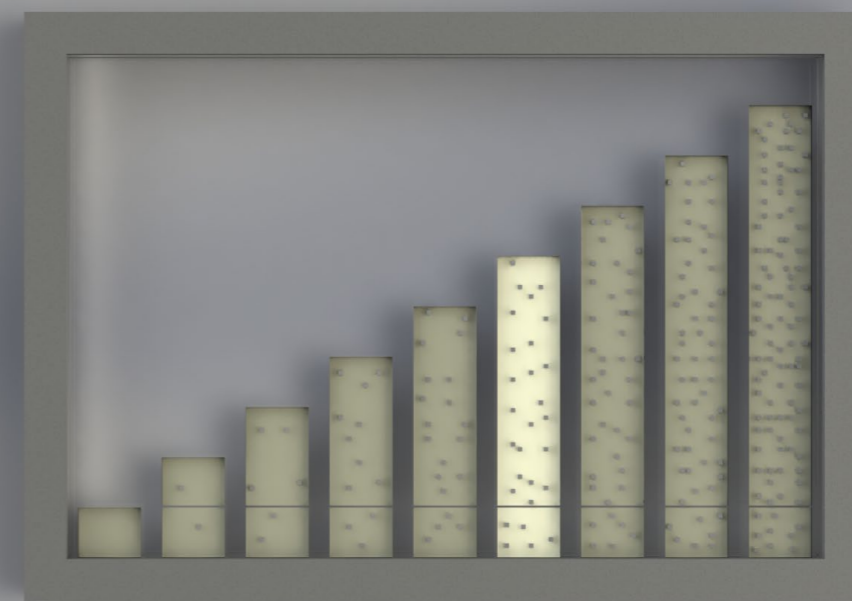
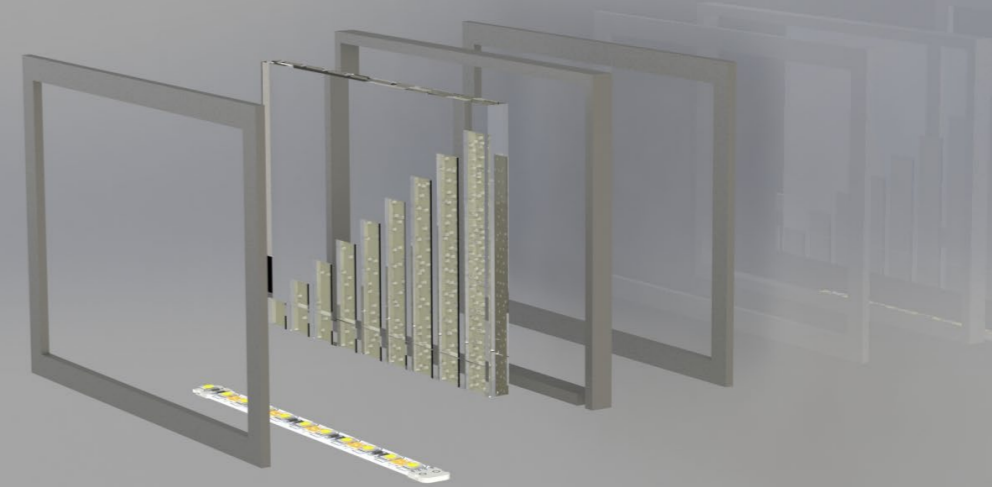


Fig. 64: Visuals of ISO mechanism

Cables, tripod and screen

The cables coming from the mechanisms and camera are glued and guided to the hole in the middle of the baseplate into the tripod chassis. The tripod is made from steel and is welded

together with the arm holding the screen. At the end of the steel beams rubber caps are placed. The cables form one thicker cable inside the tripod and exit from one leg to the control panel.



Fig. 65: Visuals of cables, tripod and screen

Control panel

Where the shape of Demophoto is made after the archetype camera, the control panel is designed with the form language of cameras (ch.4.5). The buttons resemble those of cameras with grip and textured feeling. The red accents can be found in the shutter release button and points on the buttons. The body of the panel has the same luxurious leather texture as cameras and the edges are smoothly rounded off and have a professional metal feel.



Fig. 66: Control panel in context



Fig. 67: Control panel

Stage 6

Conclusion

This stage concludes the project by checking the proposal with the list of requirements(3.3) based on the analysis. Next, a few recommendations for further development are made.



6.1 Evaluation of requirements

- The requirement has been met.
 - The requirement has partly been met, further recommendations are given.
 - The requirement has not been met, changes need to be made
1. Can be easily moved when changing exhibitions. (2.1)
 2. Design has form atmosphere or vibe of cameras. (2.1&2.2)
 3. Is accommodated to the knowledge level of rechargers, visitors with no/little experience with photography. (2.1&2.3)
 4. 75% of the actions need to be physical. (2.2)
 5. Requires sharing of knowledge by users. (2.2)

To determine if the outcome of this graduation project is a success, the design is checked-up with the program of requirements:

Demophoto, the camera part, can be easily moved and has one cable exiting the installation, however since the photobooth part can be filled in by the museum, it can not be said with certainty that the whole design meets this requirement.

This requirement is met, by designing the shape of Demophoto and having the form language of the control panel in the atmosphere of cameras .

The design is best experienced when, but not excluded to, having little knowledge about photography. The visual feedback offers a good explanation about the principles shutter speed, aperture and ISO. When one of the two users has experience, still sharing of knowledge has to take place, making it suitable for visitors with and without experience.

Although the percentage can not be measured exactly, it can be said with certainty that at least 75% of the actions required are physical.

Co-participatory sharing is required in the experience.

6. Offers the ability to make mistakes, making mistakes should not be punished. (2.2)
7. Accommodates at least two visitors at the same time. (2.3)
8. Lets the user(s) experience a part of the work of a photographer. (2.3)
9. Gives insight in the work of a photographer. (2.3)
10. Gives the visitors a better trained eye when looking at photographs. (2.4)
11. Gives experience with important variables such as: ISO, shutter speed, aperture, composition, framing or soft skills. (2.5)
12. Has a clear goal or challenge. (2.6)

Since the interaction with the installation is based on trial&error learning, there is room for mistakes.

The installation is best suited for two users at a time, but does not exclude multiple users controlling Demophoto. However this should be tested.

The classic triangle is the basis for every photographer.

No matter the type of photography, every photographer wants to have control over these three variables as good as possible, so experiencing these variables gives insight in the work of a photographer.

Due to the closure of NFM, extensive testing could not be done, so this requirements has not been fully tested. However, validating the concepts (4.3) shows this concept has the best chance of fulfilling this requirement.

The experience gives a complete experience with ISO, shutter speed and aperture.

The challenge in the experience has the users make three photographs with specific visual results. What these results should be depends on the design of the photo booth.

6.2 Feasibility, desirability & viability

The outcome of the project is further discussed looking at feasibility, desirability and viability of the design.

Feasibility - can it be done?

Demophoto

Chapter 5.3 shows in reasonable detail of which parts the product is configured and what material these parts should be made of. These parts have mainly been tested for functionality in the proof of concept and received improvements in the final design proposal. The control panel needs some more prototyping, but since the electronics needed for such a part are not difficult for an electro technician, this should not be a problem.

Photo booth

This side of the experience does not need very complex components. The proposal does not go into great detail what the design should be, this is left up to the NFM, or even other museums. This leaves the possibility to keep changing the photo booth, since this is not the most complex part of the experience. The moving part in the photo booth can range from something as simple as a decorated fan to a complex construction with falling objects or balls being blown through tubes. This part needs further designing and comes back in the recommendations.

Desirability - does it address the stakeholders' values and needs?

Visitors

The target group, rechargers / day-trippers, with no/little experience with photography, are looking for a day away from their everyday life. "Bring the light!" offers them a new experience with photography and has them forget about their work-life for a few minutes. Furthermore the analysis shows the target group is most interested in is how a camera works and what a photographer needs to do to make a photograph. This design offers them both.

Museum

The museum is looking for new ways to make visitors part of the debate about photography. The museum also tries to attract people who would normally not visit this museum into this debate. The design gives these unusual visitors a better trained eye when looking at photographs, giving them a bigger voice in this before mentioned debate. Furthermore the NFM is looking to be more child-friendly and attractive for children in elementary school. Although this has not been the main target group in this project, the design is attractive for children due to its transparent and big appearance. The subject might be

complex, but the design might offer some understanding about photography being about painting with light.

Photographers

Telling a story or giving a message is the main desire of photographers. Although the project does not clearly prove that the visitors have a better trained eye after experiencing "Bring the light", but the experience shows promising results for letting the visitors better understand the photographs they are looking at. If further research proves that visitors have a better idea of what the photographer wants to tell, the desirability for photographers has been met. In conversation with photographer Johan Nieuwenhuize the design was positively received. He appreciated the design trying to educate the visitors in the basics of photography and that shutter speed, aperture and ISO are the first steps.

Viability - Will it survive on a longer term?

Durability

When looking at durability, this depends on the way museum visitors (mis-)use exhibitions. Although this project did not research long-term use of museum exhibitions, the durability is seen positively. The used acrylic sheets might look fragile, but are actually very durable and the connection between plates is strong. By keeping the cables coming out of Demophoto to a minimum, the chance of tripping over one has been

minimized. The body of Demophoto offer the possibility for maintenance on the mechanisms and camera in the top.

Photography

When looking at the viability in respect to photography the perspective is good. The basic triangle in photography of the three variables has been the basis of this art for a long time and the prospect is that this will be the same for the foreseeable future. Where these variables first were used for functionality e.g. not having to stand still for 10 minutes after shutter speeds improved, nowadays these variables are also used for creative freedom, making experiencing these variables in an art museum even more relevant.

Context

The photo booth could be changed for every big exposition. This means that the experience can adapt to the context of these exhibitions, for instance mimic an iconic photograph used in the exhibition.

6.3 Recommendations

In stage 5 a design proposal is given to solve the design problem in stage 1. However the design is not yet ready for implementation in the NFM. This next chapter shows recommendations for further development to make implementation possible.

Technical

Camera

To connect Demophoto and the control panel to a real camera, a set-up needs to be made by someone with a lot of technical knowledge and experience with cameras. Making this a reality within the given 100 days in this project is unrealistic. The NFM can make this happen with their network and when they decide to put money into the project. When there are more details know about the type of camera/lens needed for the installation a calibration can be done on which stops are needed in the three variables.

Control panel

Currently the control panel is designed in the form language of cameras. However, since the scope has been to work out the camera, this part has not been further developed. A design iteration is needed to make the control panel design more feasible.

Shutter mechanism

The prototype shows the stepper motor is not able to lift the curtains. However in the prototype these curtains are made from water-cut steel. Further tests need to be done if the proposed acrylic curtains are light enough to be lifted by

the stepper motor. Otherwise a different mechanism needs to be designed to transfer the torque from the stepper motor to the levers.

Design

Photo booth

In terms of design, mainly the photo booth needs to be designed. Because this part can be a interchanging part of the design, it is best if the museum decides the atmosphere and backgrounds of this photo booth. If other photography museums adopt this design, they can also design their own photo booth, since this is not the most complex part of the experience.

Additional information shutter speed, aperture and ISO

To make sure the visitors leave the experience with a satisfied feeling, some additional information on the three variables is needed. This is to make sure the visitors can always complete the challenge by providing some information on the variables they are playing with, if required.

Implementation preparation and post-production

In addition to experiencing the process of taking a photo, the other two valuable

parts of the work of a photographer, as stated in chapter 2.6, could be implemented in the installation. In this project the decision was made to work out the part where a photographer takes the photograph, but with the possibility to add the activity of preparation and post-production if the design would be adopted and continued.

Interaction

Visualization mechanisms

The closing of the NFM due to the Covid-19 made testing the full prototype with the end-users impossible. Because of this it cannot be said with 100% certainty that the proposed design of the mechanisms will help the visitors understand the basic triangle of photography. For this further testing is needed, when the museum opens again.

Photo challenge

Together with the photo booth a complete challenge needs to be designed. This is best done by designers with experience in game design. A good balance between playful photo problems and explanation about the products needs to be designed.

6.4 Wrap-up

“Bring the light!” is a clear and attractive installation that lets the visitors of the Nederlands Fotomuseum experience a part the work of a photographer. By co-participation and sharing knowledge the visitors learn how to use shutter speed, aperture and ISO, and what these variables do to a photograph. This gives them insight in the work of a photographer, how the mechanisms behind these variables manage the amount of light, and gives them a better educated look when confronted with the overload of images in this modern day and age.

This project has improved my ways of doing research, by going into the world, observing and talking to the relevant groups and validating my ideas in multiple iterations

The project has learned me to do a broad analysis, integrate the needs and insights from different stakeholders, validate ideas in multiple iterations, and create a mechanically worked out design.

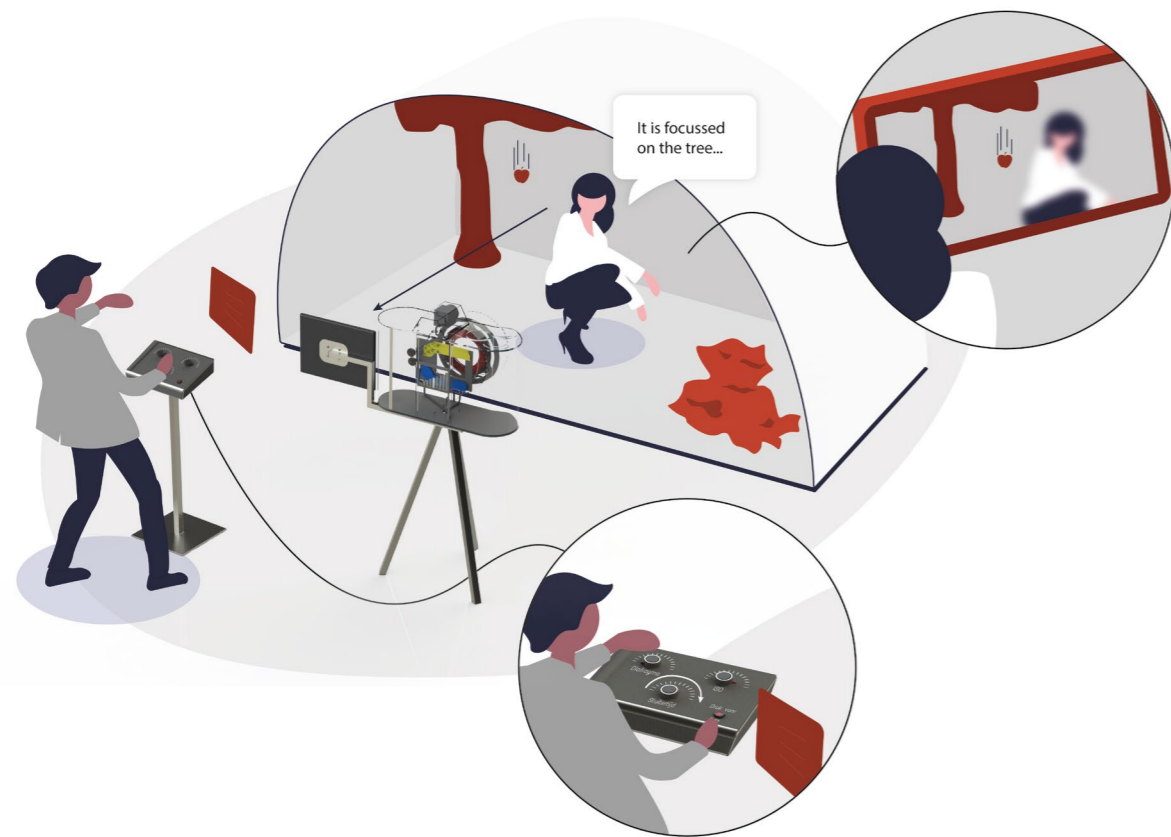


Fig. 68: Bring the light!

References

1. Nederlands Fotomuseum Rotterdam (2019). About the museum. Retrieved November 11, 2019, from <https://www.nederlandsfotomuseum.nl/en/about-the-museum/>
2. Ciolfi, L., & Bannon, L. J. (z.d.). Designing Interactive Museum Exhibits: Enhancing visitor curiosity through augmented artefacts. 7.
3. Falk, J. H., Scott, C., Dierking, L., Rennie, L., & Jones, M. C. (2004). Interactives and Visitor Learning. Curator: The Museum Journal, 47(2), 171-198. <https://doi.org/10.1111/j.2151-6952.2004.tb00116.x>
4. Heath, C., & vom Lehn, D. (2008). Configuring “Interactivity”: Enhancing Engagement in Science Centres and Museums. Social Studies of Science, 38(1), 63-91. <https://doi.org/10.1177/0306312707084152>
5. Hornecker, E. (2005). A Design Theme for Tangible Interaction: Embodied Facilitation. In H. Gellersen, K. Schmidt, M. Beaudouin-Lafon, & W. Mackay (Red.), ECSCW 2005 (pp. 23-43). https://doi.org/10.1007/1-4020-4023-7_2
6. Hornecker, E., & Stifter, M. (2006). Learning from interactive museum installations about interaction design for public settings. Proceedings of the 20th Conference of the Computer-Human Interaction Special Interest Group (CHISIG) of Australia on Computer-Human Interaction: Design: Activities, Artefacts and Environments - OZCHI '06, 135. <https://doi.org/10.1145/1228175.1228201>
7. Kortbek, K. J., & Grønby, K. (2008). Communicating Art through Interactive Technology: New Approaches for Interaction Design in Art Museums. 10.
8. Macdonald, S. (2007). Interconnecting: Museum visiting and exhibition design. CoDesign, 3(sup1), 149-162. <https://doi.org/10.1080/15710880701311502>
9. Meisner, R., vom Lehn, D., Heath, C., Burch, A., Gammon, B., & Reisman, M. (2007). Exhibiting Performance: Co participation in science centres and museums. International Journal of Science Education, 29(12), 1531-1555. <https://doi.org/10.1080/09500690701494050>
10. Rizzo, F., & Garzotto, F. (2007). “The Fire and The Mountain”: Tangible and social interaction in a museum exhibition for children. Proceedings of the 6th International Conference on Interaction Design and Children - IDC '07, 105. <https://doi.org/10.1145/1297277.1297298>
11. Roozenburg, N., & Eekels, J. (1998). “Productontwerpen, structuur en methoden”:

