AKILA

A MULTI-FUNCTIONAL CAMERA EQUIPMENT

01 PRODUCT

MSC04 - 04 INDUSTRIAL DESIGN

AALBORG UNIVERSITY, MAY 2015

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TITLE PAGE

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THEME	Camera equipment
PERIOD	02/02/2015 - 27/05-2015
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INTRODUCTION

This product report is intended to be a sales brochure which can be shown to possible investors or collaborators, therefore it's presenting the features and ways of use for Akila.
The premises is that nowadays videos became more popular, people go on holidays, trips and other travels and they find that the best mean to record all of that is by making a short video, that later can be viewed. As most of these videos are recorded by semi-professional videographers the outputs do not always have the desired effect when re-watched. One of the main reasons for this, is the fact that most semi-professionals do own a good camera, but nothing to very few equipment besides the camera and for videography having at least a stabiliser, slider and a tripod are very important. These travellers have one thing in common, they all desire a piece of equipment that is multifunctional so they only need one equipment for multiple video output possibilities that is easy to carry around on holidays and travels.

Akila is a product especially designed for these people who travel much and want one product that is easy to carry around, assemble and disassemble and above all gives the user a very rich variety of outputs so the footage can be as exciting as they want, but still keep the basic standards for steady footage.

CONTENTS

HIKE TO THE TOP

Semi-professional videographers who like to hike and travel, need one product that can enable them to have more then one output possibility; equally important is the lightness of this product and the fact that it should close in a compact shape so it does not impediment their body movements.

AKILA IN USE

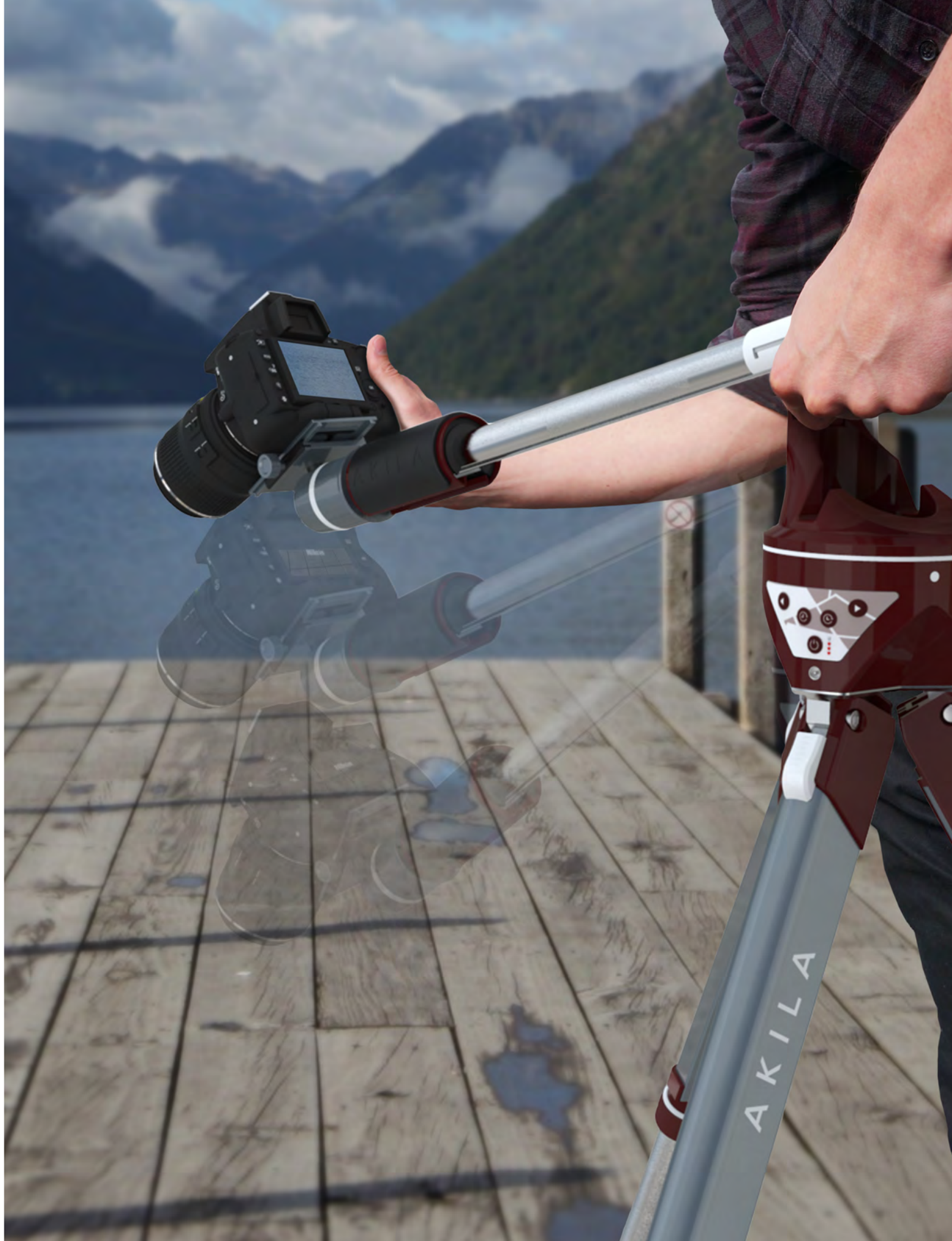
Akila is a multi-functional product that enables the user to shot a variety of video outputs, while it was designed emphasising a compact shape when it is closed up, so it can be carried around easily or stored in the bag without tangling up with camera straps and other free objects and harnesses. Akila can be bought as individual parts that the user can assemble according to it's need, use and skill level regarding videography.

THE STABILISER

The stabiliser function of Akila is great for when the user wants to film while walking. This helps prevent some of the jitter that is inevitably caused by walking. The stabiliser is a 400mm long aluminium extrusion that has added a ball head at the end where the camera can be attached to; under the camera, a fixed handle is placed, this handle is made out of plastic with a coating of EVA to make it comfortable to hold and interact with it. On the inside the handle is coated with foam in order to dampen the jitter.
The top of the ball head has an adjustable plate, ensuring that the stabiliser can work with multiple sizes of cameras and objectives attached to it.
At the bottom of of the stabiliser, second handle is placed; this helps with the slider function, that is going to be presented later.

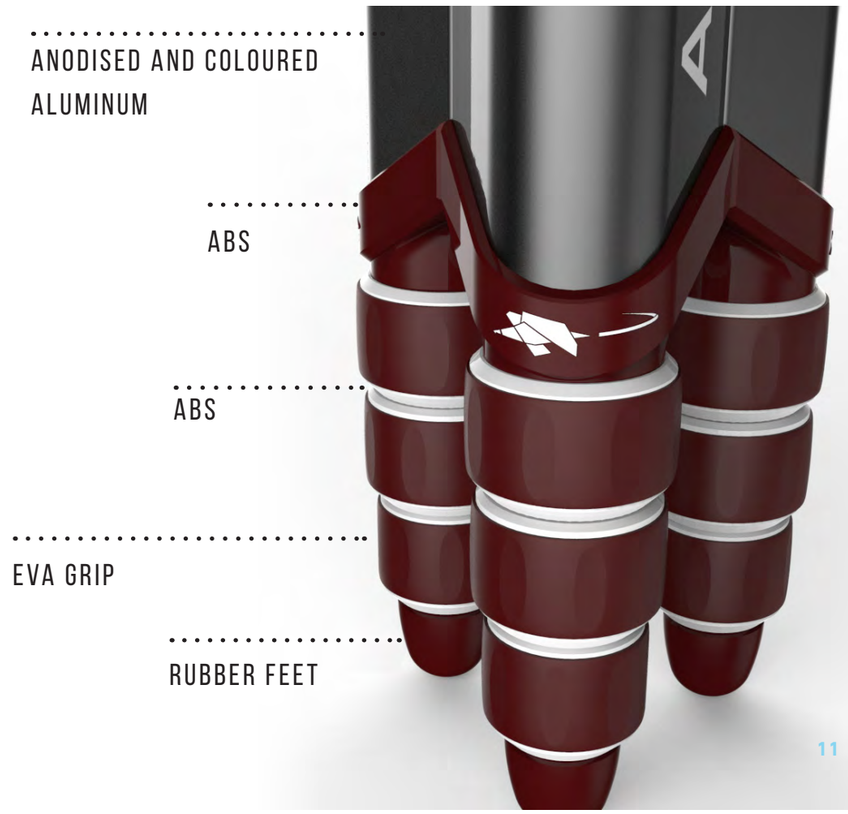
THE JIB FUNCTION

This function permits the user to have a footage that creates and arc, allowing the user to film from low going upwards. The way the jib works is by the user having one hand on the camera giving the direction and the second hand is placed on the bottom handle pushing down creating counterweight. The jib is the same handle that is used for the stabiliser, but it's sliding thanks to a small element called "Thor's hammer".
At the top part the of the base there is a tightening mechanism ensuring that the jib can be locked in place if needed with out risking to fall or slide away.



THE LEGS

In order to facilitate all the functions previously mentioned that Akila has, it's imperative for it to have some legs to be placed on. The legs have to be sturdy to help keep all the footage steady, but when they close, it should form a compact shape that does not tangle with straps, but it should be comfortable to hold while walking. The legs are extruded aluminium and to ensure the outdoor resistance, to humidity, salt, sun and others elements, they are anodised and the top part are also colour treated to create a bigger visual difference from the lower extensions.



STEP 3 - PLACE VERTICAL
AND SLIDE INSIDE BASE

STEP 2 - START ANGLING

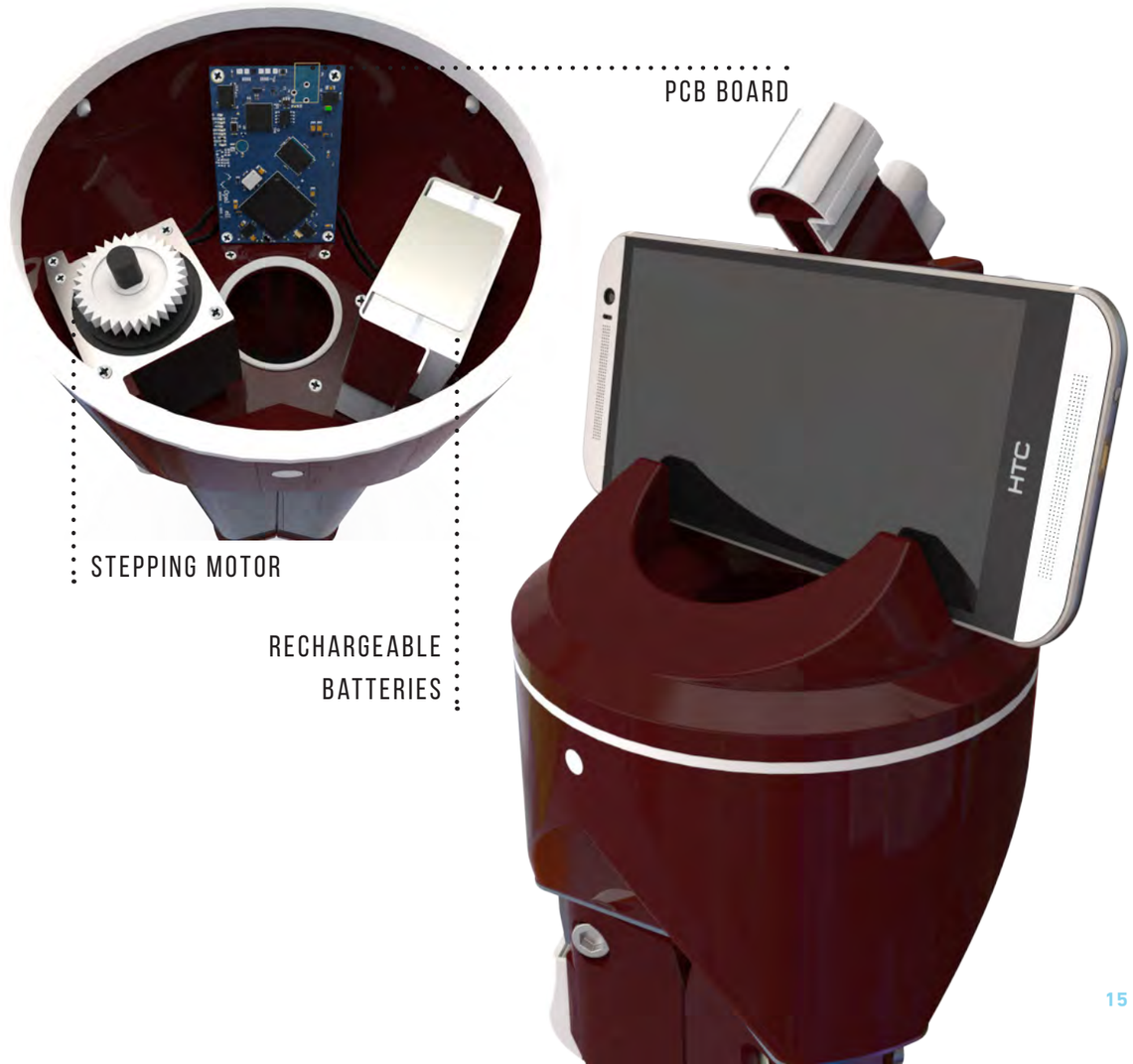
THE SLIDER

When combined with the base, the stabiliser acts as a slider, permitting the user to zoom in while still having a steady shot. It is possible for the slider to rotate both to left and right creating a steady panorama view and lastly it can also be used as a jib as mentioned previously.

STEP 1- SLIDE HORZONTALLY

THE BASE

The base is the core element of Akila, therefore it has the most complex functions; it can rotate freely and also at a specific time interval thanks to a stepping motor that is placed inside. The stepping motor makes it possible to rotate in both directions left and right at two distinct speeds. This function helps the user to film time-lapses in which he is also present. Because it has a stepping motor, the base needs two rechargeable batteries to rotate. The batteries last for 2h 20min and afterwards it has to be charged in order to use again the specific speeds.
In order to offer more for the clients, Akila's base is also compatible with smartphones, giving the user the option to film a panorama or time-lapse with their smart phones while also filming a stabile shoot with their camera attached to the stabiliser.

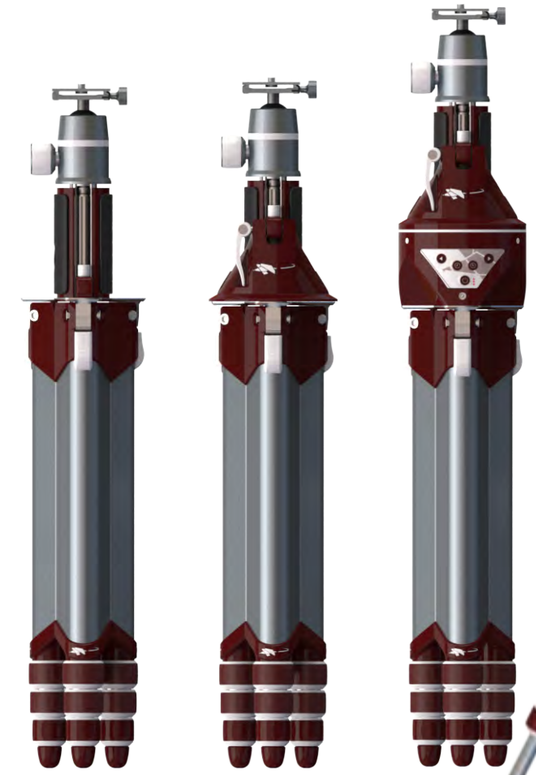


FEATURES OF AKILA

Akila is a multifunctional product, and therefore it has more features, some that can work on their own and others that need other components to function or combined they create a third function. As presented before, the stabiliser can be detached and used separately, while the legs and base can hold a smart phone which records instead of the camera. That way the user can take full advantage of the time he spends in one place. The core part of Akila is the base, hence it's the part that has most functions as well.

SYSTEM ARCHITECTURE

Akila is constructed to emphasis the multifunctional feature and one of the sub-feature is the possibility of the product to be sold as a basic product with only legs and stabiliser and all the other parts can be bought individually. This idea of an alternative way to sell/buy the product, has a great impact on how the product is designed, produced, assembled and later reassembled. The considerations made during the design stage were to have every part fit smoothly with the rest. It also means that all the attachments have to align up perfectly, so the client can buy the various parts at different times and they still have to fit with each other.



BRANDING

Akila is a unique product and therefore it is important to communicate that from first look. The product permits a great degree of movement, which is represented both in the packaging and the logo, the explorer and the freedom that comes along with the product has to be felt when handling Akila, but also visible when one sees the product in a shop or online. The webpage as well inspires the explorer to what can be achieved with Akila.

PRODUCTION PRICE AND SALES PRICE

PRODUCTION PRICE

It was found possible to sell at least 20.000 products during the first 2 years on the market within the European market.
The production price of the product is split op into three parts: stabiliser, base & legs. The estimated production prices include both material expenses, tooling costs and the production costs itself. The payment of the investment in the tooling costs are considered to be divided into every 20.000 products.
The production price of the three different parts are in the image on the right.
The total production price of the product is therefore 558 DKK excluding assembly and together with the assembly is estimated to cost 590 DKK. In this price the shipping cost are not calculated, but aware of the need of their addition.

STABILISER 81 DKK

BASE 250 DKK

LEGS 226,945 DKK

SALES PRICE

The estimation of sales price of the product is calculated with an markup of 4. This factor should ensure, that potential extra expenses can still be covered. Though it is important to remember, the production price includes the payoff of the investment for the tooling costs. Therefore the rest is profit. The sales price to own each option of Akila is presented below.

BASIC VERSION

1199 DKK

MID VERSION

1899 DKK

PREMIUM VERSION

2399 DKK

SPECIFICATIONS FOR AKILA WITH ALL PARTS IN PLACE

Weight:	2,25kg
Closed height:	61cm
Fully open height:	155cm
Stabiliser height:	460cm
Closed legs & base:	50cm
Minimum angling of legs:	0°
Maximum angling of legs:	90°
Time lapse-run time:	2h 20min
Rotation degree:	360°

PRODUCT VALUE PROPOSITION

WHAT DOES AKILA DO

- multiple output possibilities
- compact product
- durable in outdoor weather
- compatible with smartphones

WHAT DOES IT FEEL LIKE TO USE AKILA

- Akila is intended for semi-professional users, but others can use it as well
- It works well even if used by one person, as they can be in footage
- Easy interface, therefore it's fast to learn to use.

HOW DOES AKILA WORK

- stabiliser function
- slider function
- panorama possibility
- time-lapse
- stable static shot
- jib function

CONCLUSION

Currently there is a gap in the camera equipment market, because no solutions are developed to deal with multi functionality, one product giving the option of more video outputs; Akila is specially developed to fill that gap.

As a result of this, Akila is targeting a yet undiscovered market, having the potential to grow an extensive product family and thereby having a continues revenue stream.

As there is no direct competition for Akila the retail price can be set a little higher and thereby the break even time could be reduced to...years, making Akila a great investment.

AKILA

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02 PROCESS

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APPENDIX	

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We also to want to thank all the persons who were involved in the gathering of imputs and thoughts through interviews and variouse tests and analyses. None mentioned, none forgotten.

SYNOPSIS

This master thesis project takes it's point of departure from the fact that videos are becoming more spread out and sought for, unlike photography, filming needs more camera equipment in order to look professional. Many people nowadays prefer to record their travels and experiences through videos, because it captures the atmosphere in a more accurate way, they also like to take inspiration from professional videographers. Unfortunately most of these people are amateurs and semi-professionals and therefore do not own all these diverse camera equipments to succeed in obtaining the videos they aspire to. Therefore there is a need for a multi-functional equipment that semi-professionals can take with themselves that is light, compact and gives the possibility of multiple video outputs.

The developed product is named Akila and is a multifunctional camera equipment that can help the user film in different situations enabling the user to have distinct video outputs.
In order of being more precise the user group was chosen: the hikers; thus giving some restrictions about product size, weight, ways of use and transportation while still being possible to operate in different weather conditions.

Akila is sold as a basic pack and more parts can be bought if the user would like to have more possibilities of outputs. Each part is designed to fit with the other ones making it easy to add new parts to the existing product. The final result can be viewed in the separate presentation and the process is described in this report.

PHASE **0.0**

PREFACE

This report contains the 4th semester master thesis project in the process of designing the product Akila – a multi-functional camera equipment. In addition to the process report, both product report and technical drawings are printed separately and handed in as a combined package. As the project has consisted of analysis of videos and testing of video footage, larger files can be found on the attached usb stick, whereas written appendix can be found in the back of this report.

0.1 READING GUIDE

This report is divided into six different phases; research-, concept development-, detailing-, business-, marketing- and lastly the summary phase. Each phase is initiated with a short description of the content and objective of this specific stage of the project and ended with a reflection of the outcome and achieved goals.

Each of the phases consists of several smaller sections, which consist of different tasks performed during the process development. The structure of these sections is similar to the phase structure, with a short objective of the given task, followed by an explanation of the task, plus acquired data, and lastly a reflection on the outcome.

The tests and observations in the report are shown in relation to the importance of the process and only the key findings are presented. The eleborated versions are to be found in the appendix in the back of the report and the attached usb stick.

Throughout the report three indicators are presented:

The completed task gave new insight to the project and needs to be further explored.

The completed task confirmed a previous stated insight and used as a criteria for the product.

The completed task invalidated a previous stated insight.

The report uses the Harvard referencing system, where sources are being written in-text, i.e. [author(s), year of publication]. The list of references will be placed in the end of the report.

Illustrations throughout the report will be numbered, with a short explanation of the illustration. The list of illustrations will be placed in the end of the report.

0.2 CONTENTS

> *Further growth drivers in this segment are the growing variety of products and the more intensive use of image capturing features, e.g. video and panorama functions. Moreover, consumers want more professional photo equipment.*
>
> *"Trends in the photo and imaging market" [TRE, 2012]*

0.3 INTRODUCTION

The team has decided to work with the whole notion of cameras as each of the members is interested and passionate about the new world that the cameras can create. The highlighted quote from Photokina, supports the teams interest isn't one-sided and that the increased use of image capturing functions makes the consumers demand more professional photo equipment.

This being the point of departure of the product, indicates a focus on videography rather than photography. It is therefore important to distinguish between enhancing the quality of the video output, compared to enhancing the photo output of the camera. The videographers require a lot more equipment than a photographer, as the challenge of capturing professional moving images is much more complicated as the elements you are capturing are not static and the camera doesn't need to be static either. This adds very much to the complexity capturing the moment as opposed to a "lucky shot".

With this in mind the team focuses on how to add value to the videographer during filming. There are a lot of equipment on the market that are trying to accomplish just that; camera tripods, camera stabilizers, camera sliders etc. A lot of this equipment has been directed to the professional videographer, but as videography are now expanding more to the 'regular joe', there is a demand for equipment directed to this specific user; the semi-professional / hobby filmmaker. Through interviews with several users it was found that their most common use of videography is during traveling, which led the team to focus on travel friendly camera equipment.

Knowing that the market of camera equipment is a competitive one, the team has to consider a business strategy to create awareness of the future product and secure a constant revenue stream. It is therefore important to somehow communicate the strengths of the product, compared to the competitors.

> *We make cameras for photographers – but also for videographers because this sector is growing and the two are merging.*
>
> *Jeremy Gilbert, Marketing Manager, Nikon UK Group [Reid, 2015]*

0.4 INITIAL THOUGHTS

Today the possibility of taking a picture or video of a specific situation is easier than ever before and is getting increasingly popular. One of the reasons for this, is the integration of the camera function into the products that people interact with every day, as for example the mobile phone. Another reason is the desire to self-promote, which is done through several medias and services, that allow the user, to show every "interesting" aspect about themselves, and thereby sharing their experiences. Examples of these services are Facebook, Instagram and Snapchat that allow the user to share their experiences through pictures and videos. It goes without saying that people want to show the most perfect version of their videos and therefore seeks the most professional results.

Sharing of photos is supported by several services, which allow the amateur to capture or manipulate photos, to obtain the look of professionals. That is an area which is very competitive, and new products are constantly emerging. Though several factors indicate, that the interest within video is increasing. This is for example supported by the quote from the Nikon UK sales manager, which tells that they are increasing their focus upon the video media. This change is further supported by the trend of capturing yourself, while doing different sorts of action or sports.

The team spots several movements that the video media is getting increasingly popular as a media to capture experiences and sharing them, though not as in the 90's, where you would watch the "holiday tape" from beginning to end. Today they want the condensed version. The team still thinks, that most non-professional videographers are utilizing the video format during their holidays and travels, where the users are mostly exposed to new situations and experiences.

The initial hypothesis that the team is working with during the project, is that the non-professional videographers want to make videos, which does not look like a home movie, but have a more professional look to it. Therefore an opportunity to design a product, with the functionality of the professional equipment that addresses the non-professional is spotted. During the project, this hypothesis will be tested and altered depending on the information gathered and the different test conducted.

PHASE **1.0**

RESEARCH

The research phase covers the gathering and structuring of information. This phase contains the initial research that had helped delimit the problem area, whereas ongoing research will be done throughout the report, when tests and observations create questions that need answers.

The initial research is intended to identify issues or opportunities in the camera equipment area. By using methods like market analysis, user interviews and video observation, the team gathers knowledge on certain gaps in the market; what the existing equipment lacks and what can be done to fill that gap. Using semi-structured interviews with users of camera equipment, it is possible to identify what their needs are.

All this gathered information is structured into a concluding design brief containing; target group, a problem statement, a vison, a mission and design criteria. The criteria are based on insights and observations that are translated into usable demands for the future product. The design brief is contentiously updated throughout the project and should help guiding the team through the product development.

Fig. 01

1.1 TYPES OF CAMERAS

The initial research around cameras was to investigate the different types of cameras, and find the characteristics of each camera. As a point of departure the team had some general knowledge concerning each camera type's specialty and user group, so a further point was to confirm/deny these initial presumptions. This would allow the team to differentiate the target group of cameras.

The camera is for most people, in the technological world, an irreplaceable tool that helps people capture a specific moment, and share experiences and memories with others, at any given time. Initially the camera was an expensive and complicated tool, mostly used by professional photographers, though today, the development of the technology allows the common citizens to utilize the functionality of the camera. At first, the functionality of taking pictures and later videos, belonged to the camera, but as the development continued, several other categories of products would include a camera. Furthermore a camera is not just a camera any more, as camera can be acquired for different purposes [Gustavson, 2009].

A quick summary of the most used and bought cameras include: Digital Single Lens Reflex (DSLR), System Cameras (Hybrid), Compact Cameras (Point & Shoot), Action Cameras, and camera within Smartphone's. A range of different cameras within each category is shown within Appendix 7.1. Each camera type will include a trade-off within several parameters:

- Picture Quality
- Weight & Size
- Ease of operating
- Extra functionality and equipment
- Video functionality
- Robustness

The DSLR camera is for example the best overall camera within picture quality, though it has the trade-off of being big and heavy. On the other hand, the smart phone camera is very small and convenient, but the picture quality is limited.
Fig. 02 gives an overview of the advantages and drawbacks of each camera type, which of course affects the kind of user, that would approach and use this kind of camera.

REFLECTION
Through found literature and web research, the team acquired general knowledge of the cameras and their properties and functions. Though to truly understand the values of each camera types, the users of each camera type needs to be found.

As assumed, the DSLR Cameras and System Cameras are superior to other types in terms of video quality

DSLR

+ High Picture quality
+ Possibility of changing objective depending on the task
+ Great manual settings options
+ Wide range of extra equipment, including objectives
- Heavy weight
- Big and clumzy
- Requires a lot of knowledge to utilize the many settings options

HYBRIDS

+ Approaching quality of DSLR
+ Small in size compared to DSLR
+ Great settings options and posibility of changing objectives
- Low amount of extra objectives
- The size of the camera affects the quality

COMPACT

+ Very compact camera
+ Okay quality of camera
+ Easy handeling
- Poor settings options
- Quality compared to
- DSLR suffers

ACTION CAMERA

+ Very roboust
+ Great quality
+ Many video options
+ Small size
- No zoom
- No focus

SMARTPHONE

+ Always at hand
+ Quick to grasp
- Suffering quality
- Lack of manual adjustments

Fig. 02: Pros and cons of different camera types

1.2 HISTORY OF CAMERAS

The best way to truly understand the reasons of why one product is on the market today in a certain form is to look back at its history. In this case the objective is to find a pattern of evolution within the cameras and the development of the technologies that affected the way one records today. This will ensure an understanding of the past; what have users demanded of the products and what have the technology allowed. This creates a logical step forward, not just following in someone else's footsteps.

When analyzing the history of cameras it is obvious that the cameras have been around for a long time, but in the last few years the technologies behind them have changed tremendously. The most important factors to extract from the history are the obviously how the technology offers better quality of the output, but also how the cameras are becoming more and more convenient to use. As the first digital camera was created in 1991, the way of taking pictures changed. When before 35 mm film was used there was a certain limit to how many pictures you could take, whereas the new digital world allowed the users to take an overflow of pictures that are never viewed again. Same happened later with small video clips.

When GoPro launched their new actioncamera in 2010, they created a whole new wave of people filming and sharing their videos through their own webpage. With the convenience of their small camera and the HD quality, it became mainstream to capture experiences through videos rather than photos.

CONCLUSION

The research showed a clear pattern in, how over the years, the camera has become more convenient to use. Customers want a quick way of capturing the moment and they want that moment to be captured in perfect quality.

The consumers demands convenience and quality - a quick way to capture the moment

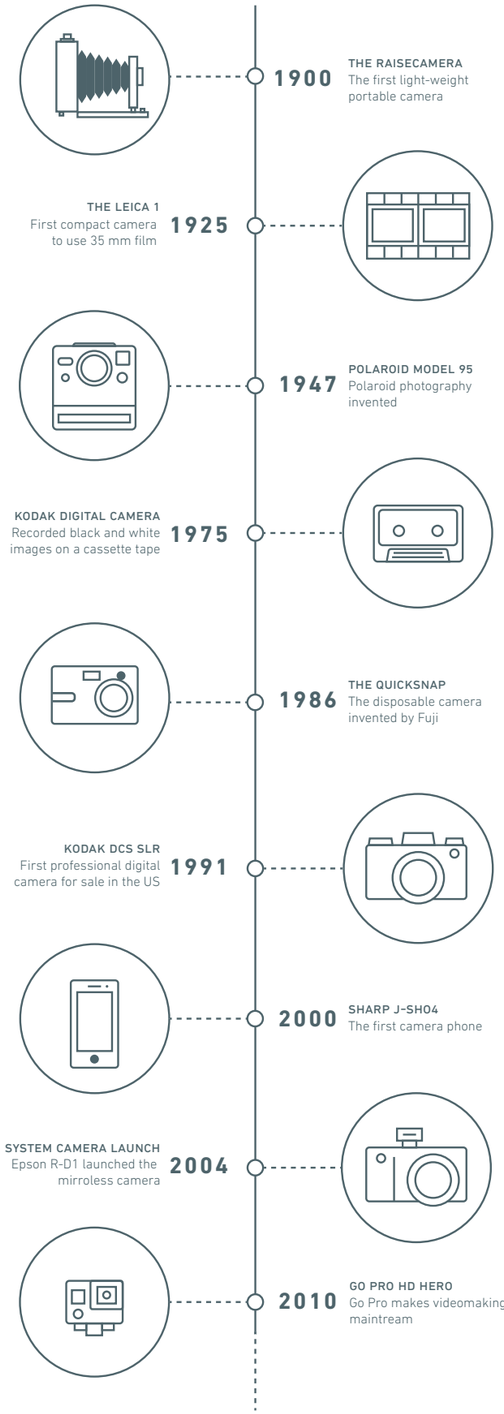


Fig. 03: Illustration of important years in the history of cameras [Gustavson, 2009].

VIDEO SHOTS:
. a term used in cinematography concerning the positioning and angle of the camera

VIDEO OUTPUT:
. the specific visual result of the camera recording { can be influenced by the movements of the videographer }

1.3 TYPES OF EQUIPMENT

Knowing the types of equipment on the market can help enable the familiarization with the technologies required for the cameras used today and potential gaps on the market. This research helped to identify each piece of camera equipment strengths and weaknesses. The full research can be seen in Appendix 7.2.

As visible in fig. 03, six different categories have been examined. Each type of equipment has its own specialty that helps the user to achieve a specific camera shot. Inside each category, there are a variety of products that differ in size, weight, price and performance. The pros and cons are based on web searches that includes; product reviews and users test of newly purchased equipment.

CONCLUSION

The key elements that were obvious after the research, was that there are no obvious lacks on the market, but also that each individual piece of equipment is only focusing on one or maximum two specific outputs. It was also found that a lot of the equipment requires a lot of set-up time, which is time not spend filming.

REFLECTION

The research was done only through observing other people use the equipment and reviewing them. The team needs more hands on test of the equipment.

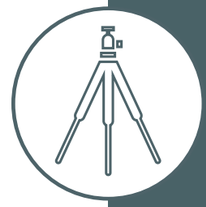
Each equipment category focuses on one specifc output
Team needs hands on testing to find more concrete criteria

STABILIZER

+ Allows the user to move while filming
+ More smooth video output
- Needs a lot of practice to use probably
- Difficult to achieve the exact counterweight to camera

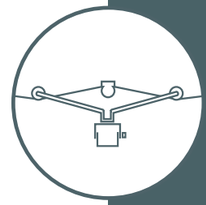
DRONES

+ Possible to achieve large area footage
- Cannot use everywhere because of safety reasons
- Difficult to control in windy weather



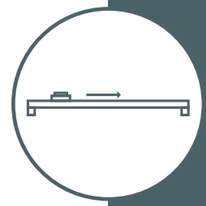
TRIPODS

+ Allows panorama shots
+ Steady photos and videos
- Long set-up time



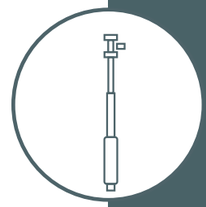
LINE CAM

+ Action scenes that take place on the ground
- Long set-up time
- Expensive
- Require certain sorroundings to set-up



SLIDERS

+ Great for time-lapse
+ Constant movement w. engine
- Long set-up time
- Very heavy and space
- consuming



SELFIE STICK

+ Great for smaller smartphone + action cameras
- Can't suppert heavy cameras

Fig. 03: Pros and cons of different equipment categories.

Fig. 04

Fig. 05

Fig. 06


Fig. 07

- *DSLR cameras are very poular - also for videorecording, which has decreased the sales of actual videocameras.*

  PhotoCare, Boulevarden

- *It is often the 'geeks' that ask for the more specific extra equipment like camera sliders*

  PhotoCare, Slotsgade

- *The costumers mainly share their photos and videos on Facebook - some on our blog.*

  Jysk Rejsebureau, Aalborg

- *Tripods are a must have; sliders, cranes, sound recordings, microphones and micro ports are important as well. The more you add, the more professional output you get.*

  Goecker, Aarhus

Our product should be compatible with DSLR and System Cameras

We have tried to focus more on videos from our trips around the world as they tell a better story.

Jysk Rejsebureau (Appendix 03)

1.4 EXPERT INTERVIEWS

The objective is to achieve knowledge from people who are experts in the field of both camera equipment, but also to get information on travelers in an effort to confirm our initial thoughts on the most common usage. To do this, semi-structured interviews will be conducted at both photo stores and travel agencies.

The team constructed a semi-structured interview for both travel agencies and photo stores as the knowledge each of them has, would probably differ a lot. An example of the questions asked, plus all answers from the different experts can be found in Appendix 7.3. Comments that gave a deeper insight in our users are shown in bullets in fig. 04 - fig. 07.

The interview with Jysk Rejsebureau was really interesting as they indicated that their customers did document their travels on video and shared them on different medias like; Facebook and Jysk Rejsebureau's blog. They also confirmed our initial thought on videos becoming more popular and something they are trying to focus a lot on in their advertisement of their travels.

The interviews with the different photo stores gave a lot of insight in what the users are buying at the moment. Some of the most important insight was that there is a very clear segmentation in this target group of videographers. I.e. it is mostly the 'geeks' and film enthusiasts (later to be introduced as semi-professionals) that asks are willing to pay 3000-6000 DKK for an DSLR or System Camera to achieve that extra quality. This group also desire a more 'niche' equipment like camera sliders, whereas the amateurs tend to lack the knowledge in use and are scared of the post editing process.

CONCLUSION

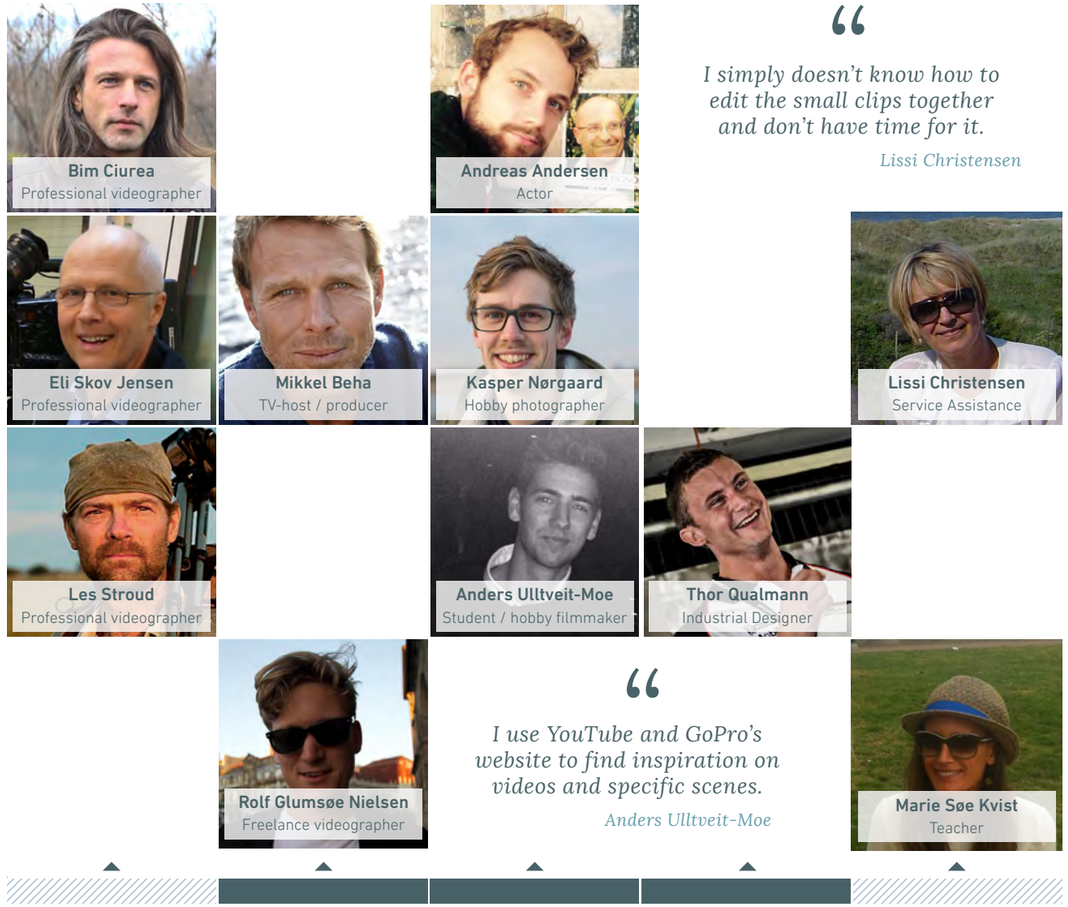
Our previous assumptions concerning travelers use of videography was confirmed. The film enthusiasts demand for DSLR cameras and System Cameras for video recording also confirmed our initial research in section 1.1.

1.5 TARGET GROUP

The team needed to get more information on the actual users of the camera equipment. Until now, the team had achieved a lot of basic knowledge on the equipment and the people selling it. The objective was to find more concrete critera from the users and to investigate if there are possible segmentations in the usergroup.

To get an insight in the users experiences with videography, what equipment they use and how they use it, several interviews were conducted. The interviewees differed from people with very little experience to people who use videography everyday. The reason being that the team wanted to know if some of experience and knowledge from the professional users could be applied or transferred to a product for the non-professionals.

The styles of the interviews varied from person to person. Still the structure was always the same as the group almost always used semi-structured interviews as this enables the interviewer stray from the already planned questions and follow up on an interesting answer. An example of a semi-structured interview can be seen in Appendix 7.4.



I simply doesn't know how to edit the small clips together and don't have time for it.

Lissi Christensen

I use YouTube and GoPro's website to find inspiration on videos and specific scenes.

Anders Ulltveit-Moe

Fig. 08: The interviewees arranged in order of experience.

From the interviews it was confirmed that most of these people use videography on vacations and travels to capture their experiences. During the different user interviews, a lot of initial problems were discovered (Appendix 7.5) One of these problems was discovered through an analysis of the extreme videographer Les Stroud, who is both the host and cameraman for the show "Survivorman". The analysis showed several problems (Appendix 7.6 for full analysis)**:**

- When he needed footage of himself walking, he had to walk long distances back and forth to the camera to achieve the big area shots
- Setting up camera equipment took 65% of his time

The team found these specific scenarios interesting as this user is interested in achieving some specific shots, but is limited by the equipment available. Knowing this is an extreme scenario, there are a lot of similarities to people who are traveling alone and want to be able to be in the shots as well.

An opportunity in creating a product that allows the 'one man' traveller to capture shots with his own presence

CONCLUSION

The interviews showed a lot of variance in the users experience as was expected. In an effort to understand the segmentation of the usergroup a graph was created as shown in fig. 09. The targeted semi-professional user is highlighted an shown in three segments as they differ from hobby filmmakers to more experienced videographers. Knowing that the transition between the groups is more interlaced the graph is divided more strict as this makes it easier to place the users in these categories.

REFLECTION

The team got a lot of information from the interviews, still are lacking some concrete data - more specific; observations on the users during filming. These observations were difficult to achieve, but from the interviews with the semi-professionals it was known that they seek inspiration from the professional videographers and try to achieve the same video outputs and quality of their work (see quote by Anders Ulltveit-Moe in fig. 08 on page 13). This also confirms our initial hypothesis on people's desire to achieve professionally looking results.

Before analyzing the work of professional videographers it is important for the team to understand what exactly are the factores that change an amateur looking video to a professional.

The initial hypothetis of the users wanting to achieve professional looking videos was confirmed

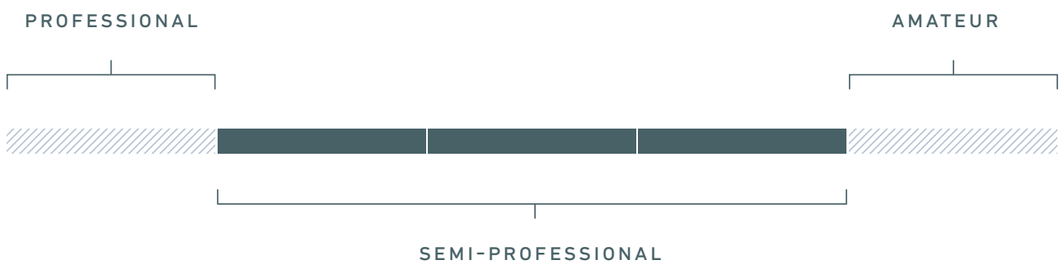


Fig. 09: Illustration showing the segmentation of the target group.

1.6 ANALYSIS OF PRO VIDEOS

To get an understanding of what the semi-professional videographers perceive as a professional looking video, the team analyzed different videos on YouTube – both amateur and professional. The objective was to look at different film techniques or more specifically, to see what kind of equipment and factors that was necessary to achieve different specific shots. Reasonable guesses were made on what equipment was used, based on the video output.

The team analyzed multiple professional videos, spanning from; Nordjyllands Trafikselskab's bus commercial, Go Pro advertisement, a bike trick video and others (Appendix 7.7 + USB 1.6). The bike trick video was especially interesting as this video showed a great variety of shots, which was something that played an important role in a lot of the videos. Changing between shots created a great dynamic feeling and kept the viewer interested.

With the knowledge achieved in section 1.3 the team listed the different shots and what equipment that are used.

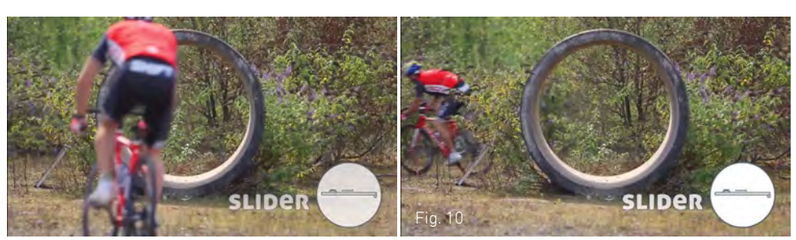


Fig. 10

THE SLIDING SHOT:

- uses a camera slider, where you pull the camera in a track to ensure perfect smooth motion

Fig. 11

THE STEADY SHOT:

- requires a static camera position - mostly achieved with tripods that can adjust in height

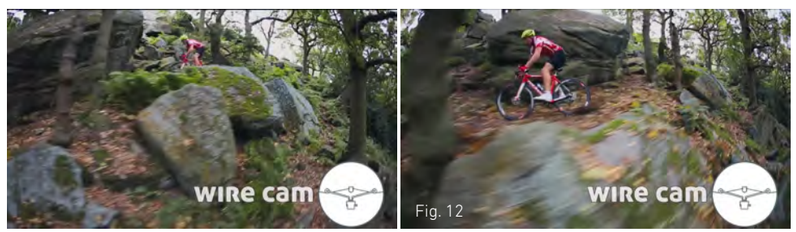


Fig. 12

THE LONG AREA SHOT:

- is basicly a long camera slide that requires wires attached on sorroundings and a camera sliding on these wires

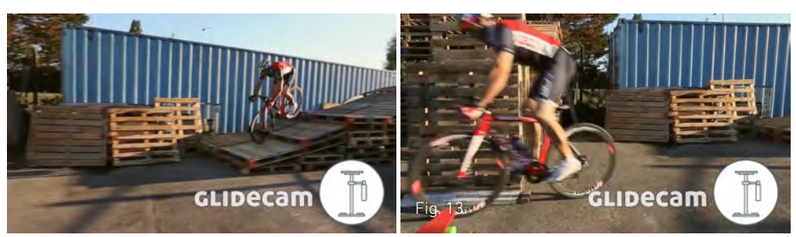


Fig. 13

THE DYNAMIC SHOT:

- used to capture movement and allows the videographer to follow the object in frame in a smooth motion

In addition to the professional video mentioned above, the team looked into videos posted on Dansk Studiecenter's website [Danskstudiecenter.dk, 2015]. They showed a great variance in quality, where it was very obvious that one was done by a professional and the other by an amateur. The videos show that the amateur was trying to achieve a lot of the same shots as the professional, but obviously was lacking the knowledge and time to achieve the same quality. See fig. 14 and fig. 15.

The team introduced the term: 'time vs. outcome' as there were a lot of indications in the DSC videos that the non-professionals are willing to make compromises on the quality if the time spend setting up equipment is reduced.

CONCLUSION

The analysis showed that stabilization and smooth movement of camera, is really the Alpha & Omega when differentiating from an amateur and professional video. Different factors affects the image stabilization:

- the vertical jump the videographer makes during filming
- the horisontal rotation of the camera
- post edited slow-motion makes the shakes less visible
- post stabilizing software can remove small shakes

These factors are important to be aware of in the future design process.

Stabilization in the video output is Alpha & Omega of having a professional looking result

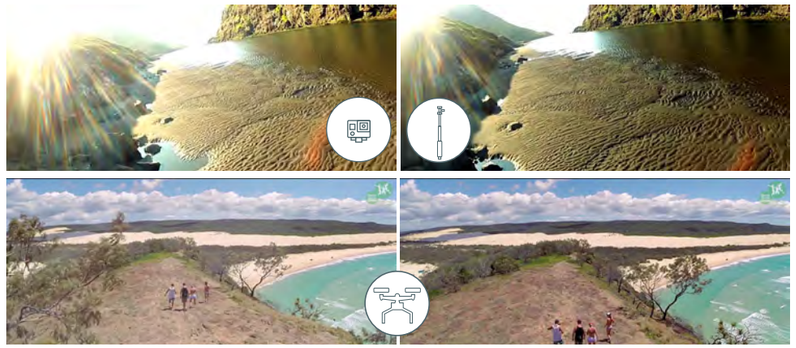


Fig. 14: Screenshot of DSC videos. The amateur recorded (top) shows an attempt of creating an area shot with an actioncamera and selfie-stick. See videos on USB 1.6.

Fig. 15: Screenshots of DSC videos that shows one of the main differences in a amateur recorded video (top) and a professional video (bottom). The above is shot with a handheld camera and the bottom either with a camera slider or a stabilizer with added after editing. See videos on USB 1.6 and full analysis in Appendix 7.8.

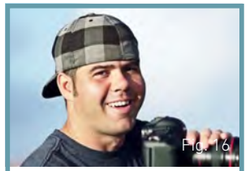


Fig. 16

devinsupertramp

3,063,463 subscribers
549,378,654 views

devingraham

635,497 subscribers
56,840,549 views

numbers from 30-04-2015

"

We love timelapses, we are always trying to push ourselves as filmmakers and try new things, so that's why we started doing more of those.

Devin Graham (Appendix 7.4)

Fig. 17

Fig. 18

weapons of choice

- Manfrotto 055XPROB Pro Tripod
- Glidecam HD-2000

"

Wide angle lenses are the only really options with a glidecam, otherwise the image will get to shaky.

Devin Graham [Graham, 2011]

1.7 DEVIN GRAHAM ANALYSIS

Devin Graham is a well-known videographer whose videos have been watched by millions. He is very active on YouTube and other social medias where he shows the whole process of making his short films. It was a great way for the team to get insight in the problems occurring behind the camera; what equipment and techniques are necessary to achieve the different shots (See full analysis in Appendix 7.9).

A lot of Devin Graham's videos are exploring different countries, trying to capture the essence and the beauty of the nature and culture. I.e. Devin's video from Peru is centered around the country's trademark destination, Machu Picchu. In the Behind the scenes video, Devin is carrying around his camera stabilizer, plus his assistant is carrying around his tripod (fig. 19). This is very heavy and large gear that is being transported around in the rocky terrain of Machu Picchu.

It was very interesting to see what shots Devin Graham is able to achieve, using only his Glidecam stabilizer and Manfrotto tripod. This was also what made the team question his use of post editing, relating to stabilization, but in an internet interview he says that only 5% of his shots needs post editing [YouTube1, 2015]. This is of course also a question of knowing your equipment and learning to use it.
A small questionnaire was sent to Devin Graham, with the focus of knowing his thought process before shooting his films and if there are specific scenes he finds interesting. The full interview can be found in Appendix 7.4.

CONCLUSION

The analysis and interview was very contributional to the project. It confirmed the importance of image stabilization, but also how variance in different shots, i.e. steady shot, area shot, dynamic shot and time-lapse, are ways of making videos more interesting. As seen on fig. 19, this also requires some man-power to carry around the different pieces of equipment. His signature way of adding a cinematic and professional feel to the videos, was his way of differentiating himself from other videographers, and to achieve this effect the majority of the shots are in some sort of movement.

Movement in each the shots add a cinematic and professional look to the videos

Fig. 19

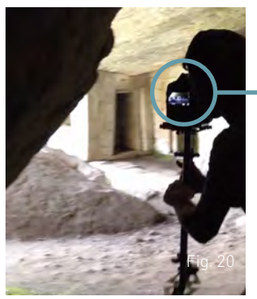


Fig. 20

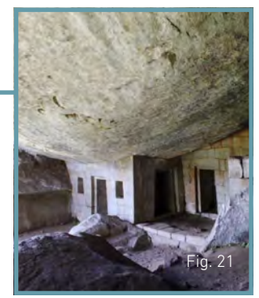


Fig. 21

1.8 CONCLUDING ON USER & SCENARIO

The interviews and analysis of different users, gave the team a lot of information and especially the insights from Les Stroud and Devin Graham has helped create a specific targeted user. Focusing on these professional users was based on the semi-professional way of seeking inspiration from the pros and desire to achieve the same results as them. The 'one man' traveler insight, made the team create some specific scenarios to understand what equipment is necessary.

Focusing on the scenario of this person going travelling alone, gave as mentioned, a lot of design criteria or insights in what types of equipment or output is necessary. As shown on fig. 23, the user needs to be able to shoot scenes with themselves in the shot. In addition to this, a solution for capturing moving time-lapses is also necessary. Lastly, as previously stated, the ability to capture stabilized shots while walking or running is a must for achieving a professional look.

Fig. 22

TARGETED USER:

- semi-professional/ hobby filmmaker
- loves traveling the world and share his/ hers experiences

CONCLUSION

Deliminating the long area shot, achieved by wirecams, was a deliberate choice as these shots are not shown that often. They require a lot of set-up time and specific surroundings to be able to use properly.

The three categories of equipment, shown in fig. 23, adds a lot of variety in the video and are necessary to achieve the videos the semi-professional user desires.

It was confirmed that these three pieces of equipement - more specific the output and movement of camera are crucial to achieve a professional outcome

Fig. 23: Three important shots to achieve a professional look and the equipment used for it. See videos on USB 1.8.

1.9 EQUIPMENT & CAMERA ANALYSIS II

Following up on the previous section, the team wanted to do an extended analysis on the three types of camera equipment; camera sliders, tripods and stabilizers. The objective was to give an idea of what the competitors could offer to the market and more important, what they couldn't offer.

To get a more hands on feeling of the products on the market, the team acquired two different stabilizers and multiple tripods to test. It wasn't possible to acquire camera sliders so analyses of these had to rely on videos found on YouTube. The tests of the tripods focused on set-up time and the size, both extended and non-extended. As the use of stabilizers was unknown for the team, the test of these was more to get a feeling of how they worked and how they affected the video output.

In addition to this, the team found it necessary to do an extensive analysis of the cameras used on these products; DSLR and System Cameras.

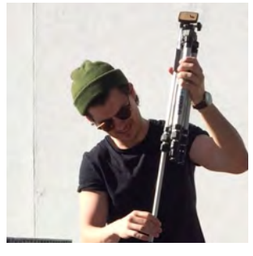
CONCLUSION

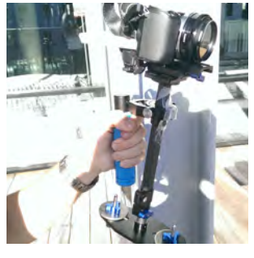
The hands on test of the tripods and stabilizers gave a lot of new insights to the products on the market. Especially the tests of the stabilizer showed that they are very difficult to use. It takes very long time just to get a somehow stable system before you can start filming.

The deeper analysis of the DSLR and System cameras gave insight in the max weight of the cameras being used. Based on information from the photo stores, plus knowing that bigger lenses won't work on stabilizers, the max weight of the camera as being bought by professionals was estimated.

The max weight of the camera are estimated to be 1,5 kg

Possibility to decrease calibration time of stabilizer





SLIDERS

+ Ensures a perfect smooth motion of the camera
+ Often modular build, so possible to extend length

- The larger sliders requires a lot of set-up time
- Big and heavy to carry around
- **To get height on the slider, one or more tripods are needed**

TRIPODS

+ Very flexible in height adjustment
+ Lightweight and easy to carry

- **Requires a lot of set-up time when extending legs, especially the twist lock with no feedback**

STABILIZERS

+ Makes the small jitter caused by walking more smooth

- The free 3 axis gyro makes it very difficult to control
- You need two hands to turn the camera while walking
- **First time user require more than 10 min to calibrate and to achieve a balanced system**

Fig. 24: Extensive analysis of the three equipment categories. Specifications on these can be found in appendix 7.10.

CANON EOS 7D MARK II

- 13.375 DKK
- 910 G
- 18-55 MM LENS: 205 G

TOTAL WEIGHT: **1115 G**

NIKON D610

- 10.999 DKK
- 760 G
- 18-55 MM LENS: 195 G

TOTAL WEIGHT: **955 G**

Fig. 25: Extract of camera analysis. See full analysis in appendix 7.10.

1.10 2ND MSC ID WORKSHOP

The team had the opportunity to use the course 'Technology and Form' of 2nd MSc Industrial Design students at Aalborg University, to research on technological epiphanies in the area of cameras and camera equipment. This was a great opportunity to get some fresh eyes on the subject, as you could risk being buried to much in your own project area (See extract of material in Appendix 7.11). In addition to the material from the 2nd MSc students the team decided to make a small research on the last 10 years of trends in cameras, based on the International CES Fair. The objective was to compare our own research plus the material from the course, as a way of concluding on phase 1.0, seeing if we missed certain technological epiphanies that were important for the concept development phase.

The course material didn't add any new insights that were useful to the project, which just confirmed that the team had covered the necessary areas of investigation. The quick trend research also confirmed some of the already discovered trends, i.e.:

- DSLR cameras are slowly replacing the video cameras, because of the superior "light capturability".
- Go Pro is taking over the action camera category – and tough to compete with their quality and market strategy
- Flying drones are increasing in popularity, but also raises a lot of questions in terms of ethics and restrictions

The full trend research from the CES Fair can be found in Appendix 7.12.

1.11 PHASE 1.0 CONCLUSION

The data gathered throughout the initial research phase are structured into the following design brief. To use this data as a guide throughout the concept development phase, important design criteria are highlighted. Although these criteria works as a point of departure, they are still very undefined, which makes it difficult to use as ways to deliminate future concept ideas. This is why ongoing research will be done throughout phase 2.0, to get more measurable criteria.

1.12 DESIGN BRIEF

PROJECT OVERVIEW

The project centers around camera equipment for the semi-professional videographer. Through a thorough research consisting of interviews, observations and analysis the focus was specified as creating a compact multi-functional product that allows the semi-professional user to capture more professional looking footage during their outdoor exploring.

The finished product is intended to be sold in professional photo stores, but as the product is directed towards travelers, it is considered that it could be incorporated as a part of a service at traveling agencies. This service could include rental of camera + finished product, guides to specific shots and post editing of video. This service could expand the target group from the semi-professional to also include the amateur videographers.

CATEGORY OVERVIEW

When designing a new product into a market as big as camera equipment, it is important to know your competitors and where your product stands out from the rest.

From the initial research the video outcome was narrowed down to what the output of tripods, sliders and stabilizers offer. There is a variety of these products on the market in different price classes. The finished product should somehow combine some of the functions that these three existing products offer, into one multi-functional product and in that way redefine how the end user is able to shoot footage during his traveling.

TARGET AUDIENCE

The team wants to create a product for the traveler who loves exploring the world. In addition, this person has an interest, as most people do, in capturing these experiences on camera so he can relive these special moments after his travels.

As videos become more and more popular on social medias, this person has a big interest in achieving the best results and seeks inspiration in professional videographers' work. This person is therefore willing to use money on a DLSR camera and equipment so he can get the shots he needs.

"How can we enable people to have an individual, yet professional outcome of their video footage, while using compact semi-professional equipment on their travels?

The criteria found is listed below. Some are very unmeasurable, but areas the team know needs further investigation:

- Compatibility with DSLR & System Cameras
- Support a weight of max 1,5 kg
- Size
- Stability
- Flexibility for different use situations
- Adjustability
- Ease of usage
- Minimal assembly time
- Protection against: weather, sand etc.
- Price range
- Allow different kind of camera shots
- Multi functionality

Enhancing the joy of video making!

our vision

Allowing people to capture the essence of their experiences everywhere!

our mission

PHASE **2.0**

CONCEPT DEVELOPMENT

Phase 2.0 covers the development of concept ideas. The point of departure is based on the work done in the research phase. Using all this information, different concepts are investigated and tested, were technology, interaction and shape are considered along the way.

The outcome of this phase should be a fully developed concept, with only minor details missing. It is difficult to not consider some of the details throughout the concept development, therefore the transition between phase 2.0 and 3.0 is more interlaced.

Fig. 26

2.1 SKETCHING SESSION I

The achieved knowledge and insights from the research phase pointed very much in the direction of creating a multi-functional product enables the user to capture professional looking shots. Until know the team had focused on specificly the moment when the user is filming. In an effort to explore different directions for the project, the whole user scenario was expanded to see if certain problems before or after filming, occurs.

Fig. 27: Illustration showing the steps around the actual filming.

Using the created fig. above as a point of departure the team focused on the moments leading up to shooting the footage and the moments after. The team used different structured sketching sessions to generate as many ideas as possible. In the end of each session, the output was evaluated in terms of potentials.

OBJECTIVE - INITIAL SKETCHING
During the research phase some ideas had been building up. The objective with the first session was to get these down on paper.

REFLECTION
Some ideas had potencial, but the team was still focusing a lot on the specific moment when filming and thinking of existing equipment, i.e. a lot of tripod looking sketches was drawn. (See more sketches in Appendix 1.13)

OBJECTIVE - NOUN SKETCHING
In an effort explore some really crazy ideas, the team used random nouns and generated ideas that could be used as camera equipment. A time limit on 2 min. for each sketch ensured immediate ideas.

REFLECTION
As expected the team created an variety of ideas, where the majority of them where just to unrealistic to use. But a couple of sketches had some potential and was further developed. (See more sketches in Appendix 1.14)

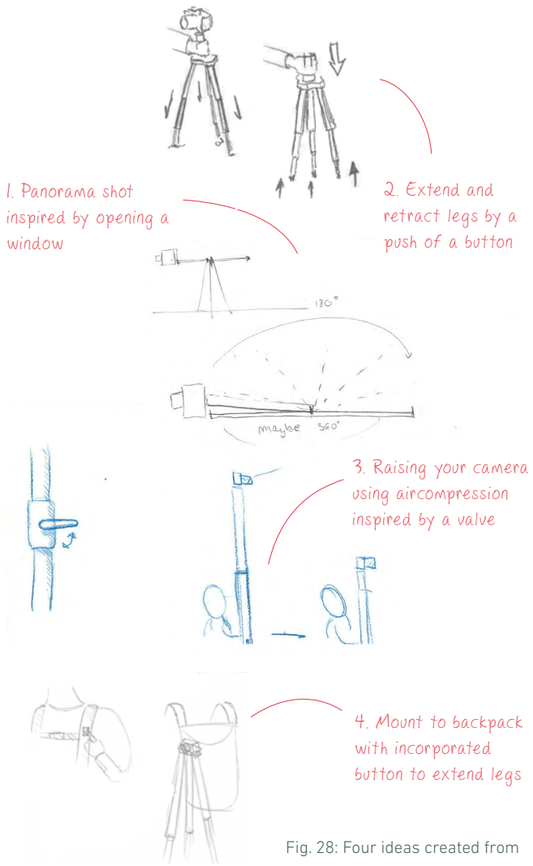


Fig. 28: Four ideas created from the first sketching sessions.

CONCLUSION
The team found potential in the three sketches in fig. 28. Sketch 1 inspired by an opening window created a new way of achieving a panorama shot. Sketch 2 was created during the initial sketching session and focused on minimizing the set-up time by extending the legs of a tripod by a push of a button. Sketch 3 was a way to achieve higher shots by using an air compression system. Sketch 4 took into account the user's backpack, again trying to minimize set-up time.

REFLECTION
Evaluating the first sketching sessions it was clear that the team still still kept coming back to existing looking products. As the sketches in fig. 28 shows, three out of four ideas looks like tridpods. It was decided to be more focused on what the video output of the future product would be.

The team needed to focus more on the specific video output the future product can produce

2.2 SKETCHING SESSION II

From the research done in section 1.6, the team knew the different video outputs used by professional videographer. Trying to focus on the movements of the camera rather than the equipment used, an additional sketching session was conducted.

OBJECTIVE - OUTCOME SKETCHING
To sketch ideas that were focusing on the video output rather than the actual product.

REFLECTION
Made the team think differentely - not about the product, but what can it do. The session produced some some good ideas, especially the idea shown in fig.30 was later tested and further developed. (See more sketches in Appendix 1.15)


Fig. 29

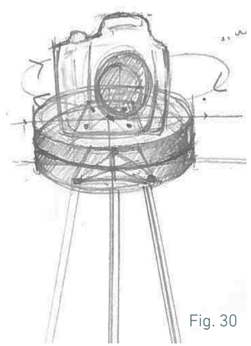


Fig. 30

The sketch in fig. 30, was an intentioned to create a 360 degree panorama shot. This idea led to a quick research on product that can produce a similar output. The team came accross the egg-timer time lapse DIY device on YouTube [YouTube2, 2015], and created a quick functional model to test the results. See the results on USB 2.2.

SUM-UP OF SKETCHING SESSIONS

Having done many different sketching sessions, the group felt the need to pin-point the most useful sketches and keep those or further work on them. That way we were able to have the sketching process work like a funnel where the ideas with most potential would be further developed.

At this point the group felt it had two choices regarding the future of the project: one was to combine all functions that proved to be so essential into one product, as there isn't anything like that on the market at this current time and the second option was for the group to pick out the three main ideas; the air compression with the rotational function on the top, the backpack and lastly the stabilizer, which from the research phase seemed crucial to the video output.

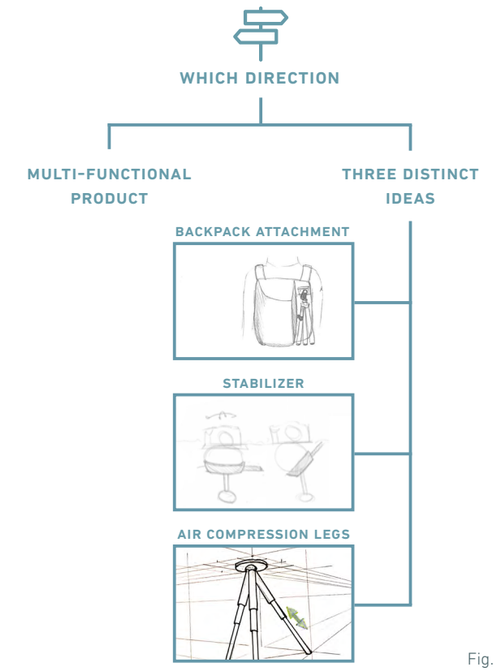


Fig. 31

CONCLUSION
The team initially feared that 'just' creating a product with all the functions of the three ideas, would be the easy solution to fullfil the users needs. Therefore it was decided to further develop one of the three distinc ideas.

A further understanding of the three distinct ideas was needed to justify the future choice

2.3 THREE CONCEPT IDEAS

Exploring the three different ideas, the team revisited fig. 27 on page 23 and placed each of the ideas in the timeline. This gave an idea to which point of time the user would interact with the future product.

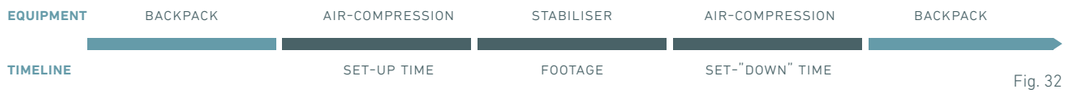


Fig. 32

Each of these three options seemed to have a lot to offer so they had to be broken down and worked on individually.

AIR COMPRESSION SYSTEM
- A very fast and easy set up and packing up time - advantage comparing to existing products on the market.
- Easy set up on different types of ground where legs are not at same level or hight.

CONCLUSION
- Further development; can solve a big problem regarding fast set up/down time.

BACKPACK SYSTEM
- Possible to focus on the whole situation and not just the actual time when theuser is filming
- Have incorporated a quick release system, so the camera can be easily taken and used
- Used as counterweight for tripod

CONCLUSION
- The backpack is not as essencial for a good video output as other equiment (fig. pp), it's not actively influencing the video. Also it is already widely spread on the market, creating a small demand for the product, therefore the group decided to abandon this idea.

The backpack concept was deliminated based on the competetive market and lack of added value to the video output.

STABILIZER
- Crucial part of the video looking more professional
- Faster way to calibrate then what's on market today
- If the objective changes, there must be a new calibration

CONCLUSION
- Every equipment the team chooses to work with, it has to have a stabiliser incorporated.

FURTHER DEVELOPMENT

The group was faced with two distinct ideas, both based on air compression. Fig. 33, is a tripod solution with a panorama function on top. Fig. 34 is an extendable tube, that enables the user to achieve sliding shots by extending the camera horizontally using aircompression.

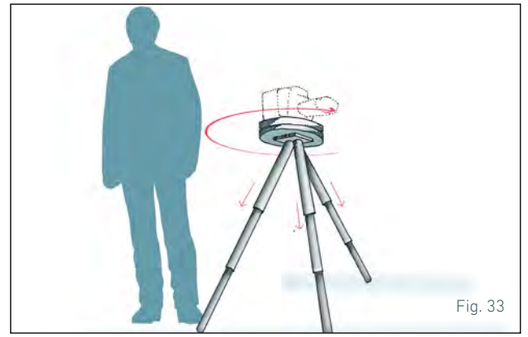


Fig. 33

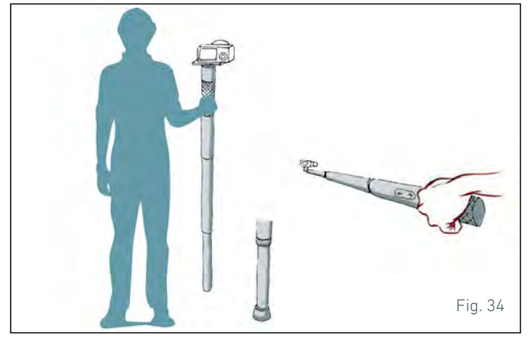


Fig. 34

The team wanted to test the usage of the concept idea on fig. 34, as there was concern about the weight added by the camera. A quick test was conducted.

PURPOSE OF TEST
To test the concept idea on fig. 34, and see if it's possible to hold the simulated weight of the product.

EXPLANATION OF TEST
An extendable center coloumn from a Velbon tripod was used as the pan-head was heavy enough to simulate a camera. The test person would fully extend his/her arm and see for how long they could hold the tube (see fig. 35).

CONCLUSION OF TEST
The test showed that it was nearly impossible to keep your arm steady for more than a minute. Imagening the weight of the camera extending further out, thereby making it a lot heavier, was enough to quickly delimate the idea.


Fig. 35

IMPROVISED BODYSTORM

Using the Velbon tripod in the test above, led to an improvised bodystorm, shown in fig. 36 and fig. 37. (See Appendix 1.16 for full bodystorm)


Fig. 36


Fig. 38

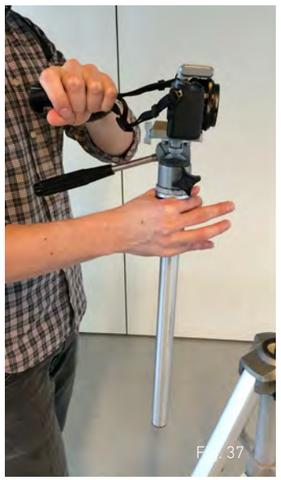


Fig. 37

Having the Velbon tripod tested and a previously discovered Manfrotto tripod with a rotating head, made the team reconsider, the choice of direction on page 24. The bodystorm created the idea of using an an inner center coloumn as an detachable stabilizing part. This newly found insight made the team redirect their project direction.

CONCLUSION
From the research phase, everything pointed in the direction of creating a multi-functional piece of camera equipment, but as a way of making sure the whole user situation was considered the team tried to explore other options. Through some different ideation processes the it was decided that the actual footage time (fig. 32) is going to add most value to the user.

It was confirmed that a multi-functional product is adding most value to the users filming experience

REFLECTION
The sketching sessions was a great way to quickly get the ideation process going and a lot of concepts was considered during. Still interacting with existing products during the bodystom was crucial as it really helped the team discover an opportunity; to create a product that could be used both for steady shots and dynamic stabilized shots.

2.4 MULTIFUNCTIONALITY IS KEY

It was decided to move forward with a multifunctional product (fig. 40) as there is nothing similar on the market and there is a clear need for the semi-professional videographers who go hiking and do not have the means to take too much equipment, but would desire the variety of outputs from these types of equipments, as seen up until now.

Some of the components have been worked on from previous ideas and therefore it was obvious the need for them i.e. egg timer pano, air compression and stabilising the shot.
From the beginning there was a core part of the equipment that would center some functions. The initial thoughts were for the equipment to have 3 outputs problems to solve: having a steady shoot while walking, a rotating function and the possibility to make a time-lapse. One of the first ideas regarding a multifunctional product are seen in fig. 39. This of course would be later developed and changed according to all the various test that will be done.

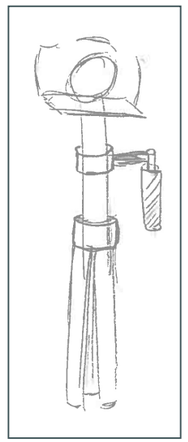


Fig. 39: Stabilizer concept with closed legs

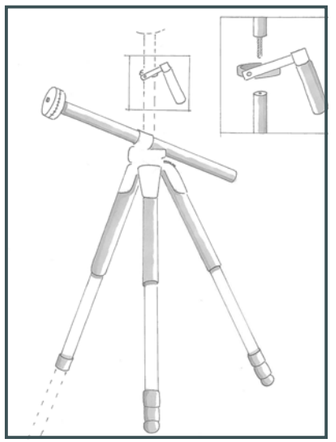


Fig. 40: Concept idea with extendable legs and removable stabilizer

PARAMETERS

In order to help understand and overcome these difficulties, some graphs were drawn to show the parameters that would change and influence the product.
If one parameter would increase, the other side would have to decrease, if the mobility is high, then the weight has to be low, so the user can carry the equipment easily without worrying about it being too heavy and so on for all. But if one parameter changes, so do all of them i.e. if the mobility high, it also affect the size and the price, so they are all interconnected. By visualising these parameters, it was easier to keep track of all the compromises that were about to be made during the design process.

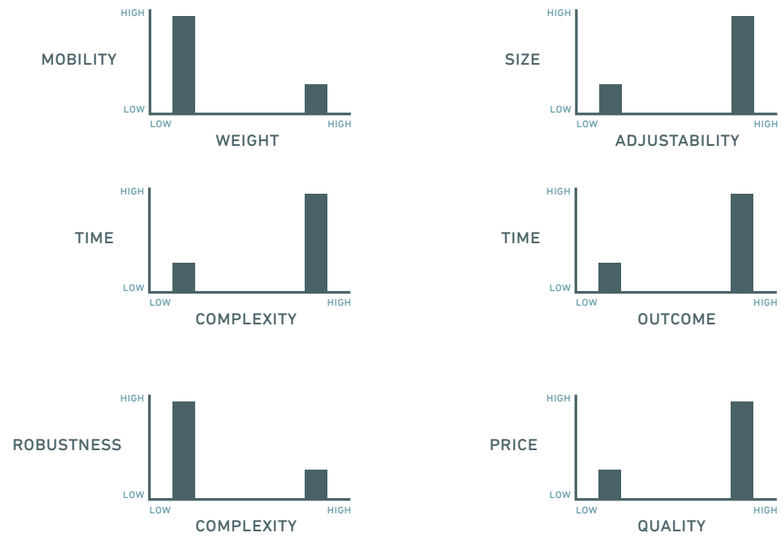


Fig. 41: Parameters that are affected.

2.5 BODY STORMS

INITIAL BODY STORM

To follow up on the teams last succesful bodystorm, it was decided to look into other product and interact with these to see what works well and get a feel of the movement the user has to make to get the output he wants.

The first body storm was initiated in a classroom in the school. From this came new ideas and criteria that the group found regarding different parts of the equipment. For example the fact that the legs should open individually and at different arc sizes (fig. 41). After the first body storm the group went back and tried to solve some of the issues that have been pointed out.

Fig. 42: Individual leg opening.

Fig. 43: Quick release system.

HARBOUR BODY STORM

From the inspirational Manfrotto tripod on fig. 38, a cardboard model was created (fig. 44) to test an how this could be used to create a sliding function.

During this one as well, many possible features were still discovered and also some of the previous ones tested. The outdoor body storm made us understand that filming people/objects that are moving are more difficult then the static ones we filmed in the classroom before. See Appendix 7.18 for full test.

Fig. 44

INITIAL BODY STORM CRITERIA

- Handle placed high on slider
- Legs should open individually
- Quick release system

HARBOUR BODY STORM CRITERIA

- Legs should be adjustable at different heights
- Safety feature for slider

An updated list of critera that are better defined is needed.

2.6 THREE KEY PARTS

As this first idea was created, it was obvious that this product would be a difficult one, in terms of making all the different parts work well together and create a harmonious product, both in terms of functions and aesthetics.

Most of the functions of the product were thought of and tested by doing the two body storms, and we had a general idea of how the product should look like and consist of (fig. 45). To simplify the process the product was divided into three distinct parts and worked on simultaneously so that everything would fit together well and will not be any surprises at the end. The three parts are the following: the stabiliser, base and legs. In this report each of these parts are going to be presented separately, just to ease the understanding, enethough they were worked on together. Each part had models and test that will be presented.

The team was inspired by existing mechanisms and therefore it was set as an objective to use those when possible, not to reinvent the wheel if it was not necessary.

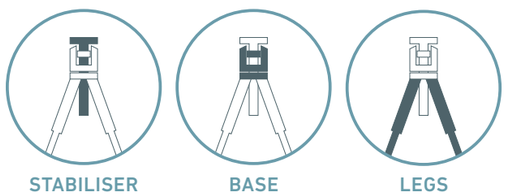


Fig. 45: Showing the three key parts of the future product.

2.7 UPDATED DEMANDS

BASIC DEMANDS	DEMANDS NICE TO HAVE	WHICH TASK DID THE DEMAND COME FROM
• Compatible with system camera + DSLR cameras	• Go Pro, Smartphone (avoid extra mounts)	• 1.4 Expert interviews
• Stabiliser weight: aprox.1 kg • Targeted total weight of equipment: >5 kg • Camera weight range (stabilizer): 0 - 1,5 kg • Camera weight on tripod: 3 - 5 kg		• 1.6 Analasys of Pro video + app. 7.7 & app 7.10 for both weights. • 1.9 Equipment & Camera analasys II • 1.9 Equipment & Camera analasys II
• Size (with camera): Folded: < 600 mm Extended: >1500 mm	• < 500 mm	• 1.4 &1.5 Expert Inteviews Target Group
• Nr. of extensions: 3	• 2	• 1.4 &1.5 Expert Inteviews Target Group • 2.1 Sketches and ideation
• Length of stabilizer: < 420 mm		• Initial Body Storm
• Wanted output: Moved stabilized shot Static shot	• Moving timelapse • Horizontal & vertical slide • Panorama	• 1.6 Analasys of Pro videos
• Individual leg length • Individual angle of legs • Min. setup time (experienced): 20 sek. • Ease of assembly (nr. of movements): 9 interactions (3/leg)	• 6 interactions (2/leg)	• Harbour body storm • Harbour body storm • 1.9 Equipment & camera analasys II • Both body storms
• Material should stand weather conditions • Price range: 2000 - 3000 DKK • Use each part individually (stabilizer & tripod) • Timer feature: Adjustable speeds: 3-4 Free rotation of top part • Fixing of camera strap • Quick camera release • Adjustable weight in stabilizer		• Harbour body storm • 1.9 Equipment & camera analasys II • Initial Body Storm • Outcome sketching session
• Adjustment of camera (centered) Stabilization in x & y axis • Slider locking mechanism of stabiliser. • Adjustable head (angling of camera)	• z axis	• Harbour body storm • Harbour body storm • 1.9 Equipment & camera analasys II & Harbour body storm • 1.9 Equipment & camera analasys II
		• Harbour body storm • Harbour body storm

PRODUCT VALUE PROPOSITION

WHAT DOES AKILA DO

•multiple output possibilities
•compact product
•durable in outdoor weather
•compatible with smartphones

HOW DOES AKILA WORK

•stabiliser function
•slider function
•panorama possibility
•time-lapse
•stable static shot
•jib function

WHAT DOES IT FEEL LIKE TO USE AKILA

•Akila is intended for semi-professional users, but others can use it as well
•It works well even if used by one person, as they can be in footage
•Easy interface, therefore it's fast to learn to use.

2.8 STABILIZING FUNCTION

From the bodystorming session the team had a vision of the stabilizing handle being incorporated into the extension part, knowing that the basic principle of stabilizing a camera is moving the inertia moment away from the camera. The following chapter explains the process of developing the stabilizer, plus an added feature of using this as a slider function. As the stabilizer is being developed parallel with the base of the product and often being influenced by its shape and function, important inputs are highlighted in the timeline in fig. 59.

As an introduction to the chapter and development of the stabilizer it is important to differ between what our future solution are able to do and what post editing effects like Warp Stabilizer can do. The Warp Stabilizer is an effect that can be applied to a video clip in Adobe Premiere Pro. It works by trying to track and move the pixels in an image to make it more stable. This can be very useful, but also create a very 'woobly' clip where you get the feeling of sea sickness, if the original clip is too shaky.

The gyroscope is a solution used in most stabilisers on the market; it's a spinning disc that can rotate freely so no matter how it's turned, it keeps it's orientation because of angular momentum [Hyperphysics, 2015].

PURPOSE OF TEST
To test the limitations of Warp Stabilizer.

EXPLANATION OF TEST
Using different filmed footage, each with different levels of shakiness, and afterwards adding Warp Stabilizer to each of them, the team gets an idea on how stabile the video output of the future solution should be.

CONCLUSION OF TEST
It was clear that the Warp Stabilizer can remove a lot of the small jitter caused by a shaky hand. Still it has its limits. The team needs to be aware of the future solution could compromise on the time used on getting ready to film versus how well the stabilization works, as post editing with Warp Stabilizer can add the extra smoothness to the video. (See video in USB 2.5)

Too get an idea on how well existing stabilizers work, plus to set up some measurable limitations on what the team wanted to achieve with their solution, a test was created. Using two existing stabilizers and a functional model using foam as a dampener, had a starting point of the development of the stabilizer.

PURPOSE OF TEST
To see how smooth our solution - a handle with foam inside to help dampen the movement, makes the camera motion compared to existing solutions

EXPLANATION OF TEST
A visible point in was put on a white wall while a team member walked towards the mark with a filming camera on a stabilizer. The video output was then analyzed in Adobe After Effects where a tracking of the cameras ability to follow the mark on the wall. The output is a graph, where the curvature of the line shows the change of direction of the camera and the length between the dots shows the speed of these changes.

CONCLUSION OF TEST
The test showed a clear improvement using the foam solution with added weight, compared to using no stabilizer. Still the solutions could not compare with the gyro handle on the existing stabilizer. Still the improvement is more than enough to enhance the quality of the video output, especially with added post stabilization editing. See Appendix 7.19 for an extract of the test and calculations.


Fig. 46

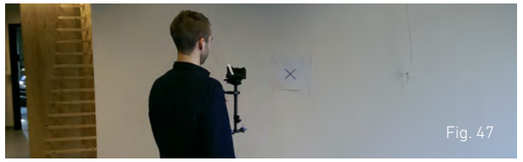


Fig. 47

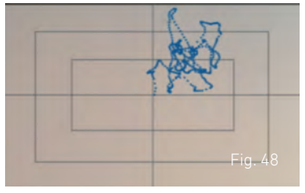


Fig. 48


Fig. 49

During the test, the team tried different varieties of foam and had a general idea on what density it should be as it shouldn't be too har, but not to soft. A quick test was performed to give a basic knowledge on the different densities of foam.

Fig. 50

PURPOSE OF TEST
To test the different densities of foam (Full test in Appendix 7.20)

EXPLANATION OF TEST
Three different foams, were tested by dividing the foams volume with its mass. The three different foams density was all between 29 and 33 kg/m^3.

CONCLUSION OF TEST
Considering the errors of mistake involving the uncertany of the scale, the team found an estimate of the used foam density, and will be used when estimating prices.

As showed in fig. 59, the team was inspired on the functionality of a Manfrotto Tripods head movement. This led to incorporating a previously removed function to the stabilizer; the sliding function which video output should copy that of a camera slider.

This added some new difficulties to the shaping of the stabilizer as the handle containing the foam, should be perfectly incorporated (fig. 53) to ensure a perfect smooth motion through the ring in the base.

Trying to ensure a smooth motion through the ring the handle went through several iterations as shown on the images below:

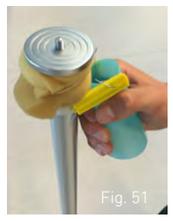


Fig. 51


Fig. 52

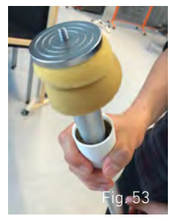


Fig. 53

As the shape and function of the base changed, so did the shape of the stabilizer. Using an inner track and adding a clear surface that interacted with the base, there were no limitations on the diameter of stabilizer handle as long as the inner track was open as shown on fig. 55. The handle size is later tested and can be seen in Appendix 7.22.


Fig. 54


Fig. 55

Fig. 56 is what we call as Thor's hammer and works by having an inner part that slides. Shown in fig 55.
The team decided to use already existing mechanisms for the upper part of the stabilizer. The selection process can be seen in appendix 21. The ball head gives the user freedom in positioning the camera in different angles, while the quick release adds value in quick attachment of camera. The upper plate shown in fig. 58, makes it possible for the user to center the camera, which is neccesary to ensure balance. As seen in all the stabilisers on the market.

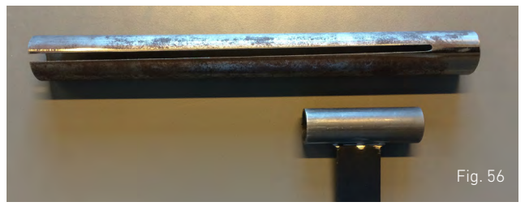


Fig. 56

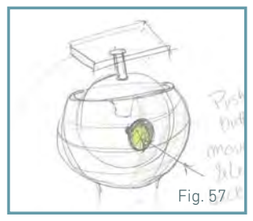


Fig. 57

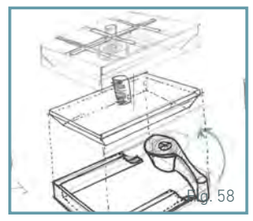


Fig. 58

Fig. 59: Timeline showing the development of stabilizer.

2.9 THE TIMER / BASE

From the first inspirations of the many DIY videos on YouTube of people turning their egg-timer into a way of achieving panoramic time-lapses, the team was trying to incorporate this function into the product. As mentioned in previous chapters the video output was tested both on the harbor of Aalborg and project work. These results can be seen on USB 2.6. Confirming the functionality of the mechanism the team saw this as a great way of achieving moving time-lapses and coming close to the video output of an electronic camera slider.

The base is the core of the product and it acts as the main component from where most functions start. This part should be where the rotation function, time-lapse & slider are and be the part that holds the stabiliser.

The first iteration of the base was more a direct transfer of the egg-timer mechanism on to a three legged air compression system as shown in fig. 68.

As mentioned in the previous chapter the body-storming session, plus the inspiration from Manfrotto's tripods, it was discovered how an inner extension tube could be used as a secondary functional stabilizer / slider. This led to another iteration of the base as new criteria immerged:

- the base should include a top part that you can move freely
- the top part should include a fixture where the extension tube can slide through smoothly

The newly added functions obviously changed the shape of the base as shown in fig. 68 To get an understanding of the functionality it was important to test a physical model. A cardboard model was used in the first test, but as the materials stiffness made it difficult to test the functions, a rough 3D printed model was used to test the quality of the video output.

During this body storm, the team found a new function for the product and that is a jib function. This is basically a smaller version of a crane. The function of these are shown in fig. 62, where counterweight ensures an arc movement of the camera.


Fig. 60

PURPOSE OF TEST
To test the functionality of the base / timer.

EXPLANATION OF TEST
Using a 3D printed model, plus adding this to existing tripod legs, different shots was tried out.

CONCLUSION OF TEST
A lot of the outputs were surprisingly good, considering the inner surface structure of the 3D model.

Still two main concerns was raised during the test. Firstly, how does the user activate the timer for the panorama shot? And secondly, the stabilizer handle needs to have a perfect transition in the tube to secure a perfectly smooth sliding motion. (See videos on USB 2.6)

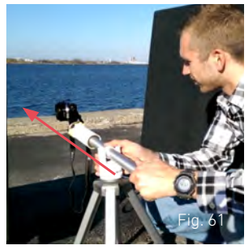


Fig. 61


Fig. 62

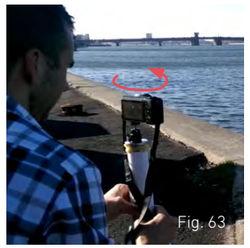
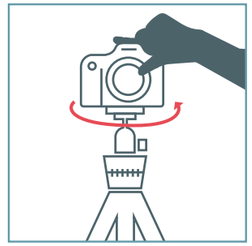


Fig. 63

USER SCENARIOS

The team decided to set up three different user scenarios to get and understanding of the pros and cons of having a mechanical system vs. a digital.

USER SCENARIO #1 **MANUAL TURN OF TIMER (1 SETTING)**



+ Tangible interaction
+ Easy to use / intuitive
+ No batteries
+ Cheap in production

- 1 direction / 1 speed
- Complex mechanical solution - fragile

USER SCENARIO #2 **BUTTON DISPLAY (MULTIBLE SETTINGS)**

+ Easy to use
+ Multible speeds
+ 2 directions

- Batteries
- Still predetermed
- settings
  Added weight / complexity / price

USER SCENARIO #3 **WIFI CONTROL (ENDLESS SETTINGS)**

+ Endless settings
+ Activate from a distance

- Long set-up time
- Batteries
- Added weight / complexity / price

Fig. 64: Three different user scenarios

In addition to the user scenarios, two cardboard models was made with and diameter on 90 mm as an effort to make the base as compact as possible. The models contained rough shapes of what the mechanical solution would contain and what the digital solution would contain. Fig. 65 contains a stepping motor, batteries, cog-wheels and printboard. Fig. 66 contains; a cog-wheel and two coils as an effort to achieve two directions.


Fig. 65


Fig. 66

Based on the user scenarios and the complexity of making a mechanical solution with two directions it was decided to eliminate option #1. Concerned about the set-up time in option #3, the team created a quick test based on the Go Pro App.


Fig. 67

PURPOSE OF TEST
The objective of the test was to see, how long it takes to setup and start a recording using a remote controll to the GoPro.
The test was done with the use of the phone app.

EXPLANATION OF TEST
First the GoPro was turned on, while the app started. Then the wifi on the GoPro was turned on. Waiting until the app found the GoPro. Adjust the setting - From 30 fps. to 60 fps. Push record on the app.

Manual time: 7 sec.
Total time: 1 min & 13 sec.

CONCLUSION OF TEST
The test showed that from connecting the phone with the camera to changing the video output of the Go Pro, over ## sec. past and this would destroy the initial criteria of a quick set-up time. See full test in appendix 7.19B.

This left option #2 where predefined settings creates a quick way of start shooting panorama shots or time-lapses in different dicrections and speeds.

Fig. 68: Timeline showing the development of the base.

Finishing up the function of the timer, it was important knowing what speeds was necessary to achieving a smooth panorama view, but also a slow moving time-lapse. In order to figure out the speed the team had to figure out what does out user would like to take time-lapses of. As our user is a traveler he/she would take advantage of the nature and in the nature most things are static, so there is no time limit, except for the sun.

That is why the team decided to look at sun sets and rises in order to figure out what speeds should our time-lapse function have, this speed is based on the recorded time-lapses with the egg-timer (See time-lapses on USB 2.2). As the egg-timer takes 1 hour to rotate 360 degrees it seemed to be a bit too quick if the user wanted to i.e. capture a sunset or sunrise. If we slowed the rotation down to taking 2 hour to rotate 360 degrees it would be possible to make the camera rotate 90 degrees on ½ hour, as this seems fitting to capture everything without the sun going out of frame.

To find fitting speed for the panoramic rotation a test was performed:

PURPOSE OF TEST
To test what speed seems pleasing for the eye when rotating camera.

EXPLANATION OF TEST
Different speeds where tested in a 180 degree rotation. These were then compared to each other.

CONCLUSION OF TEST
While 22 sec per. 180 degree rotation seemed a bit to slow and 18 sec. where a bit too fast it was decided that 20 sec. per 180 degrees was the best result for a panoramic view. See full video test on USB 2.6.

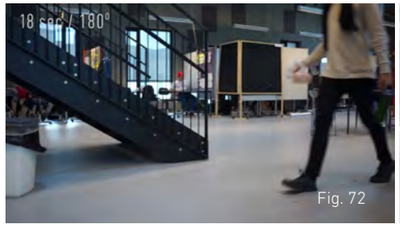


Fig. 72

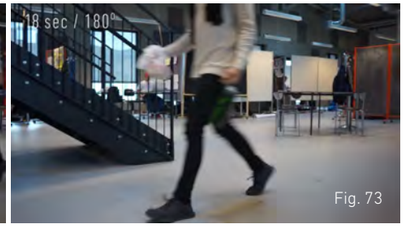


Fig. 73


Fig. 68


Fig. 70

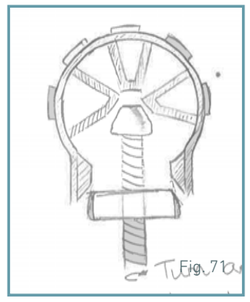


Fig. 71

As shown on fig. 68, point 5, the upper part of the base changed as the slider function now relied on an inside track connected to a rotating mechanism which is shown in fig. 69.

By creating an inside track for the slider to slide in, the team had to consider how the opening could avoid attracting dust or sand, while filming outside. By having dust and sand inside the slider would impeed "Thor's hammer" from slideing smoothly and therefore the footage would suffer by jumping at times.

Different options where considered, i.e. small rollers on the side of "Thor's hammer" that would minimize the friction from the sand, but unfortunatelly it wasn't a good enough solution; another idea was a small foam cleaner at the top, to swipe out the dirt, but because of the small size this would do more harm then good, by pushing all the dirt upwards and getting it stuck there.

A third and final option was chosen to further develop; creating three points on the side, working like an ice ship principle, pushing the dirt to the side. This way there is a special place where the dust and sand can fall through withought affecting the slider and implicitly the footage.

2.10 THE LEGS

The legs were essential for the product to stabilize the entire product and adding height to the camera no matter the surroundings. They also were a necessity to highlight and show the added value of the base and slider. With that in mind, when the air-compression leg extension was delaminated because of complication in the development, the legs were decided to be made with already existing mechanisms.

The development of the legs was divided into three important functions.

1. The angling of the legs and connection to the base part.
2. The extension of the legs.
3. The legs feet and connection to the ground.

Before going into the details in each function, it was important to find how many extensions was needed and how long each extension should be to ensure the necessary height. A quick test was made:

PURPOSE OF TEST
To test how many extensions is needed to ensure a minimum height of 150 cm.

EXPLANATION OF TEST
A quick cardboard model was created with three extensions with a length of 500 mm.

CONCLUSION OF TEST
With a length of 500 mm pr. extension with an added extension of the stabilizer it was more than enough with three extensions and could be possible to cut off the length. Still it was found that the transition of each extension require a certain length.


Fig. 74

1. Based on the body-storming session and analysis of different tripod models, their were some clear criteria on how the legs should extend. I.e. individual angling of each leg to ensure different positions no matter the surface. Based on these criteria it was decided to go with the incorporated cog-wheel in the base as showed on fig. 76.

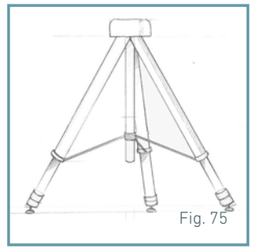


Fig. 75

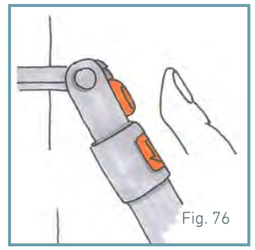


Fig. 76

2. The extension of the legs is a very time-consuming activity when setting up existing tripods, as the team found out in section 1.9. Based on this it was decided to incorporate the mechanism shown in fig. 78, as this was clearly the fastest to extend but also the clear feedback this solution gave.

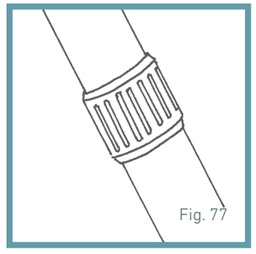


Fig. 77

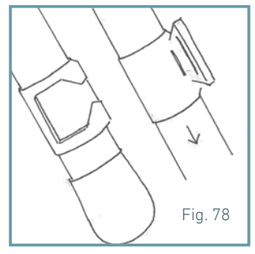


Fig. 78

3. The choice of an individual angling of the legs also made it possible to angle the legs in an almost 90 degree angle. This generated a clear requirement for the feet, as these should be able to grip to the surface in any angle. Based on this a rounded rubber foot was chosen, as shown in fig. 79.

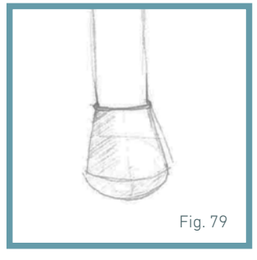


Fig. 79

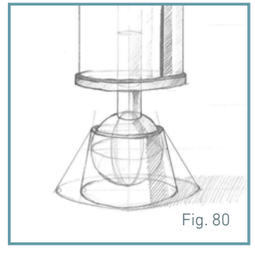


Fig. 80

2.11 SUM UP

The functions of the product are at this point clear to the team, with only the detailing left. But knowing that the multi-funcionality of the product would differientate it from existing camera equipment, the team also wanted it to look like it stood out from the rest. As for now the three legs of the product created a concern of being placed in the 'just another tripod' category. This led to a study of the specifc users and creating an identity of the product.

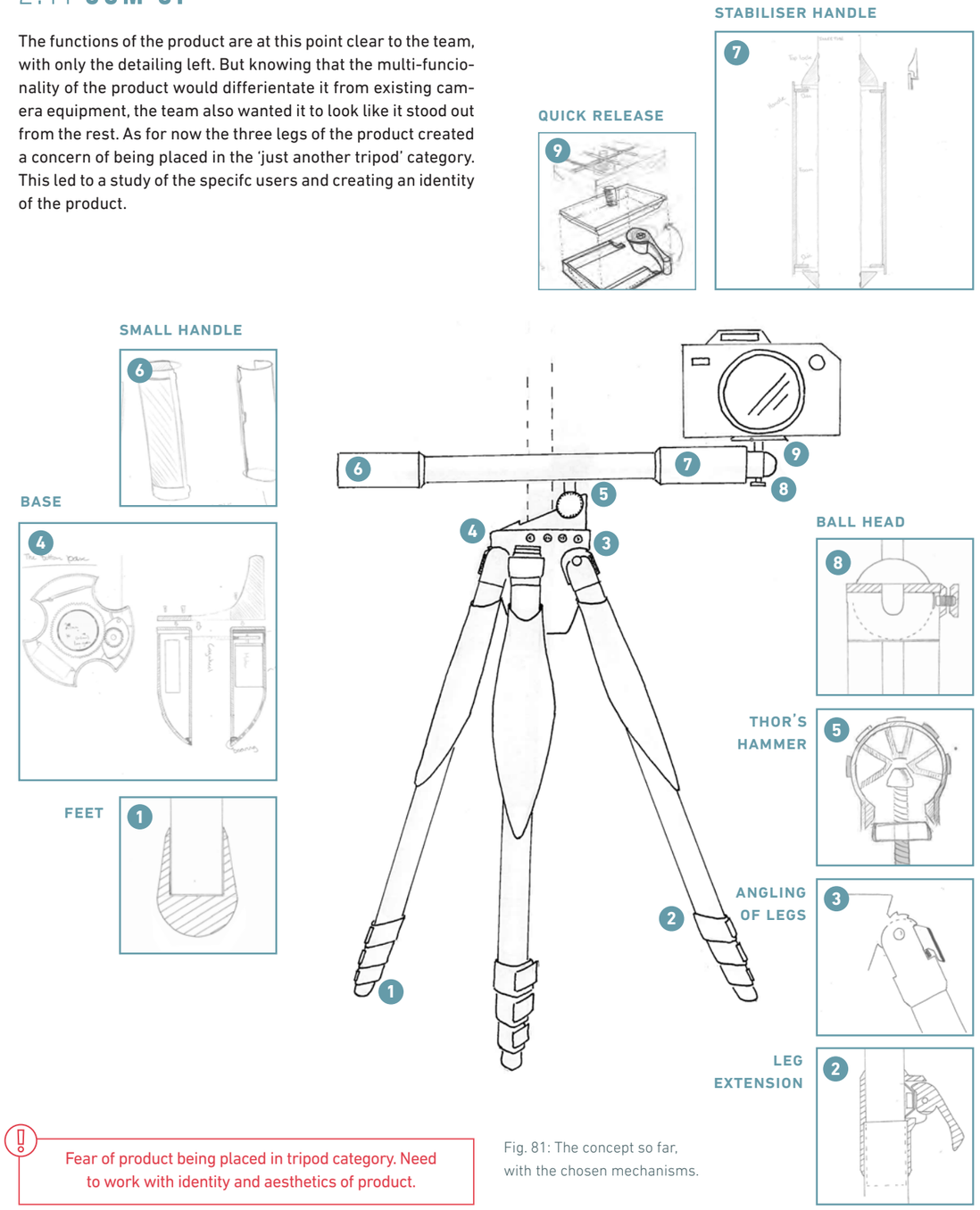


Fig. 81: The concept so far, with the chosen mechanisms.

Fear of product being placed in tripod category. Need to work with identity and aesthetics of product.

2.12 IDENTITY

To get an understanding of the identity of the product, the team created a word cloud as shown below with words that represented the product. The highlighted words were used in the further process to create mood boards of products and details as a reference point of what could be transferred onto our product. This was inspired by our user group the travelling souls.

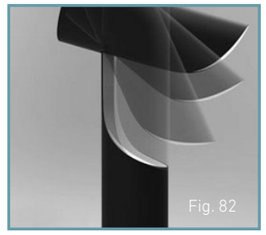


Fig. 82

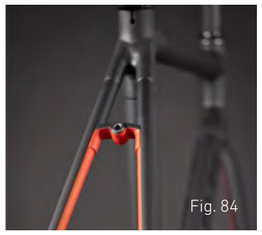


Fig. 84


Fig. 83


Fig. 85

QUALITY - Simple geometric shapes, clean lines, honesty of materials, attention to details, few interaction points and shapes that close up in a nice form.

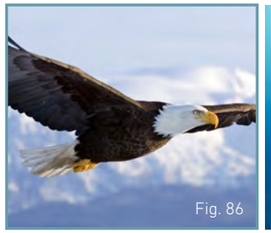


Fig. 86

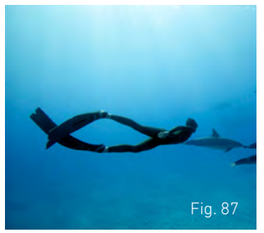


Fig. 87

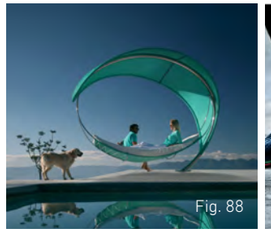


Fig. 88

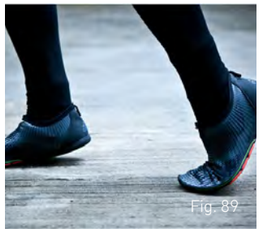


Fig. 89

FREEDOM - Distinguish between the freedom of use in the product and the feeling of freedom.


Fig. 90

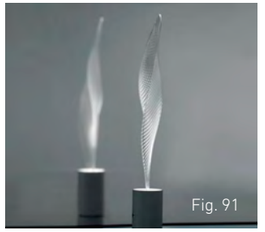


Fig. 91

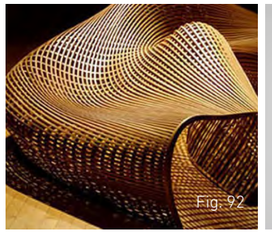


Fig. 92


Fig. 93

DYNAMIC - You can predict the next move, curved & diagonal lines, inspiration from nature – birds, insects, wings.

The team struggled to use these descriptions as a way to distinguish the product from the camera equipment category and decided to look more into the future user and target group of the product, more precisely the adventurous back packer.

2.13 BACKPACKER RESEARCH

As the user analysis in the first research phase lacked information on the user's identity. The team revisited the user in more depth. It was discovered that the travellers we reffered to are actually backpackers. A deeper analysis on what it truly means to be a backpacker and if there are different segments in this user group was comenced.

Based on the teams' experiences with backpacking and interviews with friends who shared the same experiences, two segments of backpackers were found.


Fig. 94

1. The backpacking community – these backpackers are traveling around the world, staying in cheap hostels where they talk about the trips they made during the day over a beer with fellow travelers. This means that they always have a base camp where they keep their big backpack and goes on hikes lasting from one to two days.

Conclusion: short hikes, have a base camp where they can leave heavy gear, can afford more weight when travelling, can get to electricity fairly easy., possible to take down backpack more times during a hike.


Fig. 95

2. The long hikers – the main difference from the other segment, is the length of the hikes. There is not always the certainty of having a base like a hostel, meaning they need to carry around all the necessary things to survive.

Conclusion: long hikes, everything they have has to on their backs in the backpack at all time, pack as light as possible- every kilo counts, not always easy to get electricity, very difficult to take down backpack if not stoping for longer rests.

> *"Sharing your stories and adventures with other fellow travelers, that is truly the essence of backpacking.*
>
> *Morten Ulltveit-Moe*

Though these two segments are different, the main conclusion from the analysis was very much captured in the quote from Morten Ulltveit-Moe. The whole identity and essence of being a backpacker is exploring the world, going on adventures and then sharing these experiences with fellow backpackers.

The team decided to explore this backpacker identity – trying to transfer that feeling onto our product. In addition to this, it was important to keep in mind the spirit and freedom of the backpacker. This identity should be imediately visible by the shape of the product, just as much as the functions of it;
regarding shaping keep in mind the eagle and enclosed shape from previous page.

PURPOSE OF TEST

To test how user the product could be mounted and reached on a backpack.

EXPLANATION OF TEST

Using an actual sized backpack, different position of an existing tripod was positioned different places to see what felt comfortable to reach for the user.

CONCLUSION OF TEST

During the test, it was found that it was easier to reach the product if it was lower positioned. A quick model of a backpack attachment was created, and made a big difference in the user experience.


Fig. 96

A backpack attachment could enhance the user experience. Could be created as an accessory.

2.14 SHAPING THE PRODUCT

Using an existing tripod as a base with lowered opacity, the team started generating ideas for the shaping of the product. This was a quick was to do different designs, when all the basic elements where known.

The sketches shown in fig. 98, was an effort to incorporate a storytelling feature to the product, where the backpacker could tell where he / she has been or experienced. This would create a very customizable and personal product that evolves throughout the users travels. I.e. sketch 1 is an enclosed shape with an added map, where the user could mark on locations, whereas sketch 11 is inspired from old leather suitcases with added stickers of different countries.

Some of the details in the sketches where further developed. I.e. the enclosed shape on sketch 1, was made as a physical model to get a feeling of the interaction.

Still the team did not find, that adding the identity of the backpacker as an aesthetic feature on the product, to be the right way to go. This led to a quick sketching session where the identity was more focused as a functional feature.

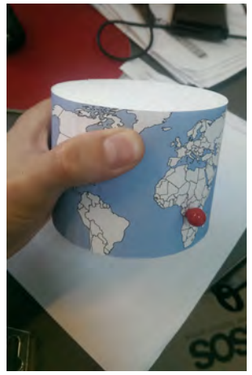


Fig. 97: A quick physical model exploring the idea of mapping out your journey on the surface of the legs.

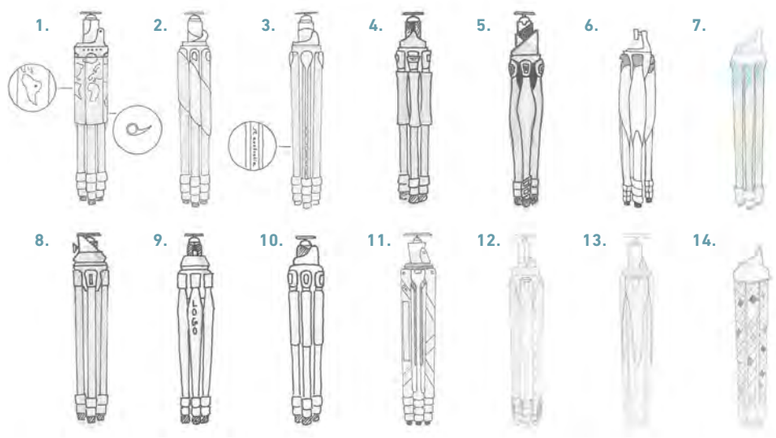


Fig. 98: Ideas for the aesthetic look of the product.


Fig. 99: Two ideas further developed

This shaping based on the identity of our user, did not lead to anywhere usefull, so a step back was needed

2.15 DECONSTRUCTING THE PRODUCT

As it was visible in the previous part, incorporating in a visual way the identity of the backpacker in the product look was not the right way to go. Consequently the team tried a different approach by deconstructing the product and comparing to other products on the market.

With the possibility of having to compromise on some of the functionalities, different ideas were presented, but none could be justifiable. The deconstruction of the product was an effort to rethink the whole user situation with the newly added information on the backpacker. Still the conclusion was that too many functions of the product would be lost if the legs were replaced or removed completely. Based on this conclusion, the team didn't want to compromise on the products multi-functionality as this was the key selling point of the product, other options were tried.

Another look at the market to see how it was possible to differentiate the look of our product could be done, here it was noticed that all tripod legs look almost identical and very technical. The conclusion the team had based on this observation was to try and move away in an effort to differentiate ourselves from other products on the market. The idea of a uniform enclosed shape seemed a good direction to go in, as everything on the market was the opposite. The inspiration for this related back to the moodboards created on page 39 in fig. 82.

Instead of trying to remove the legs, the team found a loophole by trying to make the legs invisible; taking Nis Ovesen's comment a design response, was given by having this enclosed shape of the legs. The found problem during backpacking was the tangling of straps with product, but also many users have the tendency to carry their equipment by holding it in their hand when walking or shoulder supported; because of this reason the enclosed leg shape had to be comfortable to hold in hand.

In addition to this it was a way of differentiate the products shape from existing tripods and leading the users attention to the core of the product; the base part.

This led to a quick test before the final detailing of the product.

> *"I remember that my Manfrotto tripod was always being entangled in all the other stuff I had in my backpack.*
>
> *Nis Ovesen*

PURPOSE OF TEST
To find a comfortable size for the legs diameter.

EXPLANATION OF TEST
A perfectly round shape and a triangular shape were firstly tested to find the most comfortable shape to hold. Furthermore different sizes of the three legs combined profiles where tested on different hand sizes of fellow students.

CONCLUSION OF TEST
The curvy triangular shape was preferred by most of the test persons as this created a nice grip to it. The 100 mm in diameter, was found most comfortable.

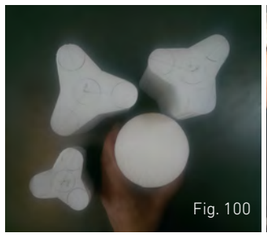


Fig. 100


Fig. 101

Fig. 102: The evolutions of the legs enclosed shape.

2.16 AKILA

The team wanted the product to reflect the identity of a backpacker and the feeling of freedom they have. In addition to this we wanted a symbol that represented the functionality and aesthetic look of the product.


Fig. 103

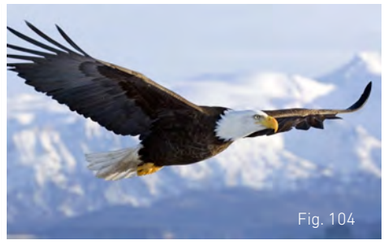


Fig. 104

The eagle possesses many capabilities that are reflected in our product. It was previously researched during the moodboard session, where it symbolized the freedom of a bird flying, relating directly to our user group of backpackers.

In terms of functionality, the eagle, as other bird species, has the ability to keep their head perfectly still when moving the rest of the body, as a way of better seeing possible prey. This is similar to the image stabilization that our product offers.

Lastly the team had previously looked into the aesthetics of the enclosed shape and the feeling of quality this gives to a product. The transition from the eagles nicely closed shape when not in flight and to the expanding of its wings when in taken off.

AKILA

The product is named Akila [from the latin word Aquila – meaning eagle]. In addition to the above mentioned relation the the product features, the eagle is illustrated in an flying turn motion, to highlight Akila's core; the rotating base of that holds all the functions together.

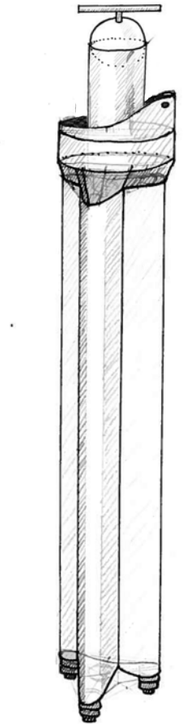


Fig. 105: Sketch of the enclosed product

PHASE **3.0**

DETAILING

Phase 3.0 of the project covers detailing of the product created in the previous phase. The structure of the chapter is similar to the last sections of the concept development phase, as it will be divided into the three main parts of Akila; the stabilizer, the base and the legs. The content of each parts detailing will be containing considerations on; size of certain parts, different choices of detailing, production, materials, construction and elaboration of the choices made. As each part obviously contains a lot of detailing, the most important parts are shown in the report and elaborated in appendix and USB 3.0.

As a lot of the details are being made during the 3D modelling of Akila, the outcome of the phase should be a finished detailed product, with measurements, dimensions and weight. This will be the point of departure for considering the business aspects of Akila.

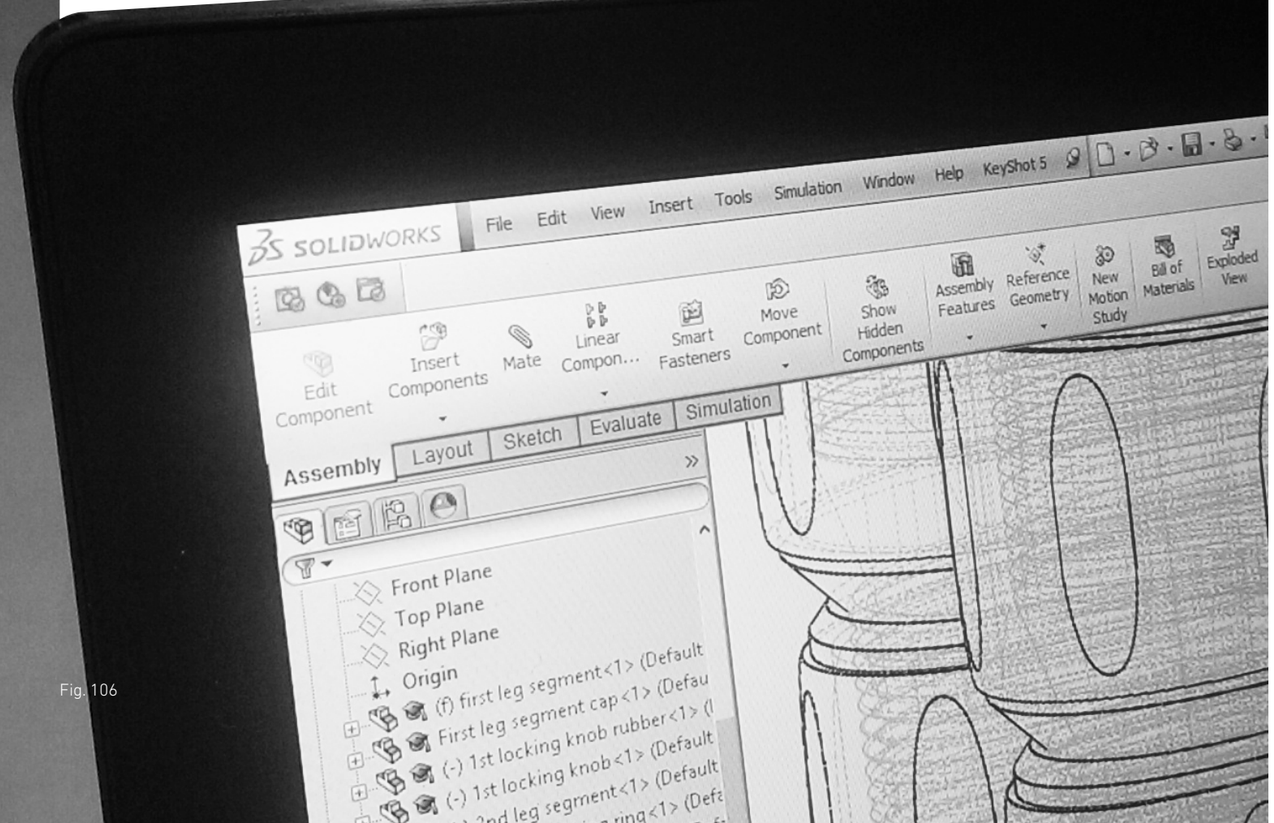


Fig. 106

3.1 SYSTEM ARCHITECTURE

As this is a multi-functional product the team has considered various ways of selling the product and therefore different ways for it to be produced and assembled. The best options were regarding adding and taking away some features; these features are actual product parts that the user can buy. That way there could be a basic product, and various parts which can be added later as the user becomes more familiar with Akila and also as his skills regarding filming increase.

Akila is a multi-functional product and for that reason it does not clearly fit in one product category. Consequently the way the product is constructed emphasises this multi-functional feature, one of the sub-features of these is the possibility of the product to be sold as a basic product with only legs and stabiliser, or adding the slider to it or adding both slider and base (fig. 107). Meaning that all the other parts besides legs and stabiliser can be bought individually. Having this idea of an alternative way to buy the product, has a great impact on how the product is designed, produced, assembled and later reassembled. All of these consideration had to be made during the design phase, so that each part can be produced separately and obviously the assembly should be made smoothly; to exemplify one of the considerations was regarding the interfaces between components. This means that if there are three components, all three have to fit nicely together, but also component one and three has to fit together as well. Another example is in regards to the attachments, these have to be in the same points, so that any part can fit with other ones, since they have the attachments placed in the same points.

Even though there are considerations about the parts fitting together, it is important to keep in mind that each part will be produced and sold assembled, so the client does not need to worry about what is inside each part, which is presented in the next pages. Similarly as the concept development chapter, the product will be divided into the same three parts: stabiliser, base and legs and presented sequential although they were worked on in parallel.

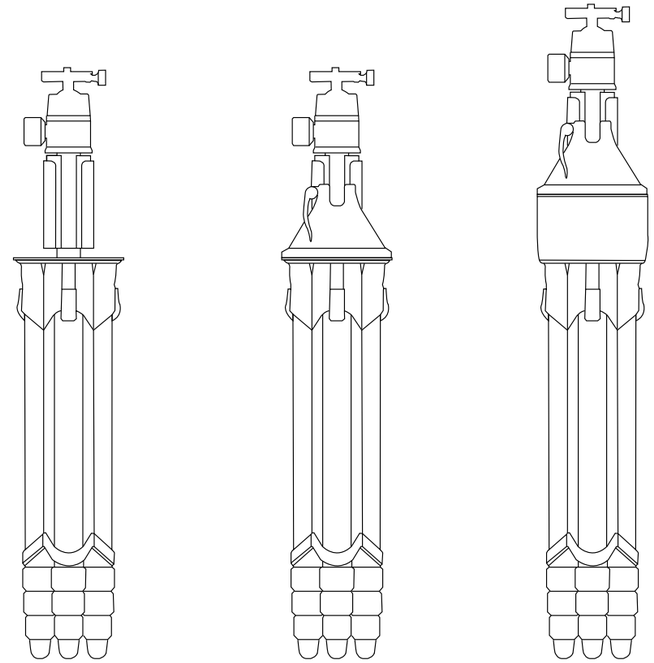
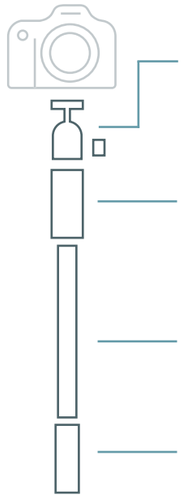


Fig. 107: The three different versions of Akila.

3.2 STABILIZER

As the main functions and mechanical princibles of the stabilizer was done in the previous chapter, it still needed some final adjustments. The most important criteria was revisited:



Ballhead:
- Carry up to 1.5 kg DSLR cameras

Stabilizer handle:
- Need to be able to move to dampen movements
- Can't cover the sliding track

Inner tube:
- Must have inner track to ensure slider function

Bottom handle:
- Extend to ensure a longer slide
- Work as counter-weight for camera

Fig. 108

BALLHEAD

Innitially it was meant that the ballhead should fit inside the inner tube to ensure lesser height above the stabilizer handle. This meant that the ball head should be less than 19 mm which is smaller than the one shown in fig. 110. Therefor it was decided to use an existing ball head to save money in production, but also to get a bigger one that could actually carry larger DSLR cameras, whereas the smaller on quickly was deformed when tightening the screw.

Using an existing ballhead also required ways of attaching this, which led to adding a threaded insert as shown on fig. 109.

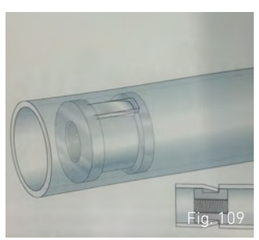


Fig. 109

Fig. 110

STABILIZER HANDLE

As the ballhead got bigger in size, it created a big size transition from to the handle, so it was decided to increase the diameter of the handle. This also created more space of the foam, which would increased the dampning effect. To ensure that the handle wouldn't be to uncomfortable to hold a quick test was created:

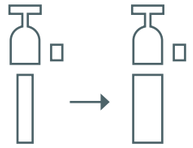


Fig. 111 Increasing handle size made the transition between handle and ballhead more sleek.

PURPOSE OF TEST
To ensure that the diameter of the handle is comfortable to hold.

EXPLANATION OF TEST
Three different cylinder with a diameter of 50 mm, 45 mm and 33 mm were tested on fellow students.

CONCLUSION OF TEST
Most of the test subject prefered the handle on 45 mm, as this felt most comfortable. The

The test cylinders were different materials where a lot of the test subject based the most comfortable, not only on size but also the softness of the material.

Creating a softer surface for the handle, it was decided to glue a sheet of EVA foam around the plast handle

ATTACHMENT OF HANDLE

As shown on fig. 112, the initial construction of the handle left some speculations on the the small spaces between the lock and the handle, whether the foam will stick out over time or the user could get a finger squeezed. Instead it was decided to glue the foam on the inner shell and outer handle which also will secure that no rotation of the handle would occur during use. Using glue to attach the foam also required changing the material of the handle to plastic instead of aluminium, as this had a better surface and wont wear off over time.

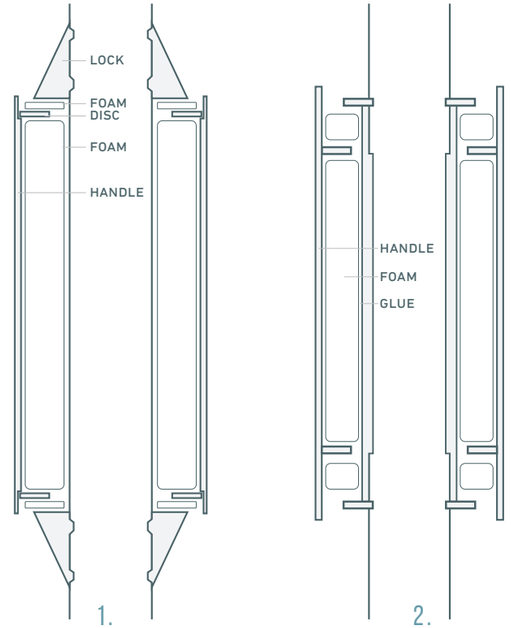


Fig. 112: The different iterations of aluminium extrusions for the stabilizer tube.

INNER TUBE

The innertube profile went through several iterations as shown in fig. 113. The considerations throughtout the development where based on both the attachment of the stabilizer handle and the inside track.

1. The initial profile had a very small surface for the inside slider, where all the stability rested on the 1,5 mm material thickness.
2. The second iteration was an attempt to create more surface of the attachment of the two 'holders' in the stabilizer handle, that would hold the foam and handle in place.
3. The final profile added more surface for the inside slider, to keep a more steady slide. The space that is 'hidden' also creates some free space for the attachment of handle.

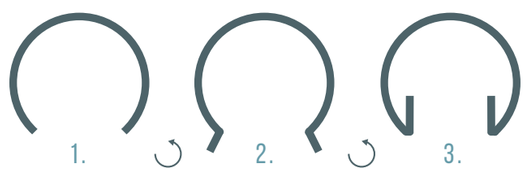


Fig. 113: The different iterations of aluminium extrusions for the stabilizer tube.

BOTTOM HANDLE

The bottom handle has two main functions; to extend the length for the slider and adding weight to counter balance the weight from the camera.

Two different solutions were discussed as shown in fig. 114, both with a similar construction. To ensure a nice an smooth feeling when extending the handle, the a shell of 2 mm plastic where attached around the stabilizer tube. Outside this, a 1 mm thick steel handle was running inside the pre carved track. The motion of rotation was discussed in the team and the motion was based on the positioning of the camera shutter on the right, which makes it natural to hold the camera with the right and handle with the left.

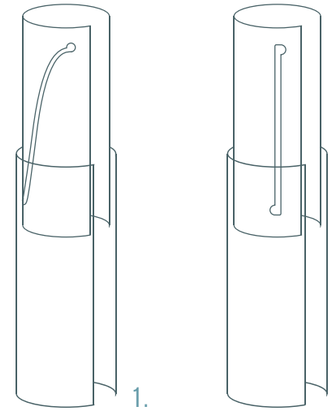


Fig. 114: Two options of extending the bottom handle

Initially the bottom handle was made of steel, in an attempt to add some weight for counterbalance. The final solution ended up being an extruded aluminium part, considering how small of a weight change it would add, compared to the added production price.

3.3 BASE PART

The base part of Akila was from the concept development phase decided to include a motor to control the panorama funtion of the product. This, and the assembly of the all the parts inside, was detailed in the following section.

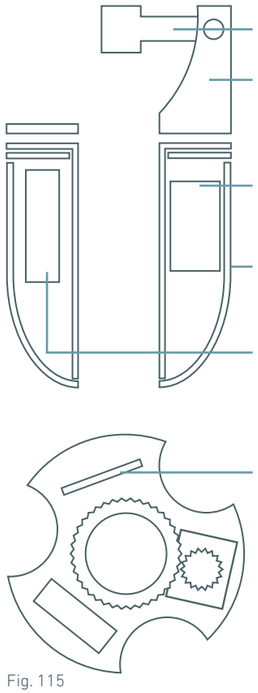


Fig. 115

MOTOR

The team looked at several types of engines, but quickly decided on using a stepper motor, because of the very precise movements construction of the motor allows, which allows the very accurate movements required by the time-lapse function. (Appendix 7.25)

The motor should be able to rotate the top of the product including camera in a vertical position. Therefore the friction between the bearing and top part is creating the resistance of the motor (See fig. 119).

Fig. 119, is showing the general forces applied on the system. The full calculations is in Appendix 7.24 The calculations can enable the group to pick the motor for the application. The choice of motor is shown in Appendix 7.25. The calculations was further supported by the test, where a small stepper motor is rotating a camera on a similar setup as ours.

PURPOSE OF TEST
Test the capabilities of a stepper motor, and the possibilities of controlling it in different speeds.

EXPLANATION OF TEST
The test was conducted with an small stepper motor connected to an arduino.

CONCLUSION OF TEST
Even though the motor had small capabilities, it was capable of turning around camera, in a very high friction Lego setup.

Fig. 116

As the team didn't have the qualifications to go into the system architecture of the PCB and the stepper driver, overall considerations regarding the print board was found. (Fig. 1 in Appendix 7.25) shows which components that needs to go into the system, and how they are connected. The rest of the consideration regarding the PCB is in Appendix 7.25.

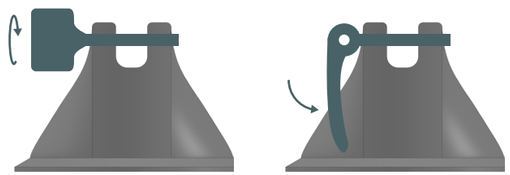


Fig. 117

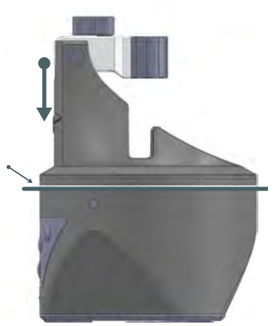


Fig. 118

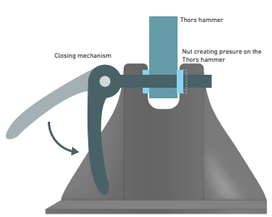


Fig. 119

BATTERY

When the type of battery had to be chosen, the team looked at several different catagories and their capabilities. All the battery types are located in Appendix 7.25. The battery chosen is a build-in lithium-ion battery, because of the hign energy to weight/ size ration. It also ensures, that the user shouldn't touch the batteries, and thereby open into the "engine room" The choice requires the user to charge the battery, equally to his camera, instead of fx inserting new batteries. As seen from Appendix 7.25, the user is capable of using the 2 hours and 20 minutes. It was decided that 1 hours and 10 minutes of time-lapse recording wasn't enough, thus 2 batteries placed in parallel was chosen.

A big subject was the attachment of the internal component as the space inside the base part limited, when a profile should be slides through the middle part. The shape of the base part, naturally allowed a small area for each component, where they could fit, without compromising the size, bearing and functions of the base part. A through description is available in USB 3.0.

BASE UPPERPART

The base upper part has several important purposes. First of all, it should allow the jib movements of the stabilizer, while it also should being able to transfer the rotations from the stepper motor to the camera. The initial design considerations regarded the base upper part as one part (Fig. 120) though when development progressed, the part was split in two. This was mainly because of the complexity a single part, with all the functionality would be very complicated and expensive to produce, thus reducing it, would lower the costs.

Fig. 120

An important feature of the part seen on fig. 117, was to allow the "Thor's Hammer" to be locked in place. Fig. 117 shows two different concept of how it could work. Either a turning closing mechanism or a cycle seat post inspired locking solution. The cycle inspired solution was chosen because it would be easy for the user to mange when filming. Furthermore the interaction point of the turning mechanism had to be quiet big, for the user to have a real grip, while the cycle inspired solution could be smaller and fit into the upper base part. The solution works as, a threaded rod is connecting the handle and an nut. When the user closes the handle, the nut is withtracted, and squeezes around Thors hammer, and thereby creating friction. To highten the friction, two rubber washers are placed on each side of Thors' Hammer. (fig. 119)

Fig. 121

As the inside of the stabilizer works a the glide track of Thor's hammer, conciderations regarding making the head less sensitive to sand and dust was made. Instead of making the whole innerprofile touch the whole glidebearing on Thor's Hammer, it was decided to make groves into the part, so that the potential dust could get through and not get stuck in between. see fig. 121.

DISPLAY

The team research different types of display options, where the main concern was the curvature of the base part, would require the either a rounded display or buttons that are are extended from the PCB board inside. The latter option, raised question on the force applied to the PCB board when pushing the buttons.

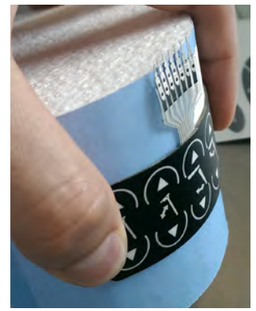


Fig. 122: A 72 mm membrane keyboard curving around a 100 mm diameter foan model.

The membrane keyboard was an option that had a lot of benefits, i.e. easy to clean from outdoor use, water safe and most important very thin display that can curve around the base. The membrane keyboard also enable a fairly easy connection to the PCB as only one plug is needed.

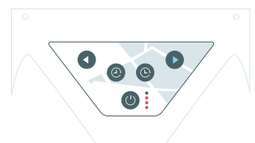


Fig. 123: Design for the membrane keyboard

To make the interaction more tangible, each speed and direction is represented with one button as shown in fig. 123. When activated the icon lights up. The four led lights next to the 'ON' button indicates the battery life.

3.3 LEGS

As the product started to take shape during the 3D modelling, the team realized that the size of the whole product was a bit bigger than expected. As it was impossible to decrease the size of the top of the stabilizer and the base, the length of the legs, among other details, was one of the first things that was further developed.

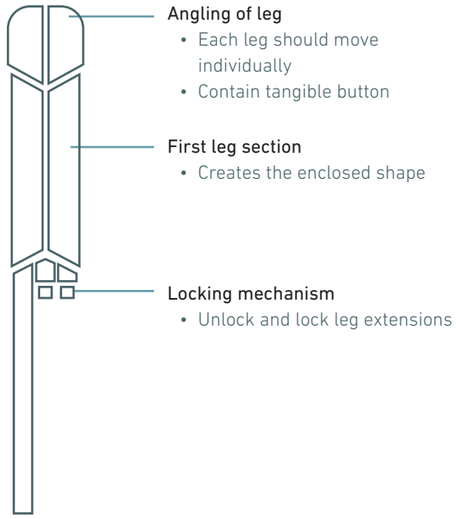


Fig. 124

NUMBER OF EXTENSIONS

A previous mentioned wish for the product was to keep the size inside 550 mm, so it could fit inside the approved dimensions for hand luggage. A quick test was created, based on the dimensions of the current size of Akila.

PURPOSE OF TEST
To test how the length of Akila can be adjusted by changing the nr. of extensions so it can fit inside a hand luggage.

EXPLANATION OF TEST
Trying to minimize the length by 100 mm, some paper was used as a quick visual, considering the overlaps of the leg section. See fig. 125.
In addition to this an area of 550 x 450 x 250 mm was created to see if how the new modified length would fit compared to the old.

CONCLUSION OF TEST
The modified model with now three leg extensions could fit inside the hand luggage dimension.

The extra set of extendable legs, also set requirments for the construction of the profiles. Initially the material thickness were 2mm, though in order for the last extension not to get very small and fragile, the material thickness was pushed to 1,5 mm. Several FEM tests were performed, to check that the legs could take the evaluated stress. The full test is shown in Appendix 7.28.

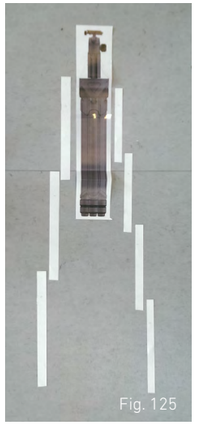


Fig. 125


Fig. 126


Fig. 127

LOCKING MECHANISM

When revisiting the backpacker user at section 2.13, a new insight gave inspiration for changing the locking mechanism' design. Trying to create a 'backpack friendly' sleek design, it was decided to use a twisting mechanicm. But from previous tests with existing tripods it was important the the legs couldn't rotate when twisting the lock.

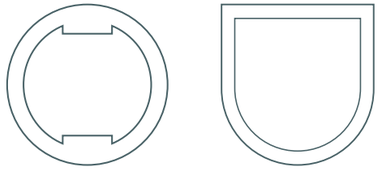


Fig. 128: Two of the profiles considered, to ensure no rotation.

Different profiles were considered to ensure that the legs stayed in place when twisting the lock. Though to ensure a smooth transition between lock and leg profile, the circular profile was chosen, even though it adds more demands for the extrusion of the profiles.
When the lock is twisted, the space between the mount, and lock is narrowed down, and the washer is pushed towards the leg profile creating friction, thus ensuring it to stay in place.

ROTATION LOCK

During the concept development, a mechanism to control the individual angeling of the legs was chosen.
The interaction of the mechanism should be easy to use, but still firm enough to hold the weight of the whole system, while being affected from the outside.

The team had two solutions for the mechanism of the rotation control. Within the first, the tooth's that stops the legs from rotating is visible from the outside, while there were hidden with the second solution. Another difference is the different interaction ways, as the first concept requires a push, while pulling the legs out. The second requires a sliding motion of the button that allows the rotation, as seen on figure 130.

The team decided to use the second solution, as the clean outer surface of the product was important for the usage situation. Furthermore the interaction of the second was easy to interpolate.

The choice of picking the second solution also affected the hinge, that connects the legs with the base which also contains the rotation lock. As illustration on figure 14 the locking mechanism should be able to slide op and down, but keeping the mechanism in place, seen from a production (injection molding) and assembly perspective, proved to be a challenge. The problem was solved by allowing a pin to go up from the bottom part of the mold, which creates a whole, where the mechanism can be attached as seen on fig. 129.

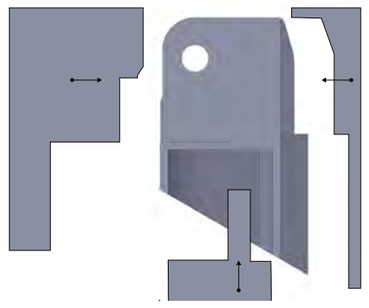


Fig. 129

Fig. 130

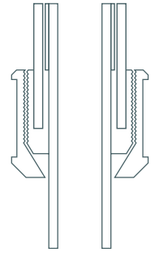


Fig. 131

ROTATION PART

The choice of having a clean outer shape of the rotation lock, also affected the space allocated to the tooth's of the rotation part. A test with an excising tripod helped determine the angeling between the locked positions.

PURPOSE OF TEST
The objective was to the which angles that were needed for our foundation to work in most situations.

EXPLANATION OF TEST
The manfrotto allowed a individual angeling of the legs, thus allowed the team to test how different angels would work in different positions.

CONCLUSION OF TEST
The test concluded, that the legs should have 4 positions. The first lock should be at 30°, where after there should be 20° between the rest, to end with a 90° angel.

The decision of the specific angel position also allowed an easier handling of the product, from a users perspective. The four positions combined with the many length settings of the legs, allowed the product to cover almost every position, even on very uneven surface. Now the user don't have to push a button, before the legs are in a 30° angle. This allows easier opening even though the shape is enclosed. Furthermore there is no situation where the angels of the legs should be less than 30°. In order to make sure, that the rotation part was strong enough to withstand the forces applied to it, while fully extended, a FEM test was conducted.

PURPOSE OF TEST
Analysing the construction and proporties of the mechanical solution behind the rotation part.

EXPLANATION OF TEST
The test examinied the situation where the legs are bend outwards with a force equal to 5 kg, simulating that 15 kg is put on top of the product in outfolded condition, where 100% of the force is going into the tooth of the rotation part.

CONCLUSION OF TEST
The test conclude, that the rotation part is capable of handling 5 kg of forces applied, within a safety factor of 1,5. This should ensure, that the joint will not break within the intended usage. The whole simulation can be seen in Appendix 7.28.

Fig. 132

PHASE **4.0**

BUSINESS

Phase 4.0 focuses on the business aspects of the project. Using the information from the previous chapter it is possible for the team to establish the cost price, sales price and estimate our organizations 5 years implementation, considering the life span of Akila.

Furthermore the chapter contains business models that explore different scenarios of which our organization could choose to take in an effort to launch Akila into the market. These scenarios will be evaluated, by analyzing their strengths and weaknesses.

4.1 PRODUCTION AND SALES PRICES

The previous phase covered the detailing of the product, therfore the next step is to calculate the production prices and afterwards understand the sales prices.
For this the team had to take in considerations the cost of the materials, the processes the materials are subjected to, mold and tooling costs and lastly the assembly.
The calculations below show the final result, but an full view of the prices of all the parts can be found in Appendix 7.26, full description of the calculations can be found in [USB 3.0]

In order to calculate an estimated production price, the team had a general knowledge about each of the manufacturing processes. The general notes are described in Appendix 7.27. It is important to be aware about the possibilities and limitations of each production method, as that can greatly affect the costs, or even mislead your estimations. The costs are base on European production and assembly prices. Outsourcing the production and assembly to China, could lower the production costs though.

An essential piece of information needed, when estimating the sales price is the expected number of products sold. According to the report of sold equipment in Germany, the number of sold tripods were around 800.000 units pr. year. [Link to German report] The high number of sold tripods, are relatively constant over several years. By interoperating the numbers from the report, the team found is possible to sell at least 20.000 products during the first 2 years on the market within the European market. The number is based on the scenario, that if only the product were sold in Germany, the market share would be around 1,25%. When the scenario is expanded to whole Europe, it seemed like an conservative estimation.

The production price of the product is split op into three parts: Stabilizer, base & legs. The estimated production prices includes both material expenses, tooling costs and the production costs itself. The payment of the investment in the tooling costs are considered to be divided into every 20.000 products. The production price of the three different parts are. Stabilizer: 81 DKK, Base: 250 DKK & legs: 226,945 DKK. The total production price of the product is therefore 558 DKK excluding assembly.

To estimate the assembly costs the team simulated an assembly of the product by using an existing tripod. It is estimated that a single worker, with an hourly rate of 250 DKK, could assembly the product within 7 minutes. Thereby the total production cost is 590 Dkk. The team is aware, that shipment will add to the general costs of the product, though they are not added to the total production costs.

To estimate the sales price of the product, the team calculated with an markup of 4. This factor should ensure, that potential extra expenses can still be covered. Though it is important to remember, the production price includes the payoff of the investment for the tooling costs. Therefore the rest is profit. The sales price is therefore 2399 DKK for the premium version of the product.

20.000 UNITS
SOLD OVER 2 YEARS

2399 DKK
SALES PRICE

590 DKK
FOR PRODUCTION COSTS

4.2 BUSINESS MODEL CONSIDERATIONS

PRODUCT ARCHITECTURE

As mentioned before the multi functionality of the product is an essential part and thus the product architecture of it was considered form an early stage. That way the product was designed to be produced in individual parts. The product is intended to be sold with only two functions (legs and stabiliser) and afterwards the user can buy the rest of the parts as they wish for. The reasoning behind this choice is considering the price, the base being most expensive, not selling this part incorporated in the product lowers the overall cost significantly. Secondly, not all our users are that skilled regarding videography and by buying a basic package that later can be completed as their skills also get better is a strong business case. Finally having a system architecture where new parts can be added to the basic product keeps the user interested in the product for a longer time and if the product is sold in stores, they prefer to have more then one product.

THREE SALES SITUATIONS

An initial idea of where to sell Akila was in three distinct stores, targeting more then one user group. The three shops are the following: a photo store, a travel agency and finally a sports store. The photo store is picked, so that there is a traditional channel through which the product is sold. The second channel is the travel agency, the idea behind this is that the users can rent out Akila as a package together with the trip they buy; after they return home they could have the option of buying the product if they liked it. The sport store is intended to target the people who hike a lot and therefore when they buy hiking gear they can also buy their filming gear. The deeper analysis and a SWOT for each situation can be viewed in (Appendix 7.23). After making a SWOT analysis, the team has agreed that the last two channels are not the best to use. The problem with both the travel agencies and sport stores is that their value is different then a photo stores. That way the users could be reluctant of buying a filming equipment from a sports store or a travel agency. Although the idea behind it is good, the actual materialisation of it is lacking, both in terms of competencies at the side of sales persons and in terms of creating trust for the user that this is in fact a good product.
Based on the SWOT analysis the first idea of selling the product in a photo store is a good concept that has potential and people would not question that much the quality of the product.

JOBY

While doing the research the team came across the Joby GorillaPod consequently when looking at various business model ideas and references the Joby came in mind. This product came on the market in February 2006 and with the initial GorillaPod and already in the summer they released a new version. The company and their products became more and more known and looked and bought. Today Joby has a bigger variety of products on the market, not just pods, also flashes and other accessories. Joby has a webpage where they advertise and have a blog, and ultimately they send the customer to specific retailers where to buy from and also linked webpage for online purchase.

COMPETITION

Looking at Joby's marketing strategy, it was obvious that there was a need to analyse our competitors. Up until this part there were more analyses of products on the market done, but all were viewed of what is on the market and what is the gap, but now that we have a product we need to see how many of our product features have competitors. While analysing the market we have observed that there are few products that are multifunctional. Most products offer just one or two solutions, but there are some that even though they are intended for one use, people make them more versatile and find new ways of usage i.e. the Joby GorillaPod. During the research there was only one product that claimed to be multifunctional and that is the VariZoom Stealthy, offers a stabiliser, monopod and 3-point shooter [source]. This is a smaller caliber then what we are working with and does not have any of the pano functions. This product was found just a little before the hand-in of the project and therefor it wasn't that much analysed.

FINAL OPTION

As a result of all the research and considerations the team had regarding the business approach it was decided to have a fictional startup company that will sell Akila. The consideration behind it, is that Akila is a new product on the market that does not have it's own category, as for now. Furthermore the team found it more interesting to become a startup company and develop and sell Akila instead of licensing it off to other companies. Even if the licensing idea is not that appealing, it is still a fallback plan in case the startup does not have the desired results. Another fallback option would be to do a collaboration with an existing camera equipment company i.e. Manfrotto. These three options will be present in a more detailed manner in the next part.

4.3 ASEA

ASEA

As the name suggests as well, the startup company will have the team members initals. Having our own startup company opens up many possibilities, but it is also a greater risk to take, but the team has decided that it would be more interesting.
Looking at other smaller companies, the team has agreed upon having an online store where Akila can be purchased. In parallel to ASEA's web page customers can also purchase Akila or the various parts of it, from internet-based companies such as Amazon, creating more awareness about our product. ASEA has a two year trial period to see if the idea is catching up to people and the company picks up and starts working.

Keeping in mind that ASEA is a startup company it is important to consider the initial budget of it and as it was seen in the production and sales price on page 51, the cost of the initial moulds is quite high so therefore it is vital to consider how to get the initial budget. One of possibilities would be a bank loan, but this being the first time the team has done something similar, the risks are too high. An alternative would be to try and get funding from various companies that offer support for young entrepreneurs. Lastly there is the option of an investor, the team looked into the market and found a company that sounds interesting. There is a Chinese tripod manufacturer called Kingjue, that is the equivalent of Manfrotto, but a little cheaper as all tripods are manufactured in China. Kingjue has just recently entered the European market, so it is not that well known. The team has considered them as a good investor because they only manufacture tripods, so it could be beneficial for both parties, we would get help with the startup and Kingjue would expand their product portfolio.
Hence we are a startup company it is very important to create a buzz around our product and company. The advertising and release of product are crucial. The team has talked about the release being some form of a public event and one good way of creating awareness is if we would present Akila at the EISA Fair, this way more people would see it and find our more about it's features, but similarly as Apple's strategy is the customers would have to wait until they can actually use it, creating more anticipation and excitement.
Regarding the advertisement, the team has concluded to take advantage of all the social media platforms especially since Akila is intended to work closely with video footage, so social medias like YouTube, Vimeo and others are mandatory, online presence has to be always a concern for us. Also as stated on page 38, there is a backpacker community, so we would like these people to be able to talk and share their experiences with Akila on ASEA's webpage, therefore we created a blog for them. Further development of marketing is shown in the next chapter.

COLLABORATION

One of the fallback options if the startup company does not work out well, the team has decided in trying to do a collaboration with an existing company. A company that the team found interesting for this collaboration is Joby. As seen before Joby is not a company with traditional products; they try to find new ways of using camera equipment and thus the team thinks that a collar with them could take place, as both of us are finding new ways for camera equipments.

LICENSE

The ultimate fallback option would be for the team to licence Akila. In case we would need to take this step, an option to licence the product would be to an existing company and since we have talked about having Kingjue as an investor, it could also be possible to license it to them as they are familiar by then with our product and it's production and assembly.

4.4 PRODUCT COMPARISON ANALYSIS TEST

When creating a multi-functional product, your naturally compare the designed product to multiple product categories. Knowing that there are a lot of pros by creating a 'all in all' product, there are also the chance of compromising on the quality and output, compared to existing 'one function' product. It is important to know these certain tradeoffs and be aware of what the product strengths and weaknesses are.

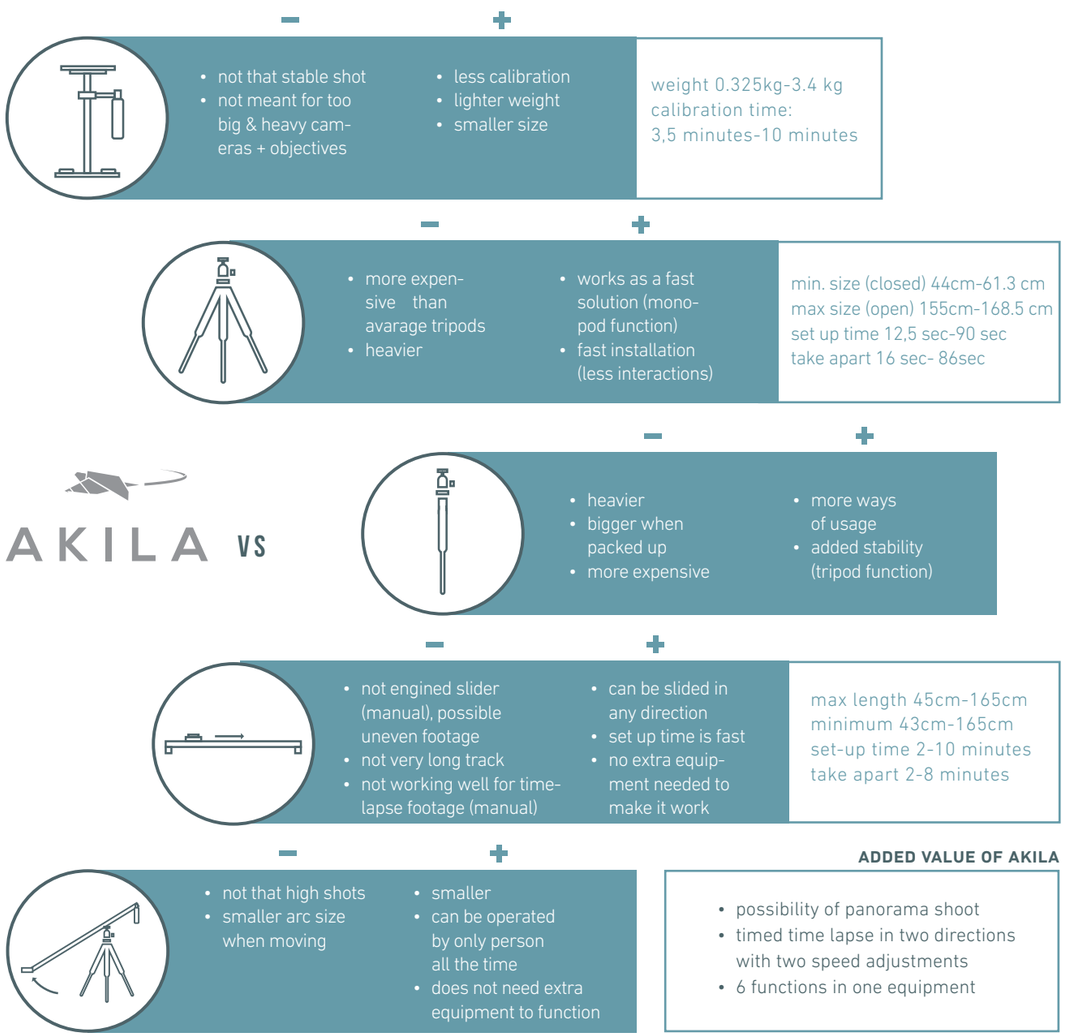


Fig. 133

4.5 IMPLEMENTATION

To have a clear understanding of our business plan the revenue stream and five year implementation plan are vital for this. In the schemes below can be seen all the figures regarding our business plan.

The future plan of the Akila is shown in fig. 137. The development period is estimated to take 4 months, as the target is, to reveal the product at the EISA fair. The investment needed for the manufacturing of the molds is 2.000.000 DKK. A full list of the individual tooling prices, are shown Appendix 7.26.

The period before start of sales will be dedicated to further improvement and finalizing of the product, though these expenses are not calculated into the investment. The production price taking material expenses, production and assembly into consideration is 490 DKK, thereby giving a profit of 1909 DKK per product,, with the calculations in Appendix. As seen in the illustration the break even time would be after 1200 products sold, which could be expected with a 5 month period.

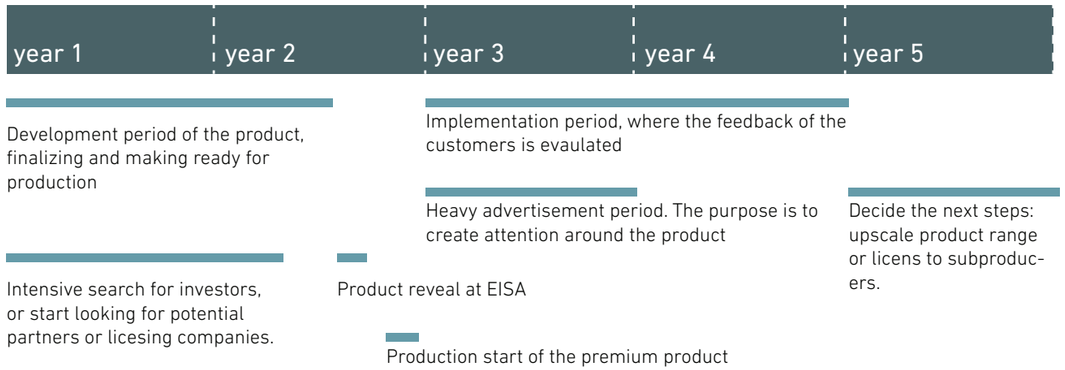


Fig. 134

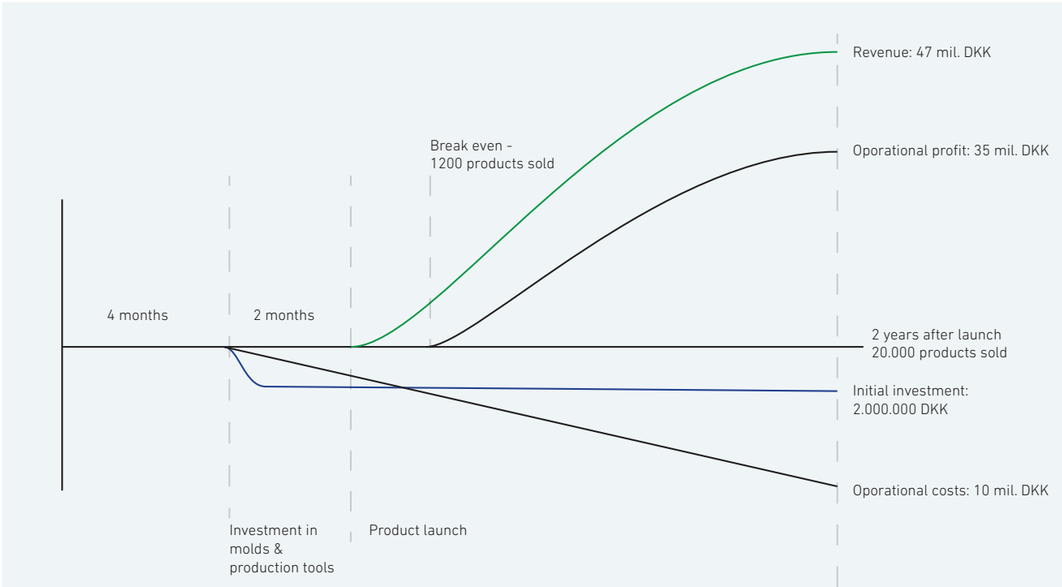


Fig. 135

PHASE 5.0
MARKETING

"A brand is an identifiable product, service, person or place, augmented in such a way that the buyer or user perceives relevant, unique added values which match their needs most closely"

De Chernatony and McDonald (1992)

This chapter will look closer into how the team can present Akila in the best possible way. This will be done by using the already achieved knowledge about our buyers to enhance the added values that this product gives to specifically their needs.

From the previous chapter, the environment and specific sales channel are chosen, and it is therefore possible to enlist some initial criteria for the Point-of-Sale of Akila.

5.3 ONLINE SALES

As Akila is sold online a webpage is crucial and online shopping is obviously becoming more and more popular, which works in our favour.
While one out of every 5 people in the world own a smartphone, they thereby carry around their own personal shopping cart everywhere. This also creates a demand for a responsive web design.

Besides the web site being responsive, it has to express the same feelings that Akila transmits, as it's part of one big universe.

Building a webpage to sell Akila has a lot of advantages:

1. It is very easy to determine which sub-pages and products that are most visited and bought. This makes it easy to test different product lines and what to focus on.
2. When the webpage are set up, it practicly run itself and the time that should have been used on operating and selling, can be used for developing new products.
3. Business is always open. Customers can visit your webpage any time of the day, which is a great way to maximize your sales and profits.

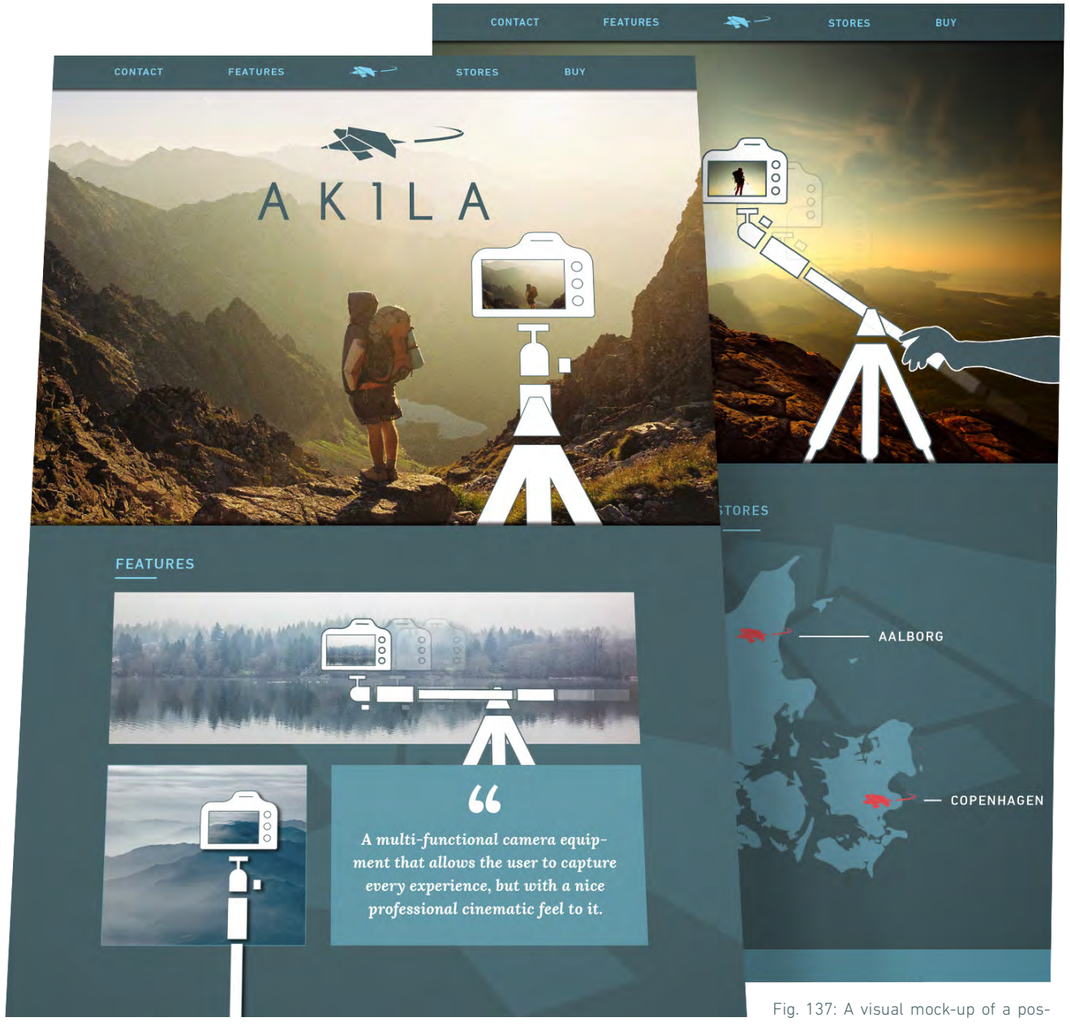


Fig. 137: A visual mock-up of a possible way to present Akila through an e-commerce website.

5.2 IDEATION PROCESS

From the previous analysis some criteria was generated to help deciding on a packing direction.

1. Highlight the core of Akila – the electronic rotation
2. Incorporate nature and backpacking identity
3. Show of the multi-functionality

As an emerging brand in an already existing and very competitive market, communication through packaging can be the last detail that makes customers chooses your product over competitors. Especially if our organization, as mentioned in the business chapter, sells Akila through existing photo stores, it is important to consider how the product is displayed on the shelves or stands.

The team did some sketches on how Akila could differentiate itself, based on the market research and the requirements achieved. Some quick physical models were created based on the sketches, trying to get a feel of different shapes. I.e. the triangular shape, shown on fig. 137, was intriguing as this created a lot of options in terms of clear flat surfaces for graphics, plus a clear advantages for storage possibilities. The model also showed that a larger triangular shape was needed to ensure the diameter of the base could fit inside.

The team did not spend that much time on the detailing of the packaging as it would have been wanted, but it's something that can be revisited and worked on in a later stage.

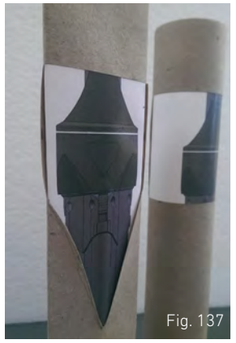


Fig. 137

The packaging should tell the world that you are an explorer. You are a person who experience amazing things and need a piece of camera equipment that can actually capture every last detail so you can show the world what you've seen.

Fig. 138: Mock-up of circular packaging where the base are in focus.

5.1 HOW TO STAND OUT?

A products packaging is becoming a huge part of the product experience. As seen on YouTube, there are an absurd amount of 'unpacking' videos, where people unpack their newly purchased product and talk about the overall experience of what they just bought.

It is therefore important to think about the overall presentation of Akila; how does it attract the buyers attention? What is the overall feeling we want to give the customer when unpacking Akila?

As stated in the business chapter Akila is sold online, so the potential buyers can actually buy our product along with their newly purchased camera. as well But this also means that it is very important to differentiate ourselves from our competitors and highlight the added values Akila gives, compared to i.e. an existing tripod. Therefore the team looked at similar products and how they are being 'sold' to the buyer. This scenario might be more interesting at a later stage when Akila will start being sold in photo stores, but also in the beging it is important to diferenciate ourselves from other products.

In the camera equipment category it is impossible not to draw inspiration from the branding of GoPro action camera. GoPro is a well-known brand, that has a very specific targeting of their product; extreme sportsmen. As shown on fig. 139, their Point-of-Sale are showing videos of extreme activities, with very little focus on the specification of the camera. These videos and GoPro's tagline: "Be a Hero", is a huge inspiration for the everyday 'couch' person, which probably are their actual buyers.

With GoPro's way of differentiating themselves as an inspiration, the team looked at existing tripod packaging to find possible ways of standing out from the rest. An inspiration source was found in the Joby Gorilla Tripod packaging, which specifically highlighted the core of their product, the flexibility of movement. Translating that into our product would mean to highlight the base of Akila.

Fig. 139

PHASE **6.0**

SUMMARY

4.2 CONCLUSION

The projects context takes it point of departure in the increasing interest in videography and peoples thrive for a perfect and professional result. Knowing that hobby filmmakers and semi-professional videographers, mostly makes small videos of their experiences while on their travels, it was decided to target the product at backpackers, which gave the product some strict design criteria. The end result of the project was therefore based on a mixture of seeing an opportunity in the market and finding a problem in carrying multiple pieces of camera equipment to achieve different types of video shots.

The outcome of the project is Akila. A multi-functional camera equipment that allows the user to capture their every experience, with a nice professional cinematic feel to it.

4.2 REFLECTION

CHOOSING THESIS SUBJECT
The subject of the master thesis has been highly influenced by a common interest of videography in the group. This both had advantages and disadvantages in terms of a very enthusiastic point of departure, where every research task and test was interesting and no matter the end result, it would be a nice addition to our own camera equipment.

The shared enthusiasm is in some ways reflected in a very complex and ambitious end result. Throughout the project the product kept adding up features, which resulted in a multi-functional product, that in hindsight could have been the divided up into three different projects.

PROJECT MANAGEMENT
In the beginning of the project the team tried to use different tools of project management. Knowing that one of the team members lived in Aarhus and could work from home some days, it was decided to use Asana, an online project management software, too delegate tasks and keep structure throughout the process. In addition to this, worksheets on the finished tasks could be uploaded inside the different task, making sure that every assignment had a clear objective and was reflected upon.

After the first month of work, both Asana and the worksheets were neglected. The main cause was too much time spent on structuring and writing in, the finished assignments, time that could be used for another assignment. Another reason for abandoning the online software was the fact that the team was the majority of the time working side by side, so it seemed odd to comment and divide tasks in Asana, when it was just as easily and quick to be done verbally. The project management was later in the project exchanged by a Scrum Board that created a very visual and tangible way of dividing tasks between team members. The added satisfaction of moving a post-it from the 'DOING' column to the 'DONE' column also raised the teams' spirit and morale.

PROJECT TEAM AND WORKFLOW
First of all, having a team of three people working on a project like this has been crucial. It would definitely not have been possible to cover as much ground, with only two people. In addition to this, it has been very beneficial for the project, that the team members possessed very different qualities that worked together nicely.

Still, the most important aspect in a good working team, is sharing the same work ethic. Throughout the project and especially towards the end, it is important to have the same goal in mind, and willingness to work the extra hour to make sure the goal is achieved.

The end of the project is also where the time aspect is very important, which often results in the different team members core competences are put in use. This is obviously a way to work faster on the assignments at hand, but also results in not improving in competences you lack.

Another important point relating to workflow is regarding a decision that the group took when it was faced with two directions for the project, one was a multifunctional product and the second option was a choice in-between three ideas. At that point the group was afraid to choose the multifunctional product as it seemed that we picked the easy way out and went forward with the three distinct products, later to be chosen one from them. Some time tater we made a loop and got back to the multifunctional product and worked it out. This experience did make the group "waste" some time, but meanwhile doing so, it gathered insight to the project and the second time was faced with the multifunctional product option it had all the reasons backed up, why it was an important project to do and how it was not the easy way out, but the only logical possible way to go based on the thorough research done before.

NO COLLABORATION
The team decided not to collaborate with a company from the start of the project. The main reason being that the team wanted to be able to design freely, finding own insight and criteria for the future product, rather than being constricted to design one specific product with a lot of demands from the company. The initial thought was to contact different companies, when the design was finished and acquire testimonials and a possible collaboration at that point, to give a more professional insight in production and the business aspects around marketing the product.

If the team had decided to collaborate with a company from the start of the project it could have given a lot more structure to the project, plus added professional knowledge throughout the project. It could also have helped the project move forward, when setting up deadlines for meetings where the company obviously expects to see progression and physical models.

PHYSICAL MODELS
As a direct drawback of the team not collaborating with a company, was the fact that in some cases a 1:1 model made from metal could have helped with some technical information and testing, but instead the group had to figure things out with the help of existing tripods and other camera equipment and by taking apart these equipments and regrouping them in the best way possible. Another way to understand mechanics was through the help of lego models and 3D printing.

In this case the group regretted not having always the means to test out speculations in a prototype.

4.3 LIST OF REFERENCES

[TRE, 2012] Trends In The Photo And Imaging Market. (2012). Prophoto.

[Reid, A. 2012] Reid, A. (2012). Nikon say "we will make our stills cameras for videographers" - EOSHD. [online] EOSHD.com. Available at: http://www.eoshd.com/2012/03/nikon-say-we-will-make-our-stills-cameras-for-videographers/ [Accessed 20 May 2015].

[Gustavsen, T. 2009] Gustavson, T. (2009). Camera. New York: Sterling Innovation.

[Danskstudiecenter.dk, 2015] Danskstudiecenter.dk, (2015). DSC-TV. [online] Available at: http://www.danskstudiecenter.dk/dsc-tv [Accessed 20 May 2015].

[Graham, D. 2011] Graham, D. (2011). Adventures of Devin. [online] Devingraham.blogspot.dk. Available at: http://devingraham.blogspot.dk/2011/05/my-weapons-of-choice-camera-lenses.html [Accessed 20 May 2015].

[YouTube1, 2015] YouTube1, (2015). Q&A: Devin Graham. [online] Available at: https://www.youtube.com/watch?v=ugPoPNjLwOM [Accessed 20 May 2015].

[YouTube2, 2015] YouTube2, (2015). Egg Timer Time-Lapse. [online] Available at: https://www.youtube.com/watch?v=V1hKLGwmLM0 [Accessed 20 May 2015].

[Hyperphysics, 2015] Hyperphysics, (2015). Gyroscope. [online] Available at: http://hyperphysics.phy-astr.gsu.edu/hbase/gyr.html [Accessed 21 May 2015].

4.4 LIST OF ILLUSTRATIONS

The list of illustrations can be found on the attached USB stick .

PHASE **7.0**

APPENDIX

7.0 CAMERA TYPES

Action Cameras

- Extreme sports use
- Young primary user group
- Wide angle (close on body)
- A lot of accessories
- Covers the whole service (app. editing software etc.)
- Video, pictures, time-lapse
- Secondary user group - everyone interested in videography
- Quick and easy to use - if needed a lot of settings

Smartphones

- Front and back camera
- Usergroup - every smartphone user
- Always on hand
- Easy backup of files
- Easy sharing
- Growing in accessories
- Easy set-up
- Endless editing options

Point and shoot cameras

- Amateur user (very easy to use)
- Easy and quick picture
- Compact
- Minimal no. of accesories
- Basic video needs
- Minimal settings

DSLR cameras

- Primary professional users
- Secondary (interested in good quality)
- A lot of setting options
- Configuration for every location
- Picture quality (main selling point)
- Expanding video options
- Heavy

7.2 TYPES OF EQUIPMENT

PROS	CONS
• you can move while filming • quick and easy • compatible with more camera types (e.g. phones, go-pro, DSLR)	• not 100% steady • after longer filming times the hand can strat feeling heavy and hurt.

• you can move while filming • quick and easy • compatible with more camera types (e.g. phones, • go-pro, DSLR) • better for heavi-er equipment • easier to use for a longer time	• big harnests on the body can be uncomfortable • might be very warm to wear in the summer • if equipment is too heavy, it might be difficult to to physical activities (e.g.hike, run etc)

* there are many types of sliders on the market, both with and without an engine, which can improve or limit the output of the video.

• some with engine have the posibility to con-trol the movement, making it constant • some have to axes, making possible filming in two directions. • great for time-lapse	• setting up time • weight • cost • some need extra equipment to work (e.g. tripod for sliders to increase the height)

• amazing airfootage • professional videos made by amateurs	• cannot use everywhere because of safety rea-sons (e.g. bigger cities) • if not familiar with flying the drone might distroy it. • not good in windy weather

	PROS	CONS
	• two axes • steady photos/videos • 1 leg (monopod) for a faster solution • professional tripods can hold up very much weight. • are great for astro photography/videography • there are cheaper versions for semi-professionals or amateurs.	• stuck to ground, not movable • weight • size • some take too much time to install • cheaper versions not so sturdy • if it's a monopod it's important to hold it while using it.
	• lighter • smaller • quick setup • multifunctional equipment • especially designed for amateurs easy to use	• not as tall as a normal tripod • harder to balance on uneven terrain (e.g soil) • depending on the model it cannot hold up too much weight.
	• movies and documentaries • action scenes that take place on the ground.	• long time to set up • expensive
	* great for smaller cameras (point and shoot) or cell phones, but the video cameras or DSLR's are too heavy for it, so it's not a real option in this case.	
	• perfect for getting high shots • safer and easier then a crane • can be mounted both on tripods and on dollys (if desired to move over obsatcles) • can move vertically, horizontally or combining the two.	• still big and heavy • needs a remote controll and maybe even an extra screen • sometimes two people need to operate it (one the jib and another one the camera)

7.3 INITIAL INTERVIEWS

JYSK REJSEBUREAU:

- The main destinations for that our customers seek is USA, Thailand and Australia
- This is mainly backpacker travels, but the volunteer work trips are becoming more popular
- The costumers mainly share their photos and videos on Facebook, some on our blog
- They mainly share travel tips and recommend different routes on their trip
- We have tried to focus more on videos from our trips around the world as they tell a better story
- This is sometimes also a wish from the supplier
- (mail to: kler@jr.dk if we need more information on people that have used their service)

FDM TRAVELS:

- Our most popular trips are family 'drive self' vacations
- Our blog on fdmrejser.dk are very popular and people share stories and pictures. Also our Facebook page is popular for sharing.

JAPAN PHOTO (MAREN TURIS GADE)

- Missing service - would not help because of strict times

CLICK (BOULEVARDEN)

- No time, but were willing to help if we scheduled a meeting

PHOTO CARE#1 (BOULEVARDEN)

- (Galaxy K zoom – a camera with a phone)
- In the last couple of years the "point & shoot" camera has decreased in sales
- On the other hand the dslr cameras is popular, also for videorecording which has decreased the sales of actual videocameras. The dslr are better in many ways in video recording (light).
- The younger people buy the dslr cameras around 3000-5000 kr. The more expensive ones are more aimed for the professionals.
- The mirrorless cameras is sometimes more popular because of its size
- The polaroid cameras are becoming very popular between teenage girls! They never seen a physical picture before.
- The dslr camera are often bought by woman who wants to take pictures of their children and family
- We don't sell that much "special equipment". People who want this most often contact a bigger company like Goecker.
- The special equipment isn't demanded that much

PHOTO CARE#2 (SLOTSGADE)

- The sales from Jan – Apr ('13 compared to '14) has decreased 50%
- Dslr cameras 50% and "point & shoot" cameras 45%
- Still this year the most popular item is the more compact cameras
- The costumers often ask for video quality, also wifi is very popular
- It is often the "geeks" that ask for the more specific extra equipment like sliders (glidetrack)
- The polaroid camera is actually the most requested item. Mainly the teenage girls that wants to put the pictures on their "bff wall"
- Compact camera 58.000 (sold in 2014) – 64% less than 2013
- Hybrid camera (mirrorless) 15.000 (sold in 2014) – 88% less than 2013
- DSLR camera 41.600 (sold in 2014) – 69% less than 2013

7.4 USER INTERVIEWS

Initial questions asked:
Which camera / equipment do you have? (mention everything)
When do you make movies?
Your thoughts about how the video should be made?
Where do you get your video inspiration from, and do you seek some specific scenes, which can be hard to achieve? Which result do you seek?
How long does it take to setup a scene?
Are you interested in time lapse sequences?
What about editing and sharing of videos?

KASPER NØRGAARD

This is the list of equipment that he owns:
Camerahouses.

- Nikon D600 Kamerahus
- Nikon 1 V1 with 10-30mm f/3.5-5.6 VR
- Sony NEX-5 with 18-55mm f/3.5-6.3 OS

Objectives
- Nikon 50mm f/1.8 G AF-S
- Nikon 28mm f/2.8 AF-D
- Nikon 300mm f/4 AF-S IF ED
- Samyang 14mm f/2.8 IF ED UMC AE
- Nikon TC-14E II AF-S Teleconverter 1.4x
- Kenko extension tubes

Flash
- Metz 50 AF-1 Speedlight for Nikon
- Yongnuo Speedlite YN560-II
- Nikon Speedlight SB-700
- Yongnuo SC-28 Off Camera shoe cord
- 3 x Yongnuo RF-603N wireless flash triggers

Stativer
- Sirui N2204 + K-20X Ballhead
- Manfrotto 679B monopod
- Joby Gorillapod SLR-Zoom

Bags
- ONA, The Brixton Messenger Bag
- Lowepro Video Fastpack 250 AW

Mix:
- 5in1 reflector
- Photoolex cable release
- Maumi DHG Super Circular Polarising filter 77mm
- Hoya HMC ND400 multi-coated filter 77mm
- Step up ringe fra 52mm til 77mm og fra 58mm til 77mm
- Giottos Rocket Blower
- Diverse ekstrabatterier, oplader og lens hoods

- When and where do you take pictures and video?
- Usually tries to go you once a week - it can be hard to do otherwise once a month. It can be a problem with the dark period of the winter, to have the time to get the right lighting for the scenes - The lighting is becomming flat. He is usually doing nature and landscape photography.
- Normally the vacations is the place he takes pictures. He often finds the most inspiration during these times too. He thinks it' s a great inspiration to get out of the normal routines.
- He is not doing much video, because he never knows what to do with the video afterwards. And he likes to describe the experiences from a single picture.

- Where do you get your inspiration from?
- Daily checks of blogs (diyphotography.net & petapixel.com). They keeps him updated, technically and with inspiration. Furthermore 500px.com and youtube channels.
- He is having a hard time doing 3-dimensional depth in his landscape pictures, especially because Denmark is flat.

- How long time does it take to setup a scene? (he is doing nature and landscape)
- Normally the scenes is appearing by themselves. Sometimes he can use about 30 min to get the picture right. He would variate the shutter speed, ISO, f-stop and try to move the camera to get the scene right.

- - Timelapse?
- Nothing that he does - haven't tried it yet.
- - Editing and sharing of picture & videos?
- He is using quiet some time on editing photos, through Adobe Lightroom & Photoshop. He would normally do it straight after a photosession. HE would pick the 10% best pictures to quickly edit, whereafter some specific will be chosen to be thoroughly edited.
- The best pictures are shared through 500px (other people can buy them)
- Some is shared on Facebook or Flickr.
- We had some more questions, so we sent some more for him to elaborate:
- Questions:
- -Regarding your frames, what are they used for? Pros / cons for them
- - What is the pro / con with your cameras? and do you have any specific situations where you prefer one?

- Regarding the frames: Sirui is the primary frame. (lightweight, compact 35-40 cm in folded condition) so it can easily be carried around, while being stable. It can also function as a monopod because one leg can be dethatched.
- The Manfroto monopod is more stable for typical situations. He is using in situation where mobility is required but still needs some support. For example sport events, where he is using a telelens or photos of animals, where the speed needs to be fast. The monopod cannot stand by itself, so it will not be used for longtime exposures.
- The Joby Gorillapod is normally for traveling, and he does not want to carry that much. IT is not super stable, and re-quires something to place it on, but absolutely better than nothing.
- Regarding his cameras, his D600 is the primary ,which all his objectives fits. Though it is quiet large to carry around. That is why he bought the other two. The sony is smaller, but the sensor of the camera is almost the same size + you can change objectives, and almost same control of settings. Negative is the missing "seeker" but only an LCD display. + It can be hard to set the controls in the field. Furthermore a bit too big to be small. The Nikon 1V1 has a digital seeker and it is smaller. An dis and advantage is reduces sensor size = greater magnification of the pictures, but less good quality. It can also attatch the objectives for his D600. Therefore it is usually a travel camera. And he want to sell the Sony.

ANDERS ULLTVEIT-MOE

Equipment:
- GoPro 3 Black, iPhone 5s (Stick, suction mount, small tripod, mounts to bycicle etc., head and breast mount)

When are you making films:
- In the sparetime, when I get off from school (made 5-6 different films)
- 3 using the goPro camera, the rest using the iPhone

Initial ideas on scenes:
- Going on ski trip on Friday – already wrote down on cellphone specific scenes and where to put the camera (been there before, so he knows the locations)

Inspiration:
- Uses youtube and goPro's website to find inspiration on videos and specific scenes
- Different scenes that's hard to do (multiple camera angles) difficult to do with one camera
- A ski video where you can see the whole person, but not the equipment
- The one where he mounts the camera to the pelican

The use of timelapse:
- Mostly amateur level (of him and his friends drinking fx.)

Use of setup time:
- Depends on the scene. If it is just a quick capture of the moment its easy just to press record
- When the camera need to be placed, there is obviously more setup time and he uses multiple tries and angles because of the lack of display on goPro. Edit afterwards.

Mentioning of slider:
- Could be useful with a slider – but initial thought that there to expensive

Editing and sharing
- Uses a lot of time on editing, probably 2 hours for 1 minut film
- Shares movies on youtube (private) so he can control who he shows it to

ELI SKOV JENSEN

-95 % of the videos they make are for the news
-He doesn't has time for using Steadicam and doesn't have practice in using it
-DSLR has the ability to make great footage but lack in focus and (blændemæssigt)
-Worked there since 2008, but been in the business since 1987
-They were very happy with the lights that took batteries – quick and no cords
-Max 5 min. to setup before shooting
-Around 2010 there has been a change in the structure. Outside of Copenhagen they have become suppliers of video. Even Snapchat asked if they could record some video
-He sees a big future in the wireless backpack transmitter (using 3G and 4G)
-A rule of thumb during interview; A total shot, a close-up of a detail and a half close-up
-The close-ups are interesting and easier to clip to another angle after
-"about time" – sometimes he has time to ask for a re-shot other times he just tries and capture whatever happens (ren reportage)
-From experience he knows what is interesting and try to keep that in focus
-Later in editing it is easy to see what he missed
-Tries to calm people by explaining what it's used for
-Often uses between 2-4 cameras to shift between angles
-300.000 kr. for the camera and 100.000 for the lens
-They have specific settings for different color temperatures
-He uses the camera for low shots and you don't notice the shakiness when something is moving in front of the camera
-They have a big field of depth and a lot of light
-At DR they don't use any special effects like slow-motion. Captures the reality.
-In his spare time he takes a lot of pictures but rarely videos. Sometimes small clips.
-At Gigantium he saw a journalist wearing a "stabilizer" – a shoulder thing with a stick resting in position in front of her
-He found it very interesting to have some stabilizing equipment with him on his travels – easy to take with him
-VJ (video journalist) using smaller cameras
-8GB storage can contain approx. 30 min. of broadcasting
-They thought the cameras would be lighter when they switched to digital, but actually they got heavier because of the cooling and batteries

MIKKEL BEHA

Det er Mikkel
Goddag, det er Anders Nielsen fra Aalborg Universitet
Goddag Anders.
Goddag, forstyrrer jeg?
Nej det er fint.
Det er fint.
Det var ikke fordi jeg ikke gad at svare på dine spørgsmål, jeg tænkte bare, at jeg ikke havde 2 minutter, så det var nemmere at tage den over telefonen.
Det er bare helt i orden. Jeg går ud fra, at du har læst det jeg skrev i mailen, angående hvad vores retning på projektet er?
Ja.
Så er det fint, hvis jeg stiller et spørgsmål?
Du fyrer bare løs..
Det var for at høre, hvilke slags, eller type af kameraer i bruger, når i er ude at filme, hvis vi ser bort fra når den professionelle fotograf er med.
Ja, altså den professionelle fotograf han / hun skyder på en C300 (Canon), det er ligesom vores hovedcamera. Men rigtig meget af det, jeg tror måske omkring 30-40%, af alle optagelserne er lavet på andre cameraer. I den første sæson brugt vi nogle, jeg tror de hedder Sony EX 1, som er nogle lidt, 4-5 år gamle. De var ved at være udtjent, og de kunne tåle lidt saltvand, og det er sådan nogle små, ikke særlig dyre, sådan nogle som man har brugt som DJ's og sådan noget. Så har vi lavet en del på 2 små lommekameraer. Sådan nogle Panasonic loom (jeg tror han mener Panasonic Lumix), man kan få dem til 2-2.500. Det er sådan nogle små stillbilleds cameraer, men som laver glimrende video. De er gode, de er vandtætte, de kan tåle ned til 10 m dybde, og kan tåle nogle slag, og de ligger altid så man kan tage dem, hvis der lige er et eller andet, eller have dem med i lommen ikke. Så har vi brugt GoPro cameraer, som vi bruger til, primært til fix-skud, altså ned under vandet, nogle hvaler, nogle delfiner, eller et sjovt billede oppe fra masten. Og der er de jo gode, for de kan jo spændes op alle stedet. Så har vi brugt et Canon camera, hvad fanden hed det. hvad (som om der var en anden der sagde noget). Et canon G16, som er et godt semiprofessionel stilbillede camera, som laver god video, som vi har brugt på alle vores undervands billeder her i 2. sæson. Så det er sådan pakken. Så det er jo små billige cameraer, men som kan tåle nogle slag, og ikke koster alverden, og som kan tåle at blive slidt, for det bliver de, når man er ude at sejle.
Nej det kan man nok ikke undgå.
Nej, de får noget saltvand, noget fugt og nogle bank ikke.
Hvad med i forhold til ekstraudstyr, stativer og sådan noget? Er der noget bestemt udstyr i har brugt der?
Vi har noget der hedder SunGun, en lille LED lampe, med genopladelige batterier, som er rigtig god til at sætte lidt ekstra lys, hvis man skal lave noget om aftenen, ned i kahytten eller oppe i kokpittet. Vi har et manfrotto stativ, sådan et almindeligt foto stativ til et par tusind kroner, som vi har brugt få gang. Men i virkeligheden bruger vi meget lidt stativ, for det er svært på en båd, for du bliver nødt til hele tiden af rette horisonten op, for hvis du sætter et stativ, så vil du se båden gynge, og så vil du se en horisont, der hele tiden står og vipper der ude. og det bliver man tosset i hoved af. Så det man gør tit gør på en båd, det er at man kompenserer ved at stå med lidt spredte ben og vugger modsat, kan man sige af båden, så man prøver at holde horisonten lige, for så kan man også fornemme bådens bevægelser bedre.
Er det sådan noget hvor i begynder at bruge stabilisatorer eller er det stadig bare håndholdt?
Det er håndhold, for bevægelserne er for store til at bruge en stabilisator. Stabilisator kan tage de der små ting, hvis du sidder i en bil og filmer ud af et vinduet, de rystelser der er i en bil, kan stabilisatoren ligesom tage. Men de der lidt større bevægelser kan stabilisatoren ikke følge med. Der laver den tvæt imod bare uro, og lidt afhængigt af hvilket kamera, men så laver de uro og slører billederne på den måde, fordi de ikke kan følge med på så store bevægelser.
okay, jamen det er meget fint at få med. Men du har så været inde på det andet spørgsmål, om der er nogle problematikker, på at optage på en båd sammenlignet med at optage på land?
Der er meget lidt plads, det er svært at komme på afstand, på en båd. Altså alting er jo meget småt. Dvs at ofte vil du på land gå 1-1,5 m længere væk som fotograf, for at filme en situation som udspiller sig, så der står man sådan set tættere på her. Dvs. vi kører også normal med lidt widet (tror han mener wide) objektiver for at kunne få lidt med rundt om os ikke. Og eller er den store udfordring er ved fugt og salt, fordi der er salt i luften. Så man skal være ret omhyggeligt med at skylde dem, dvs. de kameraer som kan tåle vand, skylde dem i ferskvand, når man har mulighed for det. og holde de andre kameraer nogenlunde rene, tørre dem af med en vådserviet, engang imellem. Dvs. tørre saltflagerne af dem ikke, for det er rigtig hårdt ved dem. og det kommer jo ind alle steder. Man kan se på vores kameraer, på de professionelle kameraer vi har med, når de kommer hjem til dem der har leveret dem ikke, efter 2 måneder kan man se på alle printplader, at der begynder at være tærring og de irrer, fordi luftfugtigheden er så høj og der er salt.
Hvad med i forhold til om i har oplevet nogle specifikke problematikker når i selv har stået for kameraførslen sammenlignet med når i har en professionel fotograf med?
Hmm, vi har haft 3 forskellige fotografer med, på de programmer vi har lavet. Og det er alle nogle fotografer som vi kender godt i forvejen. Jeg vil sige, at det største problem har været at finde nogle fotografer, der kan leve så tæt sammen med os og som kan være på et båd., og kan agerer under de specielle forhold som det er at leve ombord på en båd. Så derfor har vi taget 3 fotografer som vi kender rigtig godt i forvejen, og som er søstærke og som kender os. Så på den måde har det fungeret rigtig godt, og vi er bare gledet ind som det 6. medlem i familien. Men det vi har oplevet er at det giver noget styrke. Der er jo nogle perioder hvor vi ikke har fotograf ombord. Hvor vi så selv går og filmer, og der er vi blevet bedre til at udnytte det, at der ikke er en fotograf, så det har en lidt mere hjemmevideo karakter. Så vi ikke ligger skjul på, at selv tager kameraet, at man ser bevægelsen hvor jeg sætter det op, for nu er jeg alene på vagt om morgenen, og slukker det igen når jeg er færdig med at fortælle et eller andet til kameraet. Altså man brguer bevidst at seern er taget i ed på, at nu er jeg alene, der er ikke nogle fotografer, nu er det bare mig og mit lille lommekamera. Det giver en anden fortælling, det giver nogle andre, en anden måde at fortælle på, når man gør det på den måde.
Det går jeg ud fra, er det samme for Emil og Theis, når de selv er ude på båden, og i er her i Danmark?
Ja, ja, det er nemlig det. Ja når de har været ude på de store hav stræk og sådan noget, så er de jo nemlig også alene med kameraet, og bruger det jo også på den måde, hvor man godt kan fornemme at de er der alene, og man godt kan fornemme at der ikke er en professionel tv-fotograf, ved siden af.
Jeg tror sådan set at det var ved at være det. jeg havde af spørgsmål sådan umiddelbart.
Det er bare i orden.
Tusind tak for hjælpen, det var fornemt at du havde tid til at hjælpe os.
Det var så lidt, held og lykke med projektet.
Tusind tak for det.
Det er godt du.
Så hej hej.
Hej.

ROLF

-Tidligere camera Canon 5d mark 2 – skillsættende (camera 60d)
-Spejlrefleks indsat en video funktion (vidste hvor store impact det ville ha)
-Den sensor i mark2 blev overført til video
-En krig mellem de her dlsr camera
-Har firma og kørt selvstændig (musik video, og coorporate)
-Panasonic gh4 Lumix (en mindre udgave og kan filme 4k og slow)
-Mark 2 er dårlig ift. lyd
-Mindre panasonic giver brug til rejse optagelser
-Lumix udnytter kun halvdelen af objektivet (zoomet en) ift. canon
-Ny bølge af videokameraer (96 frames i lumix osv.)
-Tror ikke ville have privat brug af shoulder rig
-Tripod selvfølgelig og hoved der kan drejes (lettere gh4 og derfor lettere)
-Ikke brugt de stabilizer (ville mere gå efter de elektriske)
-Kan bruge dem som kran (sat en snor i den ud over en altan)
-Gh4 indbygget så den sætter dem sammen
-Har ikke brugt slider med motor men uden
-Forskelligt med opsætning af scener
-Bruger selv led lys (meget let) modsat den rødhætten lampe

DEVIN GRAHAM

Hello Devin,

1 Do you have some initial thoughts on how the video should be made before staring to film? Maybe explore the place and make a mental note?
2 How much time do you need to set up for a scene?
3 What are your thoughts regarding time-lapse footage? we can see in the newer videos that you use some time-lapse with some movement, but not too often the slided view. Why is that?
4. In which cases do you prefer to use a tripod over the cam glider? Or any other equipment?
5. Do you have any physical discomfort while shooting? Do you have any spine, shoulder or arm issues because of the weight of the equipment you carry around?
Is it ok if we will contact you in the future if we have further questions?

Thanks again :)
Regards,
Andrea

I don't have much time to answer these, but here's a quick answer for all of them :)

1. Yes, we know how we will film the video, the style, etc. Sometimes we are surprised though by the filming circumstance so we make adjustments and changes to meet those needs. We film very documentary style for our montage videos.

2 . Usually it's a full day to set up the stunt, and then 2 days of filming ideally.

3. We love timelapses, we are always trying to push ourselves as filmmakers and try new things, so that's why we started doing more of those.

4. Always use a glidecam, and usually only use tripod for tight shots to break up the glidecam shots. The tripod takes a lot more setup.

5. It's physical work for sure, often sore at the end of the day, usually in my legs because that takes most the weight, nothing to bad though, filming everyday so we are surviving :)

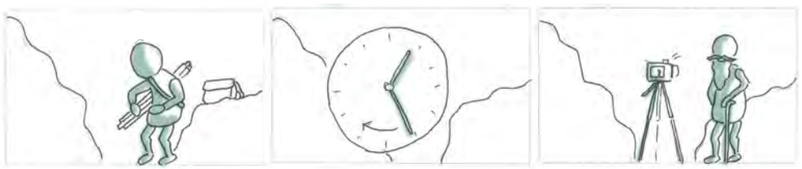
Devin

7.5 INITIAL PROBLEMS

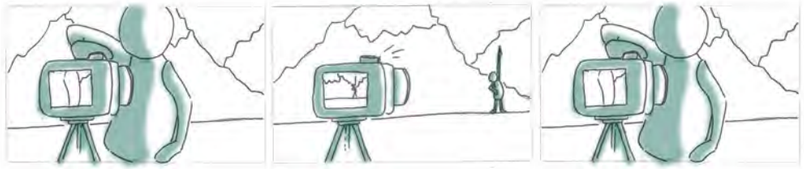
Some of the initial problems are sketched below. Each of these problems coulde lead to more solutions

MOMENT GONE

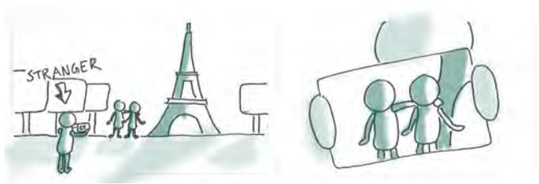
SETUP AND POSITIONING



BACK AND FORTH

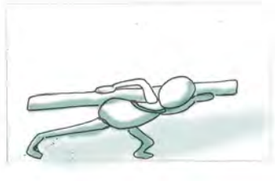


STRANGER PHOTO



PRICING PROBLEM

HEAVY GEAR



7.6 ANALASYS OF SURVIVOR MAN- SUPERUSER

- MULTIBLE CAMERA POSITIONS
- STABILIZER STICK / BODY MOUNT

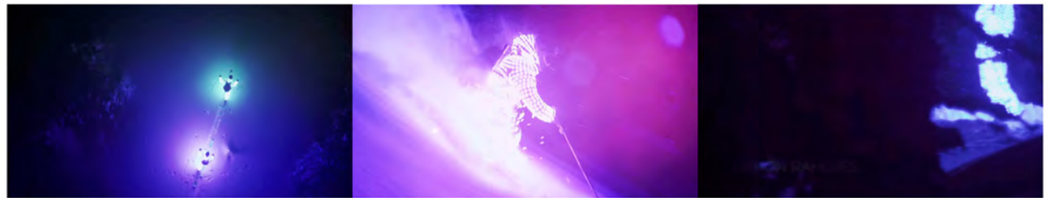
- QUICK GROUND RECORDINGS

- THE LONG SHOTS
- WALKING BACK AND FORTH TO CAMERA
- PROTECT THE SORROUNDINGS (SNOW) / DETOUR

- USING THE TRIPOD AS BODYMOUNT
- SETTING UP CAMERAS (65% OF HIS TIME)

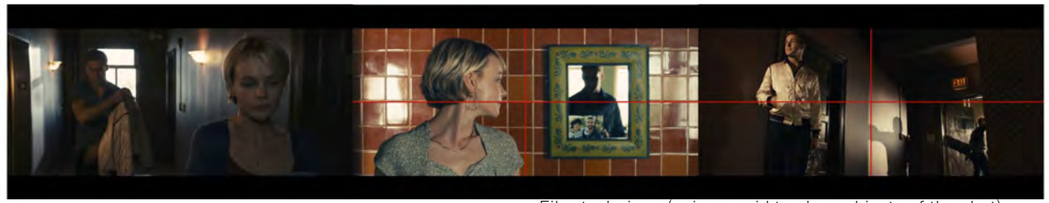
7.7 VIDEO ANALASYS

This analasys helped the team understand what are the basic elements seen in movies or videos that try to copy the cinematic effect. As more elements have to work together to create a specific effect that is desired.



•Camera always in movement, but stabile
•Mostly area shots to capture, the lightning around the skiers
•Use a lot of slider effect
•Constant slow-motion

•"surprise effect" keeping the viewer exited (introduction / blurry)
•Time-lapse night sky in the back of mountain
•The music fits the imagery and or specific scenes and cuts



•Stationary camera
•The actors does the moving
•Cutting instead of camera movement

•Film technique (using a grid to place objects of the shot)
•Music to highlight the mood
•Same use of a specific grid (central) in Wes Anderson movies

• Drone effect as intro
• Point of View shot (specific goPro)
• Voice over to set the mood

• Handheld stabilizer + slow motion to minimize shakings
• Super slow-motion (1000 frames)
• Special effect (time lapse) using both slide and stationary

• Camera movement intro – switched to stationary
• Switch between close and area

• Switch between slow-motion and speed up
• Using movie like effects (voice over etc.)

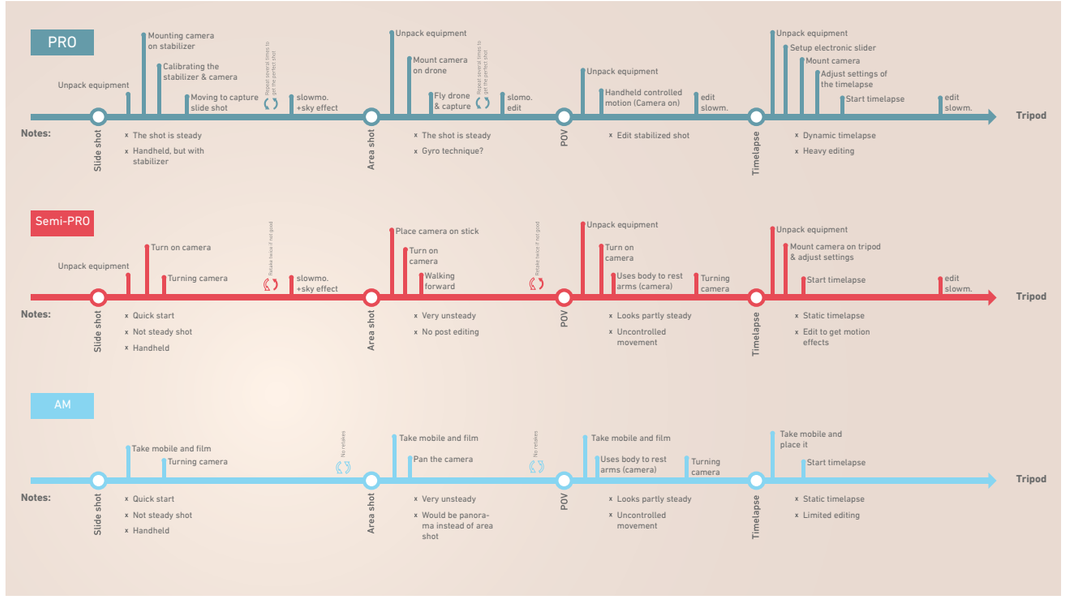
• Static and movement time-lapse
• Small intro after two clips – back to time-lapse
• Switch between moving and stationary time-lapse throughout video

• "no stress" music
• A lot of editing to highlight colors

•Handheld stabilizer
• A small amount of slow-motion
• Always movement on the shots

• Huge gear (the tripod / setup time)
• Looking where you are stepping vs. the display

7.8 DSC VIDEO COMPARISON



OBJECTIVE

The objective of this assignment is to analyze what the differences is, between and pro and amateur videos, and which parameters that can be affected. The analysis will focus on the videos from Dansk Studiecenter as they have both very professional looking videos + videos that aim for the same look but with an amateurish look.

EVALUATION

The video comparison showed a huge difference in the quality of the videos, but also that the semiprofessional often aims for some of the same 'shots' as the professional. There is obviously put more time in both shooting and editing in the professional video, but factors like; stabilization, controlled movement and light are factors that can be affected with some user friendly equipment (easy to use, cheaper, lighter etc.)

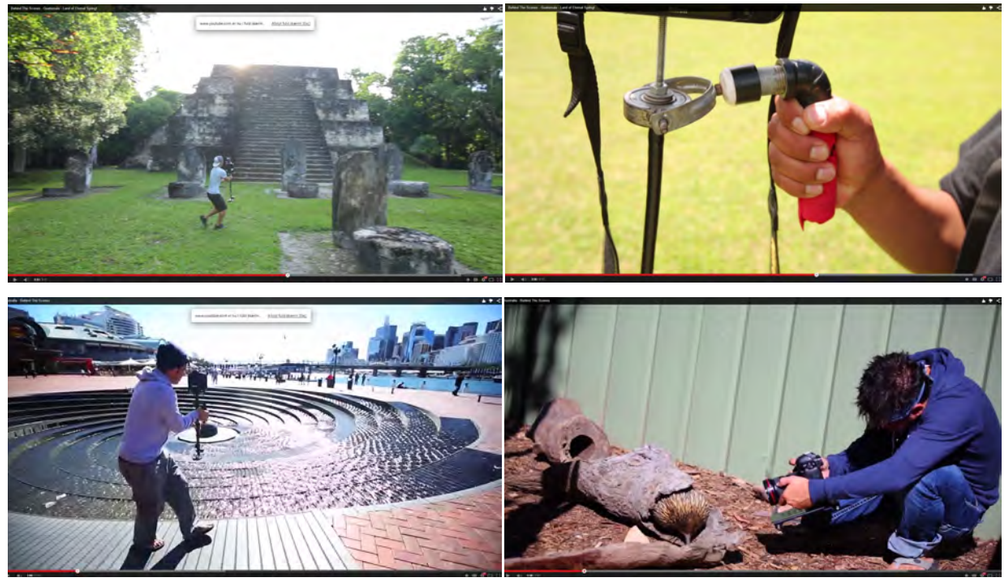
REFLECTION

As the group had trouble analyzing the difference between professionals and semiprofessionals, as there was a lack of information from the professionals, it was helpful to have a visual output to analyze.

During the analysis, reasonable guesses was made on what sort of equipment was used. Knowing the different sorts of equipment it was 'easy' to say that the semiprofessional just needs that product. Therefore it was important to 'destroy' words like: they just need a drone. Instead note that they need a way to elevate their camera and control the movement so the video has a controlled/stabile movement.

7.9 SELECTION OF SUPERTRAMP VIDEOS

- Big gyro stabilizer in helicopter
- The funny sideways walk
- Always walk with stabilizer - why not around shoulder?
- Almost running when doing the shots (easier to keep steady?)



- Funny side knee walk
- Base of stabilizer when only using camera
- Watching the screen whilst also where you walk

- Filming during golden hour
- Turning stabilizer upside down
- Funny walk with stabilizer
- Filming with drone, stabilizer, gopro stick

7.10 EQUIPMENT & CAMERA ANALYSIS

TRIPODS

NAVN	JOBY GORILLAPOD	HAMA STAR 61 TRIPOD	MANFROTTO COMPACT	JOBY GORILLAPOD SLR-ZOOM	FOTOPRO C51	X5 FRANK EVOLUTION 2 CF TRIPOD SYSTEM	MANFROTTO STATIV KIT PRO VIDEO
PRICE	150 DKK	150 DKK	595 DKK	620 DKK	1.450 DKK	4.750 DKK	11.000 DKK
WEIGHT	0.045 KG	1.2 KG	1.16 KG	0.281 KG	1.68 KG	1.83 KG	7.3 KG
MIN. H.		61,3 CM	44 CM		43 CM	55,8 CM	44,5 CM
MAX. H.	21.8 CM	158 CM	155 CM	30 CM	157 CM	168,5 CM	168,5 CM
LOAD	0.325 KG	3 KG	3 KG	3 KG	8 KG	13,2 KG	13 KG

SLIDERS

NAVN	NEEWER® 24" DLSR CAMERA SLIDER	MOBISLYDER	KONOVA CAMERA SLIDER	IFOOTAGE SHARK SLIDER	WIELDY SLIDER
PRICE	430 DKK	450 DKK	3.000 DKK	5.495 DKK	10.000 DKK
WEIGHT	1 KG	0.522 KG	3.2 KG	3.8 KG	16 KG
MAX. L.	60 CM	43 CM	84 CM	135 CM	165 CM
MIN. L.	60 CM	45 CM	84 CM	65 CM	165 CM
MOTOR	NO	NO	NO	NO	YES

STABILIZERS

NAVN	PRO CAMERA CAMCORDER STABILIZER	HAGUE MINI CAMFRAME	FLYCAM 3000 CAMERA STABILIZER	LANPARTE HHG01 RR-G3 ULTRA 3-AXIS	IFOOTAGE WILDCAT
PRICE	130 DKK	500 DKK	1.300 DKK	2.370 DKK	3.850 DKK
WEIGHT	0.325 KG	0.9 KG	3.4 KG	1.4 KG	0.83 KG
LOAD	5 KG	-	3.5 KG	-	2.5 KG

CAMERA RESEARCH V2
DSLR & OBJECTIVES

PRODUCER	NIKON				CANON			
CAMERA	D750	D610	D3300		EOS 5D MARK II	EOS 7D MARK II	EOS 760D	
PRICE	14.441 DKK	10.999 DKK	3.095 DKK		19.624 DKK	13.375 DKK	5.995 DKK	
WEIGHT	750 G	760 G	410 G		845 G	910 G	565 G	
SEIZE	140.5x113x78 (MM)	141x113x82 (MM)	124x98x75.5 (MM)		152.0x116.4 x76.4 (MM)	148.6x112.4 x78.2 (MM)	131.9x100.9 x77.8 (MM)	
PIXELS	24.3 MP CMOS	24.2 MP CMOS	24.2 MP CMOS		50.6 MP FULLFRAME	20.2 MP APS-C CMOS	24.2 MP APS-C CMOS	
MOVIE OPTIONS	FULL HD (60 FPS)	FULL HD (30 FPS)	FULL HD (60 FPS)		FULL HD (30 FPS) 1280x720 (60 FPS)	FULL HD (60 FPS)	FULL HD (30 FPS) 1280x720 (60 FPS)	
WEATHER PROFFING					PROOF AGAINST WATER & DUST	PROOF AGAINST WATER & DUST		
TIME TO SETUP								
LIFESPAN								
DATE OF RELEASE								
LENS	AF-S 80-400 MM	AF-S 24-120 MM	AF-S DX 18-55 MM		EF 100-400 MM	EF 24-105 MM	EF-S 18-55 MM	
F.STOP	F/4.5-5.6	F/4	F/3.5-5.6		F/4.5-5.6	F/4L	F/3.5-5.6	
WEIGHT	1480 G	710 G	195 G		1640 G	670 G	205 G	
SIZE (D x L)	95.5x203 (MM)	84x103.5 (MM)	66 x 59.5 (MM)		94x193 (MM)	83.5x107 (MM)	69.0x75.2 (MM)	
PRICE	16.850 DKK	6.994 DKK	1.095 DKK		10.858 DKK	5025 DKK	1.074 DKK	

CAMERA RESEARCH v2
DSLR & OBJECTIVES

PRODUCER	SONY			OLYMPUS		
CAMERA	A65	A77 II	A99	E-M10	E-M5 MARK II	E-M1
PRICE	5.177 DKK	10.350 DKK	11.995 DKK	4.395 DKK	10.495 DKK	14.969 DKK
WEIGHT	543 G	726 G	733 G	396 G	496 G	497 G
SEIZE	132,1x97,5x 80,7 (MM)	142,6x104, 2x80,9 (MM)	147x111,2x7 8,4 (MM)	119,1x82,3x 45,9 (MM)	123,7x85x3 8 (MM)	130,4x93,5x 63,1 (MM)
PIXELS	24,3 MP APS-C CMOS	24,3 MP APS-C CMOS	24,3 MP FULLFRAME	16,1 MP 4/3 MOS	16,1 MP 4/3 MOS	16,3 MP 4/3 MOS
MOVIE OPTIONS	FULL HD (50 FPS)	FULL HD (60 FPS)	FULL HD (60 FPS)	FULL HD (30 FPS)	FULL HD (60 FPS)	FULL HD (30 FPS)
WEATHER PROFFING		PROOF AGAINST WATER & DUST	PROOF AGAINST WATER & DUST			PROOF AGAINST WATER & DUST + FROST
TIME TO SETUP						
LIFESPAN						
DATE OF RELEASE						
LENS	DT 18-55 MM	DT 16-105 MM	DT 70-400MM	ZUIKO DIGITAL ED 14-42 MM	ZUIKO DIGITAL ED 35-100MM	ZUIKO DIGITAL ED 90-250MM
F.STOP	F/3.5-5.6	F/3.5-5.6	F/4-5.6	F/3.5-5.6	F/2.0	F/2.8
WEIGHT	222 G	470 G	1490 G	190 G	1800 G	3270 G
SIZE (D x L)	71,6x69 (MM)	72x83 (MM)	94,5x196 (MM)	65,5x61 (MM)	96,5x213,5 (MM)	124x276 (MM)
PRICE	995 DKK	4.395 DKK	16.899 DKK	1.495 DKK	19.579 DKK	32.107 DKK

CAMERA RESEARCH v2
SYSTEM CAMERAS

PRODUCER	CANON		NIKON		SONY	
CAMERA	EOS M	EOS M3	1 V3	1 AW1	A5000	A7
PRICE	3.379 DKK	5.580 DKK	6.149 DKK	5.195 DKK	2.595 DKK	8.493 DKK
WEIGHT	298 G	366 G	324 G	356 G	210 G	497 G
SEIZE	108,6x66,5x32, 3 (MM)	110,9x68x44.4 (MM)	110,9x65,0x 33,2 (MM)	113,3x71,5x 37,5 (MM)	109,6x62,8x 35,7 (MM)	126,9x95,7x 59,7 (MM)
PIXELS	18 MP APS-C CMOS	24,2 MP APS-C CMOS	18,4 MP CX, CMOS	14,2 MP CX, CMOS	20,1 MP APS CMOS	24,3 MP FULL CMOS
MOVIE OPTIONS	FULL HD (30 FPS) 1280x720 (60 FPS)	FULL HD (30 FPS) 1280x720 (60 FPS)	FULL HD (60 FPS)	FULL HD (30 FPS)	FULL HD (X FPS)	FULL HD (60 FPS)
WEATHER PROFFING						PROOF AGAINST WATER & DUST + FROST
TIME TO SETUP						
LIFESPAN						

7.11 2MSC WORKSHOP EXTRACT

Sumup of the technoloy course for MSc02 ID

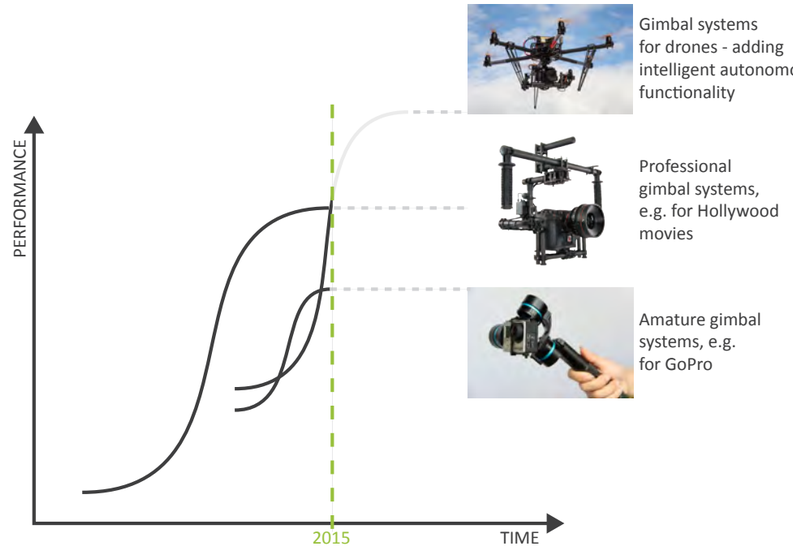
G10 - Torben Jørgensen	Image Sensor Slow motion
G12 - Anca Gogu	Camera Support (Tripod & Action Camera)
G2 - Anne Østergaard	Portable Camera Charger (Some interest)
G12 - Giulia Dalle Nogare	Editing of video on Tablet / SmartPhone
G1 - Nicolai Dam	Camera Memory Display resolution quality Double Gauss Lens
G9 - Rasmus Ø. Pedersen	Light-field-camera (Some nice thoughts) Miniature Camera Picture storage (cloud storage)
G2 - Anne Østergaard	Playstation Eyetoy & Move
G8 - Henriette Lauridsen	Gimbal Camera system (Look at this)
G11 - Nicoline Sofie Jensen	Intel Real Sense 3D camera Light Field Camera
G7 - Mathias Lund	Camera Lens Face recognition
G4 - Thomas M. Jensen	iPhone Camera (Battery) Auto follow drones Wireless Transfer
G3 - Mads Peter Hiligsøe	Lens size
G8 - Belinda, Nors	Hyperlapse
G5 - Anders Jelle	Wi-Fi Pellicle mirror Microsoft Kinetic
G6 - Peter Sørensen	Video Camera Portability DLSR Camera shoulder rig (some insight) Battery

TECHNOLOGY-task

Uploaded by: Group 8, Belinda Nors, *Henriette Lauridsen*, Line Sand Knudsen

TECHNOLOGY NAME : *Gimbal Camera Systems*

1. Describe interconnecting S-curve developments of the technology:
Like a lot of other technology the gimbal camera systems have branched out to include semi-professional equipment for amateurs with lower performance but at an affordable price point. This is a trend seen in relation to a wide variety of technology systems, where hardware or software enables us to acquire certain skills without much knowledge or work. In relation to photography we have all become more or less professional photographers; the DSLR cameras have gotten affordable and a lot of software improves the images or video both before and after shooting. Furthermore the entry of smartphones accompanied by a variety of different image and video processing apps have made semi-professional photography a part of a lot of people's everyday life.
Along with the development of e.g. GoPro cameras and drones/quadcopters the gimbal technology has been adapted to improve the quality of the captured video. The amateur gimbal systems are similar to the professional gear. The system stabilizes the image, keeping it level throughout the take and the small motors driving each axis even makes it possible to fix one axis in a wanted angle to direct the frame at the desired target. The same motors make wireless distant control of the camera possible. An option utilized in both the professional systems and in systems attachable on drones. The development of the latter is going towards a more autonomous software system controlled by various recognition related algorithms, taking the collective system performance to a higher level.



2. Describe interconnecting story framings of the technology:
The gimbal technology is old and has been utilized for various purposes throughout history. When being modified and further developed into the construction used with camera systems the gimbal technology was reframed and afterwards defined and a camera stabilizing technology – an epiphany driven by technology advances in other fields.

3. Describe a potential technology epiphany for the technology:
As described above the gimbal technology has been utilized for various purposes throughout history.
Prospectively the technology itself might improve incrementally, whereas more radical innovation most likely will be found through design-driven innovation with adaption to further application opportunities, as seen throughout the history.

7.12 CES FAIR- TREND SPOTTING 2004-2015

2004

HD-Tv (1080p) is increasing as a format.

Not content enough to play HD

The iPod is stille "the" thing within music

HD recorders

Boom - HD stream service

55" HD LCD tv - Sharp

2005

Orb - taking video, audio and photos everywhere you go - through the internet.

m:robe (Olympus) - listen to music, take and view pictures

Year of the Media Server

HD recording camera

65" HD LCD tv Aquos

2006

Digital Imaging is a really bit thing,

Kodak dual lens camera

LCD screens on camera is becoming more popular

Mobile GPS picking up

"Reading tablets"

2007

Mobile phone based GPS

Polaroid ClickFree photo backup - people are still geting used to the ditigal format of images

HD-DVD & Blueray fight for "control"

"The new IS (image stabilisation)

Digital Photoframes

2008

Too many electronic controlled products in the home (a remote control for all of them)

The year of huge memory (48Gb sdcard)

Image stabilisation is required

DSLR is becomming more affordable

Many Digital Point&Shoot

Digital Photoframes

2009

3D is becomming the deal at home (Panasonic)
OLED (sony)
Handycam x60 zoom (Sony)
Internet access from Tv (LG)
Convergence - Two different technologies evolves to fill the same function. For example Smartphones with Wifi, GPS, music etc.

NetBooks took CES 2009 by storm. Phones looked more like computers and computers looked more like phones.

Instant upload SD-Card (to Youtube)

Pocketsize videocams

Hd digital videocams

1000 fps videocamera

2010

3D is still the future.

Touch screens become more and more the case of interaction

GoPro HD Hero

First drones

Point&Shoot is still big with great development within size and picture quality

Videocams are getting smaller + increased capacity and resolution

Polaroied are reintroduced

2011

Polaroid reinvented with Lady Gaga.

GoPro Hero2

DSLR starting to appear at CES (they were normally for professionals)

Pocket cams are still big

Point&Shoot keeps developing

2012

Connection between "two screens".

3D prototyping (3D print)
Tablets
Accessories (photo) to your Smartphone
Interchangable Lens cameras (System cameras) or system cameras are introduced again. Some brands for example Canon keeps to Point&Shoot still.

GoPro Hero3

2013

Smart Cameras for Pro-sumers to share their experinces.

4K definition of screens

Pebble Smartwatch.

Displair - Display in the air, by backlight and wall of air.

The Connected Home

2nd Screen Summit - Using tablet while seeing Tv.

GoPro Hero3+

System cameras are increasing in popularity. Competing with Point&Shoot. Point&Shoot is "feeling" the pressure from the smartphone

2014

Smart Cameras for Pro-sumers to share their experinces.
4K definition of screens
Pebble Smartwatch.
Displair - Display in the air, by backlight and wall of air.
The Connected Home
2nd Screen Summit - Using tablet while seeing Tv.
GoPro Hero 4
System cameras increase in numbers
DSLR is also introduced by the "big" brands like Nikon and Canon.
4K resolution videocams are now introduced

2015

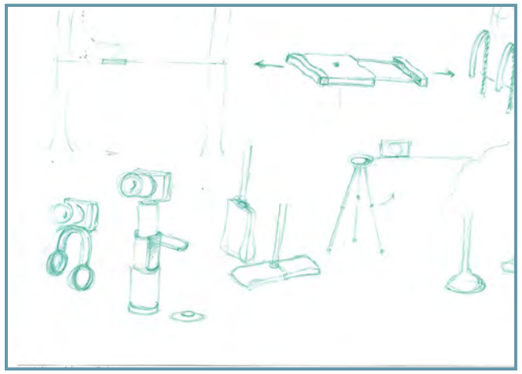
Drones are the big thing

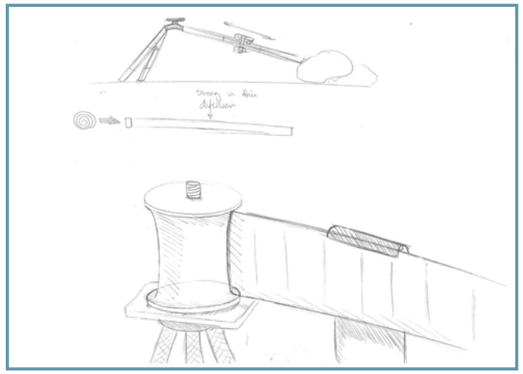
Small pocket camera (spy)

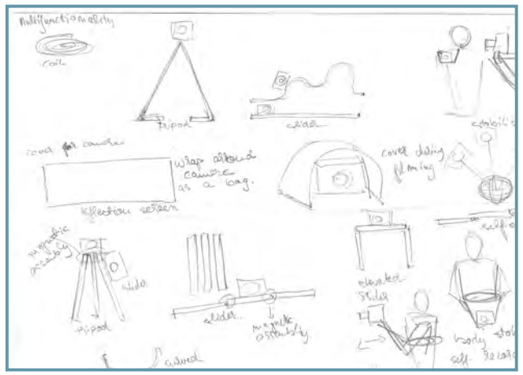
DSLR is generally introduced.

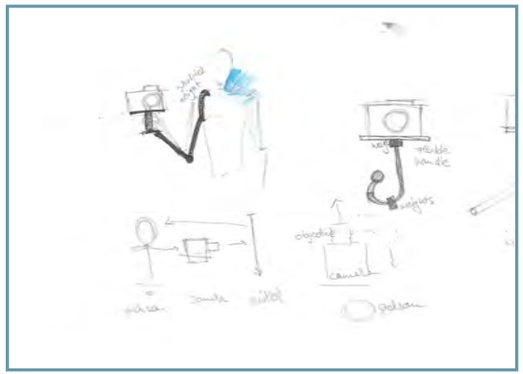
Videocams must have 4K now.
Thermal cameras for amateurs
Connected home
App controlled devices
Battery technology
Internet of things (product is increasingly getting connected through the internet)
Smartphone accessories (cameras)
Wearables
Virtual reality (googles etc)

7.13 INITIAL SKETCHING SESSION





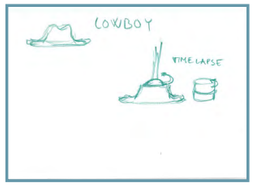


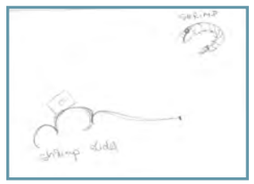


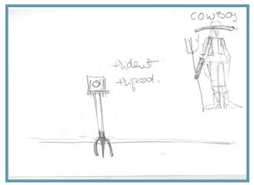
This initial sketching session, was very important, because there were many ideas that were popping up until this point and the only way how to move on was to draw them. That way everything that these ideas had to offer was taken and further developed and everything else, was just left alone, insuring that no darlings were keep and taken further on in the process.

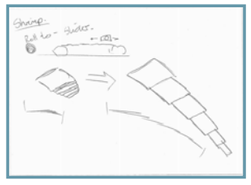
7.14 NOUN SKETCHING SESSION

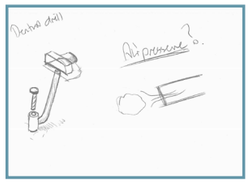
THE "NO" CATEGORY

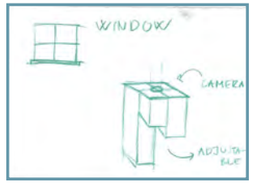


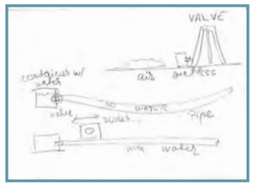


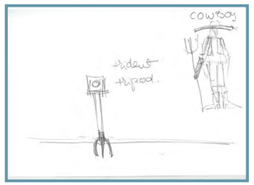




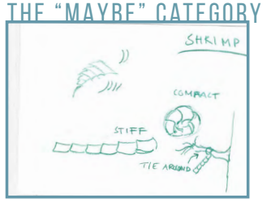


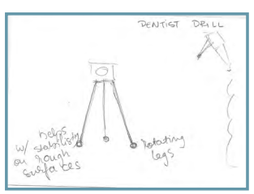




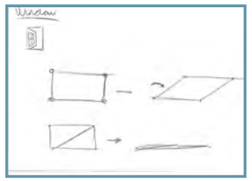


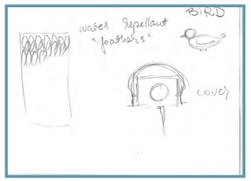
THE "MAYBE" CATEGORY





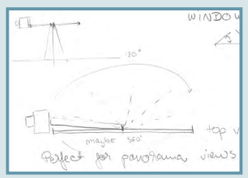
THE "PRINCIPAL" CATEGORY

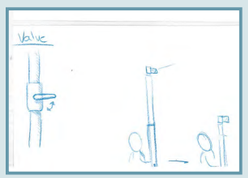


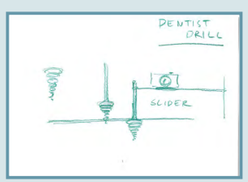


Some of the sketches that helped us the most are in the "YES", "MAYBE" and "PRINCIPAL" category, but as it's visible as well the most sketches are in the "NO" category, that is because the team tried to really think out of the box when drawing these ideas, and not think in terms of practicality; so many ideas were not really usable, but it still helped to broaden up our views.

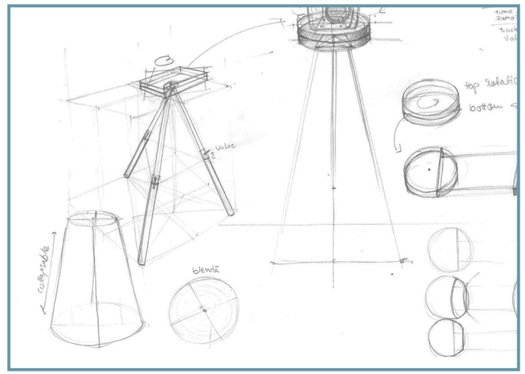
The "YES" category

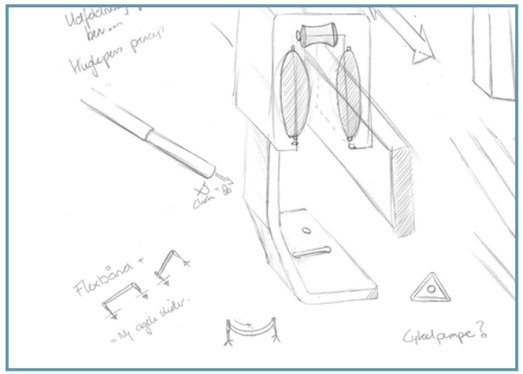


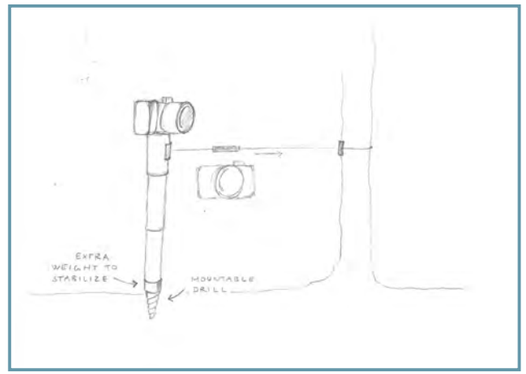


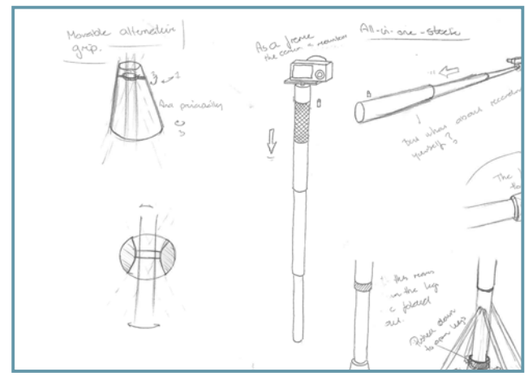


7.15 OUTCOME SKETCHING SESSION



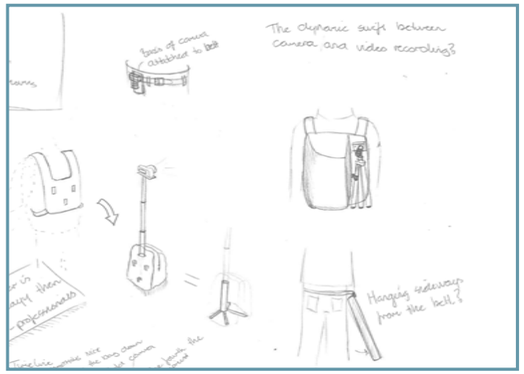


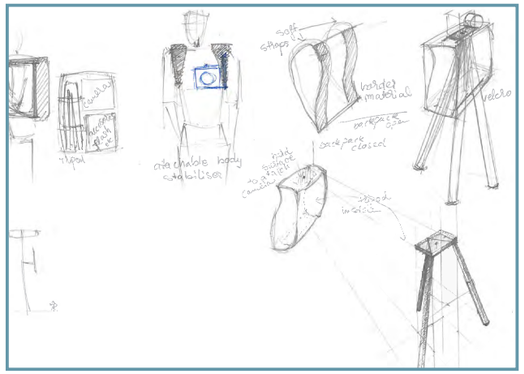


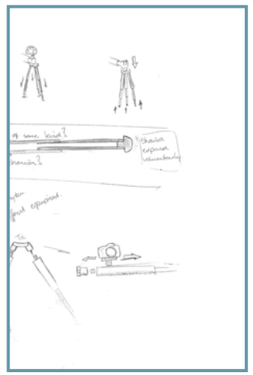


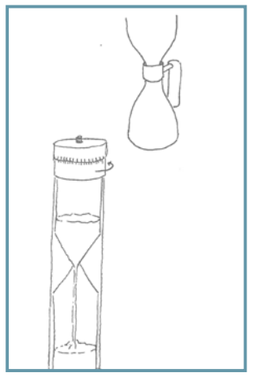
The outcome sketching session, made the group focuse more on specific video outputs and how to acieve those distinct shots with the least equipment and time to assemble them. As visible some ideas are quite repetetive, and that is because there were a few specific shots that were focused on the most. One of these types of shots were the time lapses that can be acheaved in more ways, but generally it is needed a tripod and if the time-lapse is more pro, then the shot is also moving, meaning that the camera is placed on a slider. That way the camera also moves/slides a little, creating a different effect. One of the ideas it was played with was the possibility of a vertical slider and time-lapse, but ufortunatelly, the footage is not that interesting as most people want a panorama time-lapse, so a horizontal view, not vertical.

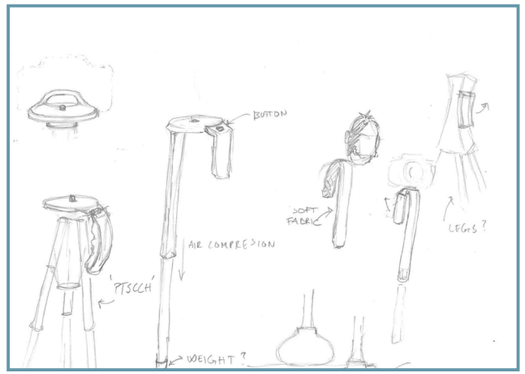
7.16 SIX ELEMENT SKETCHING SESSION

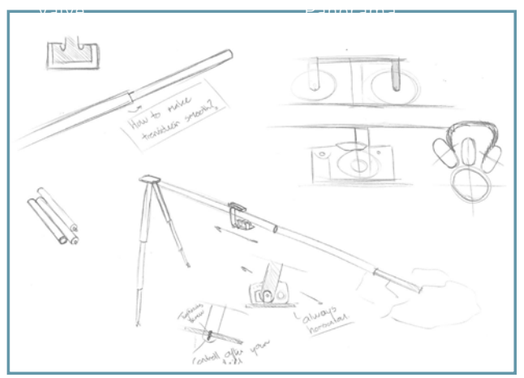












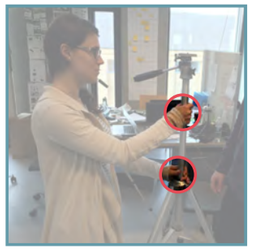
The six elements meant that there was a free sketching session where each memeber of the group could ideate freely on one of the following elements: slider, tripod, time-lapse, panorama, backpack & valve.

7.17 FIRST BODY STORM

OBJECTIVE

The objective was to analyse what are the normal movements that individuals do while they work with camera equipment. How they interact with it, where do they store the equipment when not in use and lastly how comfortable are the interaction points from various equipment. This session will be explained in photos and text.

CONTENT



1. Interaction points

The group tried to take out the handle, or stabiliser as we used it, while filming and the image was very shaky, therefore it was tried again, but with two hands on the stabiliser, that way the image was less shaky, but still not that good. Therefore it was decided that the stabiliser cannot be user while it's put in or taken apart from the rest of the equipment.

3. Inactive use

To avoid the equipment tangling up inside the backpack with other straps, an alternative is to have the equipment attached under the bag; this situation solves one problem, but it creates another one, and that is that the user has to take off the bag to get to the equipment, which is not an ideal situation especially if it's muddy and dirty on the ground.

5. Bag attachement

One way to have an easy access to the equipment is to have it attached in the front to the backpack strap. The issue with this solution is that having a bigger equipment would be uncomfortable to hike with, but would enable the user to attach in a easy and fast manner the camera equipment to the backpack without needing to take off the whole bag.

2. Equipment in bag

When traveling, many will have their equipment in the backpack, but the issues with this situation is that it is inconvenient to pack it in and out many times. Another one is regarding straps and other things tangling up with some of the equipment, impeding a fast and easy way of taking out the equipment.

4. Inactive use

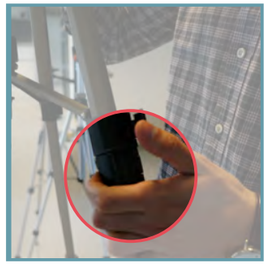
Many videographers have their tripod or stabiliser on their shoulders when walking a shorter distance so they don't need to always pack in and out of the backpack the equipment. After a while the equipment becomes heavy and also one hand is always occupied holding the equipment so they cannot move freely. This is why it is important to have a backpack attacher for the equipment.

6. Stabiliser grip

The stabiliser part has to be held at a specific height, otherwise it can do more harm then good, therefore it was important to test out where should the handle be placed and if the handle should be movable. During this body storm it was understandable that the handle should be place at the top of stabiliser for best results and also it should be always in the same place.

7. Leg opening

The leg opening test showed that there are two ways of opening tripods. Each leg separately and all three legs together. Each way has it's pro's and con's: opening together= 1 interaction, but same size arc for opening; separate opening= 3 interactions, but legs can have different arc sizes. The group preferred the latter version as it gives more diversity for the user.

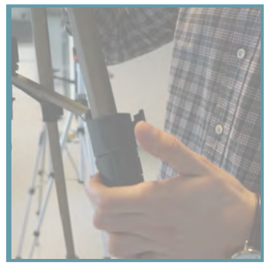


8. Leg extension

Regarding the extension of the legs, it is possible to do in more ways as well; the extensions can have locking mechanism that flips op/down or left/right or the second option is to have the extension joint rotate. The group has found that the first option works best. On top of working better it also signalling the user when the mechanism is lock/unlocked.

9. Quick release

Some tripods had incorporated a quick release system, where the camera can be attached to it, that wait's easy and fast to mount on and off a tripod. As we are working with a multifunctional equipment, the quick release system could potentially help mount the camera to more parts of our product, facilitating a fast and easy attachment & detachment movement for the user.



10. Inactive use

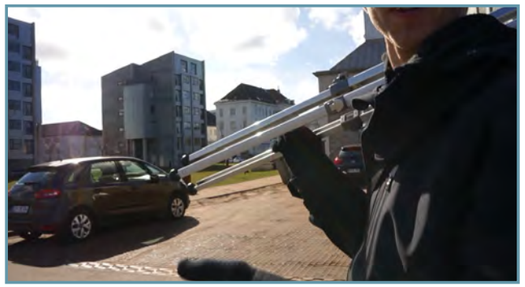
Many videographers have their tripod or stabiliser on their shoulders when walking a shorter distance so they don't need to always pack in and out of the backpack the equipment. After a while the equipment becomes heavy and also one hand is always occupied holding the equipment so they cannot move freely. This is why it is important to have a backpack attacher for the equipment.

CONCLUSION

- Filming while attaching and detaching the stabiliser from the rest of the equipment is not possible, because the image is too shaky.
- Having the equipment in the backpack next to straps and otheobjects, makes the taking out a lot more difficult, therefore the group is considering some other form of attachment to the outer part of the backpack.
- The handle has to be placed as high as possible, to improve the quality of the footage with minimal effort, regarding stabilisation
- Regarding the legs, the group had a harder time to choose one direction, as all options have positives and negatives. In the end the idea that was picked, was the idea that gave most of the flexibility to the user. That way for the opening of the legs, the group chose more interactions, but ultimately the idea where the legs can be individually opened and adjusted how far out should they be opened. While the leg extension was prefer to have a system where the user can potentially open more then one pat at once.
- The quick release system had to be incorporated so that there could be a fast mounting way for the camera on to the equipment.

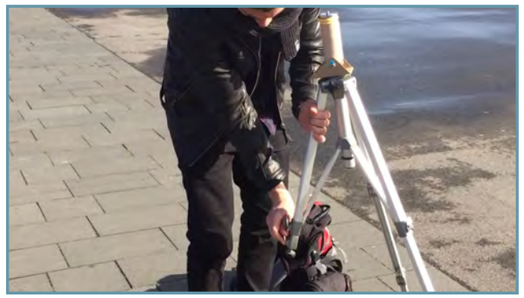
7.18 HARBOUR BODY STORM

This session of body storm was made out in the harbour, so we can get some of the problems that our users would face in nature. As the first body storm gave the group many new ideas and criteria, the product was further developed, but some of the new ideas had to be tested as well, which let to this second body storm. As the first body storm was made in a class room, we did not know how moving people, wind and other similar things would influence our product. To our surprise some of the things we worried about e.g. wind, did not affect the footage, but others, like using a phone and camera (with no table) proved to be a difficulty.



2. Shakiness while walking

- When someone is moving close to the camera the
- shakiness doesn't feel that extreme



3. Opening the legs

- 42 seconds before ready to mount the camera
- + 25 sec to attach camera
- Unfolding it in the air - but you first get feedback on, if it is perfectly leveled when placing it on the ground
- Didn't know which leg that wasn't fully extend
- Placing the backpack on the ground problem (muddy)

1. Still shot for panorama

- Even when trying my best to keep a steady hand while doing the panorama - its still quite shaky
- Test with foam handle2
- Applying the warp stabilizer makes it almost
- perfectly steady

4. Interaction points

- Nice and quick assembly and disassembly of the tripod
- Releasing the legs in air to make sure they are fully extended
- Very fast way than existing products

5. Camera+phone usage

- There might be a problem where to place the stabilizer when placing the smartphone
- Are you twisting the smartphone, thereby the timer in the same motion?

6. Holding the slider

- A nice control while holding the camera in one hand and the end of the stabilizer in the other
- Should there be a safety feature so if the slider is fully
- extend the weight of the camera doesn't make it slide out
- Action points to grab the end - maybe incorporate together with adding weights

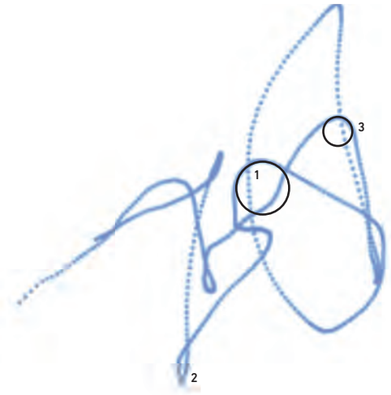
5. Quick release

- Way more quick to attach camera on tripod when attatched to strap on bacpack rather than being in it.

CONCLUSION

- Post processing can improve a little shaky footage.
- Different heights are often encountered in nature, feet+legs should adjust to those.
- Bags have to stay either on the users back or hung on a tree, they cannot be place on the floor, might be muddy.
- Using both a camera and a cell phone for footage requires a place to put the slider on to
- Safety feature for slider.

7.19 EXTRACT OF STABILIZER TEST



Descartes' theorem on Osculating circles

The bigger the radius the less change in the curve - thereby a more smooth curvature

$$\kappa = \frac{1}{r}$$

$$^1 = \frac{1}{4{,}307} \qquad ^2 = \frac{1}{0{,}508} \qquad ^3 = \frac{1}{2{,}367}$$

$$^1 = 0{,}2322 \qquad ^2 = 1{,}9685 \qquad ^3 = 0{,}4225$$

0,8744 mm

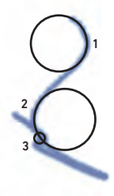
1,035 mm

$$^1 = \frac{1}{0{,}886} \qquad ^2 = \frac{1}{0{,}667} \qquad ^3 = \frac{1}{0{,}435}$$

$$^1 = 1{,}1287 \qquad ^2 = 1{,}4993 \qquad ^3 = 2{,}2989$$

1,6423 mm

1,999 mm



$$\kappa^1 = \frac{1}{4{,}576} \qquad \kappa^2 = \frac{1}{4{,}98} \qquad \kappa^3 = \frac{1}{0{,}872}$$

$$\kappa^1 = 0{,}2185 \qquad \kappa^2 = 0{,}2008 \qquad \kappa^3 = 1{,}1468$$

AVERAGE CURVATURE: 0,5220 mm

7.20 FOAM DENSITY TESTS






0,007 kg

0,05 x 0,092 x 0,049 m

= 31,06 kg/m^3

0,009 kg

0,062 x 0,039 x 0,116 m

= 32,08 kg/m^3

0,004 kg

0,051 x 0,069 x 0,038 m

= 29,91 kg/m^3

7.21 CAMERA ATTACHMENT

OBJECTIVE

The objective of the task was to find possible solutions for ways to attach the camera to the product.
The requirements for the technical solution has mainly been found through bodystorming with tripods and inspiration from existing products.
It was found that the camera attachment requires multible functions, as the stabilizer needs center adjustability of the camera, quick release of camera and flexibilty of camera while attached to stabilizer.

REQUIREMENTS

- be able to rotate camera freely and lock it
- a 90 degree tilt in at least one direction
- adjustable plate to ensure centered weight distribution
- quick release of camera
- possible to attach to backpack

POSSIBLE SOLUTIONS

When using the slider function in the product it is important that you can move the camera in different axis. Two different technical solutions was analysed to choose the one that fits our product.

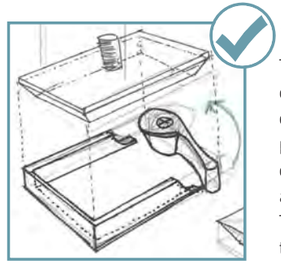
1. A pan head

The pan head has the advantage that you are able to fix one of the axis and only move the other one, which is perfect for creating panoramas. Still the pan head requires two interaction points to move the camera which is very time consuming.

2. A ballhead system

The ball head is a very simple solution that has become more frequently used on tripods. It allows a lot of flexibilty for camera movement with only on interaction point and combined with a small carving in the outer shell it allows for a 90 degree tilt that is necessary for a horizontal slide.

It was important to create a simple and easy way to quickly release the camera from the product, because less set-up time, more filming.



1. Quick release system

The system is used on a lot of existing tripods. It's very easy to use and having the plate plate attached to the camera allows quick release and attachment to product. The plate could function well together with backpack attachment.

Furthermore, a solution for attaching the camera to a backback strap was important, as it was found through bodystorming, its way quicker to start filming when having camera ready in front of you instead of in backpack.

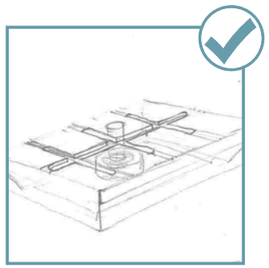
1. Belt attachment

The picture showed above is a simple solution for using the camera weight and gravity to keep the camera in place. A con with this solution is the lack of feedback to make sure the camera is secure, plus this solutions is more focused at placing the camera at your belt.

2. Backpack attachment

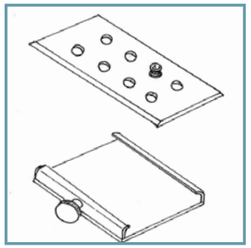
The inspiration and picture is from Peak Design. The camera is easy attachable to the backback strap, but further analysis of the product shows some discomfort in reaching the small lock when using the camera.

To secure the most stabililzed shot it is required that the camera is centerized on the product. Using the previous attached plate to adjust the cameras position was quickly found to be the best incorpareted solution.



1. Track in plate

To ensure that you are able to center the camera weight a track is made in the plate, so you can move the camera from side to side and back and forth. This solution makes it possible to leave the screw in the plate.



2. Holes in plate

This solutions offers the same functions as number one, but it is needed to remove the srew from hole to hole when adjusting the camera.

The three solutions choosen works together as the top part of the stabilizer. The ballhead ensures that the user quickly can unlock the ball head an move the camera freely. This is very useful when using the slider function as the camera won't always point in the right direction.

The quick release system was a necessary feature as the user are able to use more time of capturing the wanted shots instead of using time assembling the camera to the product. The plate that allows quick release is also gives the opportunity to create an additional add on product that can hold the camera in front of the users backback.

To make sure that the user can adjust the camera in the center of the stabilizer, there is incorporated a track in the previous mentioned plate.

7.19B GOPRO APP TEST

GoPro remote controll test

The objective of the test was to see, how long it takes to setup and start a recording using a remote controll to the GoPro.

The test was done with the use of the phone app.

1. Test with app controll & change of settings
First the GoPro was turned on, while the app started.
Then the wifi on the GoPro was turned on
Waiting until the app found the GoPro.
Adjust the setting - From 30 fps. to 60 fps.
Push record on the app.

Total time: 1 min & 13 sec.

2. Test with manual record & change of settings
First the GoPro was turned on.
Into menu, change settings and out again.
Record

Total time: 25 seconds

3. Test with app control & change of settings
First the GoPro was turned on, while the app started.
Then the wifi on the GoPro was turned on.
Waiting until the app found the GoPro.
Push record on the app.

Total time: 1 min & 4 seconds.

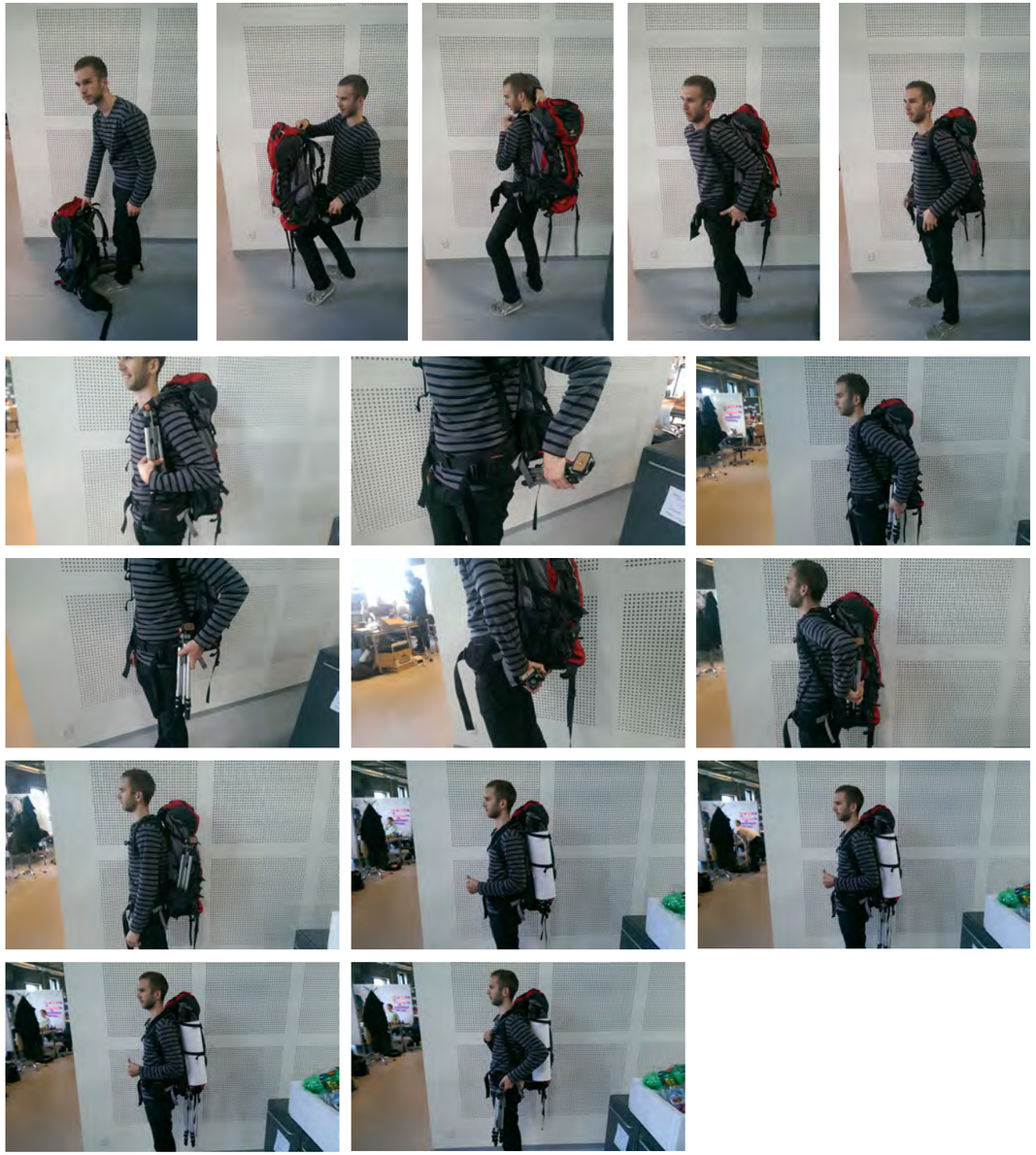
4. Test with manual record
First the GoPro was turned on.
Push record.

Total time: 7 sec.

The result of the test showed, that the control of the GoPro with an app took a reasonable much longer time in total. Though the option of changing settings on the GoPro was much quicker on the app, than manually on the product. This is mainly because of the complex menu structure on the GoPro screen, while the app is pretty straight forward.

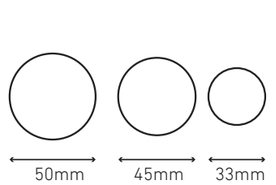
Totally the quick setup time and start to record is more advantages than the highly controllable mobile app.

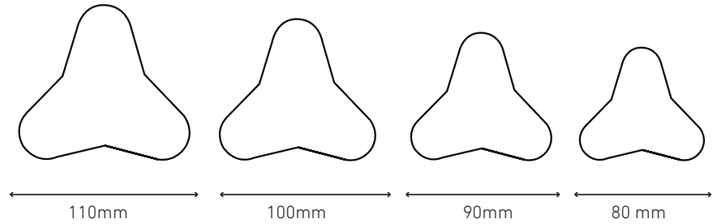
7.21B BACKPACK TESTING



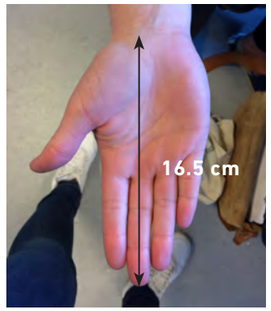
7.22 HAND TESTING

To figure out the best size for the legs, the group did a test where different people were asked to hold the legs and say which is the most comfortable size. For this test there were many people with different size hands asked for their opinion. Similarly it was done with the stabiliser handle. There were four leg profile sizes that had distinct diameter sizes and three handle profile with different diameter sizes, these can be seen below.





ANDREA K.

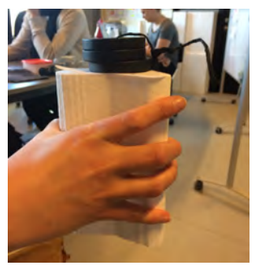


90d is the most comfortable size for Andrea, as she has smaller hands. She holds the shape with her fingers (knockles+tips) and thumb.

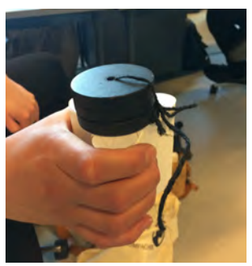
HANDLE

- preffers the 45d
- thinks the max diameter she could hold is 50mm

110d -very difficult to hold, too big.



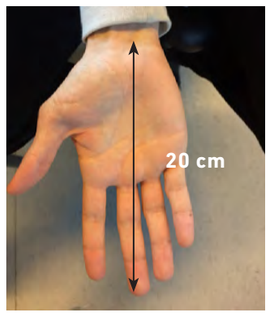
100d -getting more comfortable, but still not that comfortable, but it's holdable.



90d -very comfortable. Good grip. Best size for Andrea

80d -much tension in fingers, too small. Does not stay comfy in hand.

HANS



100d is the closest to being comfortable, but even that is just half of cm bigger then the ideal grip for Hans. Holds the shape with knockles and base of thumb.

HANDLE

- when holding the 50mm d, his hand is not so relaxed, so he does not like it
- debating inbetween the 33 and the 45 mm, as they both feel comfortable
- in the end he decided that the 45mm because it provides the best grip

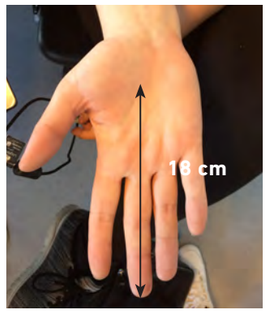
110d -too big, so it created tension and it's not comfortable to hold.

80d -too small to hold ok. It makes the hand have an unatural grip.

90d -almost comfortable, just 5 more cm and it would be perfect for his hand.

100d -it's ok, can be hold, but half a cm smaller and it would be perfect.

HELENE



100d is the best for her. Holds with finger tips and thomb. Helene feels like she would be affraid to hold the shape if it would be aluminium, it would comfort her to have a silicone rim or handle from where to hold.

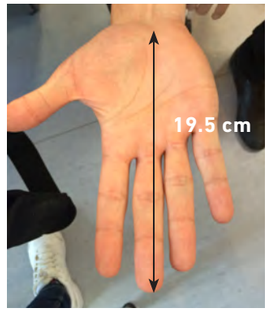
100d -most comfortable size for her to hold.

90d -also a comfortable size to hold.

80d -too small size, she feels uncomfortable to hold and have a good grip on in.

110d -too big, she feels she does not have control holding the shape.

SØREN-EMIL



100d is the best shape to hold comfortably. Interaction points are in the knockles and finger tips and the thumb and base of the thumb.

HANDLE

- the one that sits the best is the 50mmd.
- the 33mm he feels that his thumb is overlaping too much on this fingers, so he does not feel comfortable.
- the 45mm is ok, but the 50 just sits better in his hand.

100d -the most comfortable to hols. Perfect grip.

110d -too big for a comfortable grip.

90d -quite comfortable, but just a little bigger and it's good . But still ok to hold.

80d -too small, too much tension in the grip.

ANDERS

100d is the best size for Anders. The interaction points are with his knockels and a bit the finger tips and the thomb.

HANDLE

- anders likes the most the 45mm d how it has the grip, not too big and not too small
- the 33mm d he considers very uncomfortably small
- and the 50mm d is not bad, he could not choose in the begining, but evetually, prefered the one a bit smaller.

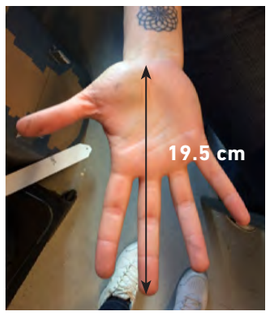
110d -a little too big to have a comfortable grip. The hand it too tense.

100d -very comfortable, to hold, the hand is most relaxed when holding this size.

90d -still a comfortable size, but just a little too small.

80d -way to small to hold properly.

JULIE



80d+100d are the best sizes for Julie. The 80d when held with whole hand/ palm, and the 100d when held woth fingers. Point of interaction are the knockles and finger tips and the base of the thumb.

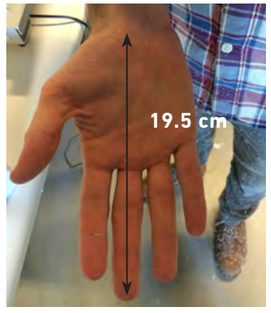
80d -the most comfortable to hold. She holds it with the whole hand not just fingers.

90d -getting too big for hand grip, she has to hold with fingers, being uncomfortable.

100d -it's ok, she holds with fingers. Not as comfy as the 80d

110d -just a little too big, but she can still hold it ok.

ANDERS K.



80d+100d
Anders didn't find the shape intuitive to hold, hand or finger grip, so he would advice some silicone finger shapes to help understand how to hold the shape properly. 100d is ok for finger grip.

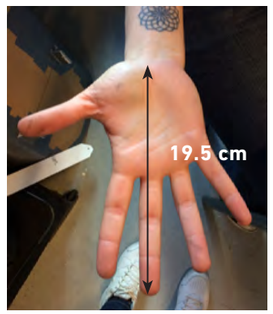
80d -the most comfortable, he holds the shape with his whole hand, like Julie.

90d -not that comfortable, cannot hold with whole hand.

100d -not comfortable for hand grip, but better with finger grip.

110d -too big for any type of grip.

ANDREA



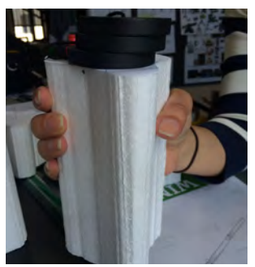
90d works best for Andrea, it interacts with the knockles and thomb. And it feels most safe and secure to hold, with or withought weights.

HANDLE

- the 33 mm d seemed too small, and gives a little insecurity.
- the 50mm d is comfortable and has a good grip
- the 45 mm d is the best when holding for alonger time, it provides the most comfortable grip.

80d -too small for a comfortable grip. The thomb is placed weird.

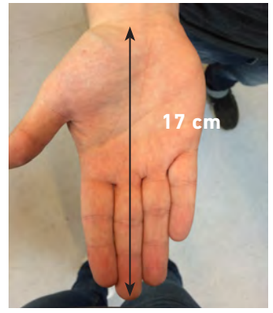
90d -the best size, fits withought any tension.



100d -very comfortable, could work as well, but it feels safer a size maller.

110d -much tension in fingers, barely has a grip on it. Too big.

BRIAN



HANDLE

- brian though the 45mm d was the best one to hold, because of the relaxed grip of his hand.
- the 33mm d was too small in his opinion and the 50mm d was a little bit too much.

7.23 BUSINESS SCENARIOS

SCENARIO #3 JYSK REJSEBUREAU

WHAT VALUE DO WE DELIVER TO THE CUSTOMER?
By renting out our product for travelers there is a clear value in giving these customers access to a product / service they lacked before. This could also expand the user group to customers with no experience as the service could include guides to specific camera shots or after editing of video.

As previously stated, Jysk Rejseburea are trying to use a lot more videos to advertise for their travels. This service could provide them with small 'stock footage' of different locations around the world – thereby adding value to Jysk Rejsebureau as a customer.

HOW ARE THE VALUE PROPOSITIONS BEING DELIVERED TO THE CUSTOMER?
Using the travel agency rental service, we allow the customer to purchase a service that include both instructions on how to use during traveling, but also a post-purchase customer support in after editing the video, for customers that lack the experience.

HOW DO WE EXTRACT REVENUE?
There are several ways of extracting revenue from the travel agencies. The most common one as described in scenario#1 is by selling it directly to Jysk Rejsebureau.

Another way is by giving Jysk Rejsebureau the product for free, but our organization will take a percentage of the rental revenue.

Another strategy is to rent Akila to the customer by Jysk Rejsebureau and after the trip the customer has the option to buy it at a lowered price. That way the user feels that he both got to try the equipment before purchase, but moreover he bought Akila at a reduced. That way the money paid for rent pays partially for the product in case of purchase.

Lastly a discount on the product could be giving, in exchange for advertising through the videos made during the travels.

STRENGHTS

- Product can be rented and tried out; giving revenue
- It can also be bought if the customer desires so
- As it's a multifunctional product it can be used in more situations, great for travelling

WEAKNESSES

- If people are less familiar with figuring out eqipment, it might take some time to adjust using Akila in different ways, so the customer might not want to spend his holiday learning how to use a camera equipment.

OPPORTUNITIES

- Using travel agencies as a channel we reach straight to people who travel, the designated user.

THREATS

- Competitors offering a similar product at a lower price or better quality
- Customers being fearfull of renting/buying camera equipment from travel agency stores.

SCENARIO #2 SPEJDER SPORT

WHAT VALUE DO WE DELIVER TO THE CUSTOMER?
Using Spejder Sport or other similar stores as a sales channel is a clear accessibility value to the customer who previously lacked access to them. Meaning that travellers who are mainly used of going to sport shops can now purchase their equipment for the camera the same place where they purchase their hikeing equipment.

As Akila is an equipment that can be bought in parts, it enables the user to buy distinct parts even while they travel, so if a new place opens up new posibilities for footage, the customer can buy upgrades for it's Akila and stat using it straight away.

HOW ARE THE VALUE PROPOSITIONS BEING DELIVERED TO THE CUSTOMER?
Having Akila sold in sport shops we allow customers who normally don't go to photo stores or travel agencies to purchace their equipment in their own comfort area, as they would buy their travelling equipment there as well.

HOW DO WE EXTRACT REVENUE?
Our organization **###** is selling Akila directly to the sport stores such as Spider Sport, similarly as selling it to phot stores thie would also reduce the selling price, but hopefully would reach out to more people from different circles and create revenue by having more customers. To help visualize this the team decide to make a SWOT analasys, so see what would be the strong points and what should we be aware of in terms of threats.

STRENGHTS

- Multifunctional product can be bought in distinct stages, depending on each user's skills/interests.

WEAKNESSES

- Sales representatives are not familiar with this kind of equipment to sell.

OPPORTUNITIES

- Same as travel agencies it targets straight the intended user, the traveller.

THREATS

- See as equipment bought in a sport shop is not that qualitative as one bought in a pro photo store.

7.24 FORCES APPLIED ON MOTOR

The objective of the appendix is to calculate the forces that are applied and required of the stepper motor that should allow the users to obtain the dynamic panorama shot, and time-lapse shots.

The scenario considered during the calculations, will be base on a horizontal rotation of the camera, where the camera is centered at the top. As the forces applied on the system is balance, the only forces affecting the system is the weight of the top part and camera, thus creating friction between the top part and bearing. add figure 1

To calculate moment of the rotational friction between the top part and bearing, the following equation has been used. As the bearing is acting as a disk the following equation was needed: (http://www.eng.auburn.edu/~marghitu/MECH2110/C_6.pdf)

moment of rotational friction $M_f = \frac{2}{3} u P \frac{R_o^3 - R_i^3}{R_o^2 - R_i^2}$,
where P is the perpendicular force to the surface area, u is the frictional coefficient, R_o is the outer radius of the circle and R_i the inner radius of the circle.

Within the system, it is known that the maximum force applying on the system is 20 N (equaling 20 kg, taking both camera, top part and an overhead into account). The outer radius is 0,57 m, while the inner radius is 0,046 m. The friction coefficient is set to 0,18 because of the nylon / abs combination.

Therefore $M_f = \frac{2}{3} \cdot 0{,}18 \cdot 20\ N \cdot \frac{0{,}057^3 - 0{,}046^3}{0{,}057^2 - 0{,}046^2} = 0.155087\ Nm$

Now when the moment from the friction generated is known, the forces applied on the motor can be calculated. figure 1,2 illustrates the transfer of moment from the rotation center to the axis of the stepper motor. Because the perpendicular forces between the gear are equal to each other, the forces can be calculated, and thereby moment. By using the following calculation, the forces can be calculated:

$$\frac{M_1}{D_1} = F_1 = F_2 = \frac{M_2}{D_2}$$

Where M_1 and M_2 indicates the moment on the first and second axes, D_1 and D_2 the distance from the center to the edge where the forces applies and F_1 and F_2 is the perpendicular forces of each gear. When every other factor than M_2 is known, it can be calculated

$$M_2 = \frac{M_1 \cdot D_2}{D_1} = \frac{0{,}155087\ Nm \cdot 0{,}0095\ m}{0{,}0225\ m} = 0{,}0654\ Nm$$

Hereby the motor should have a minimum torque level of 0,0654 Nm. This enables us to find a stepper motor for the application.

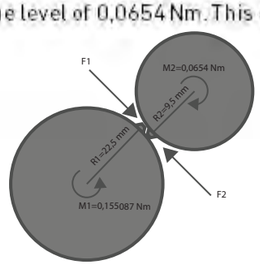


FIG. 1,2

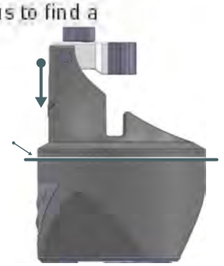


FIG. 1

7.25 BASE PART - INTERNAL COMPONENTS

MOTOR TYPES

For the motor application, several different types of motors was into concideration of driving the system. The choice were between a stepper motor, with or without worm gear or a normal dc motor.
The dc motor was quickly deliminated, as this would not allow the precise movement of the camera, that is required when doing a timelapse. The stepper motor had the capabilities of controlling the movement very precise, therefore it was chosen. Furthermore it also have a holding torque, which means, that the camera will not be able to turn, in between the steps of the motor. The advantage with a stepper motor including worm gear, it that it will allow the top of the base, to be in a locked positon, when the motor is not turned on. Though that also emplies, that the motor cannot be turned, when the power not in turned on, where-as the normal stepper motor was chosen.

BATTERY TYPES

The team had several concideration regarding the battery. The first concideration was regarding if the battery should have normal alkaline batteries, that allows the user to switch the batteries themself, or if it should be included into the product, so the normal user wouln't be able to touch them. The alkaline batteries had the advantage that they allowed the user to chagne batteires, during a hike. Though this also emplies that he should carry extra batteries with him, to be sure that it was also ready. Futhermore they didn't give any feedback to the user regarding the remaining battery level, so they risk starting an amazing time-lapse, that they can't complete because the battery runs out. An in-build batteri was chosen, also because that reduces the complexety of the base part, as the user shouldn't be able to open into the "engine room". The lithium-ion battery was primarily chosen because of it's good rechargable capabilities and because the high power to wight ratio. As the space available inside the base part is very limited, the battery needs to be able to contain the most power. This of couse comes with a price of added costs.

http://batteryuniversity.com/learn/article/primary_batteries

COMPONENT OVERVIEW DIAGRAM

The following diagram shows which components that are placed into the base part of the product. It furhter shows how they are connedted, and in which order.

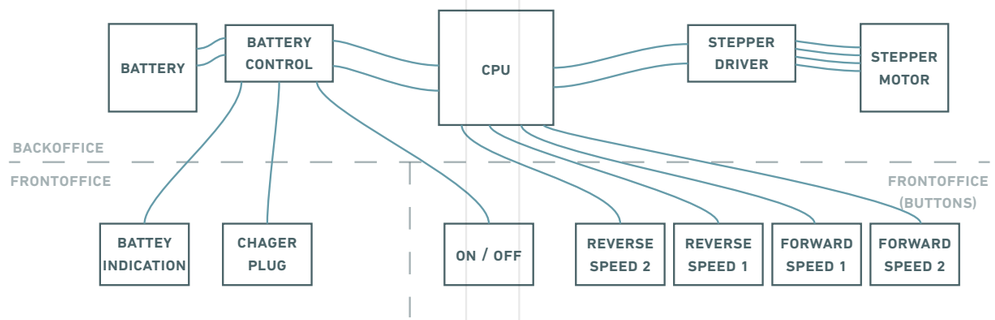


FIG. 1

STEPPER MOTOR

There are several criterias to the motor performance, becuase of the way, the movements is needed. The rotations should for the normal speed, be smooth, and not create too much noise, as that would be recorded video. During the timelapsespeed (slow speed), the noise is not a problem. The movements though have to be very precise, and be performed in "steps". This is because the user would want to move the camera in the interval between the camera shots taken.

The motor is found based on the criteris to the load and mass that it should be able to turn. During a test (page 42), with a small test stepper motor, it was found, that with increased friction and about 1 kg of mass, the motor was capable of turning around. The torque capabilities of the chosen motor is twice the amount of the testet motor, and therefore assumed, that the stepper motor is capable of turning the head around. The price of the motor, is a similar motor found on alibaba.com
The calculation behind the friction and the requriments is in appendix 7.24

PCB

The general concideration regarding PCB is limited to the overall functions from each component. As figure 1 shows they are connected in a specific order. The describtion is kept at an overall level, as the need for external support regarding PCB design is needed.

The CPU is the controlling unit of the PCB that controlls the inputs of the buttons to send the inputs to the stepper driver. It is also controlling the speed and rotation direction of the motor, depending on the signals that it sends.

The stepper driver is transforming the outputs (impulses) from the CPU into inputs to the stepper motor. The interval between the impulses, decides the speed of the stepper motor.

The size and price of the PCB is estimated from the size of an arduino, which was bought for the rotation test.

BATTERY LITHIUM - ION

The battery should be capable of driving the stepper motor for a certain time. From the motor proporties, it is known, that the motor need 5,09 W to drive the engine. This allows the team to find a solution for the battery.

The battery found is a small lithium-ion polymer battery, that allows many cycles of battery use. It has a fairly small size with good energy capabilities.

The calculation shows, that the battery would drive the motor for 1 hour and 10 minutes, though that means 100% efficiency. There will be a small waste of energy in the system, and thereby a percentace must be withdrawn. In order to be sure, about reaching a drinving time of 1 hour, with loss of energy, 2 batteries can placed in a parallel system. This ensure the duble amount of current capability, while the voltage stays the same.

STEPPER MOTOR TYPE	2 PHASE
FRAME SIZE (W, L, H)	28 mm, 28 mm, 32 mm
SPEED TORQUE (1-1000 R/M)	0.080 Nm
HOLDING TORQUE	0.065 Nm
STEP ANGLE	1.8 °
CURRENT PR PHASE (A/PHASE)	0.67 A
VOLTAGE	3.8 V
WIGHT	110 G
PRICE	5 $
LINK	HTTP://CATALOG.ORIENTALMOTOR.COM/ITEM/STEPPING-MOTORS--1068/PK-SERIES-STEPPING-MOTORS/PKP223D06A-L?PLPVER=11&CATEGID=1068&PRODID=3001048&ORIGIN=KEYWORD&SELECTEDINDEXES=MTGXMJOXFDE5ODM6MNWXODQ4OJJ8MTGYMZOWFDE4MTK6MHWXODQ1OJB8MTGYNDOWFDE4MTC6MHWXODYWOJB8MTG1ODOWFDE4MJE6MHWXODQZOJB8MTKZODOWFDE4NDI6MHWYMDAZOJB80&STDITEM

CALCULATING THE ENERGY NEEDED TO RUN THE MOTOR

The current use pr phase is 0.67 A, though because the motor uses 2 phases, the current use is the dubble.

CURRENT USE: 0,67A x 2 = 1,34 A

The voltage for the motor is 3.8v and by using the equation watt = voltage x current the effect can be calculated

WATT = 1,34 A x 3.8 V 5,09 W

The power concumption is known, and it is thereby possible to find a suiting battery, that can power the motor.

BATTERY TYPE	LITHIUM-ION POLYMER
SIZE (W, L, H)	10 mm, 34 mm, 50 mm
VOLTAGE (V)	3.7
CAPACITY (mAh)	1600
WEIGHT	26 G
PRICE	1,5 DOLLARS
LINK	HTTP://WWW.ALIBABA.COM/PRODUCT-DTAIL/3-7V-LI-ION-POLYMER-BATERY_60132034202.HTML?S=P

HOW LONG CAN THE BATTERY POWER THE MOTOR

The motor uses 5,09 W. Therefor the effect of the battery should be calculated.

Wh = V x mAh = 3.7 V x 1.6 mAH = 5,92 Wh

When the effect of the battery is known, the possible time it can supply the engine can be calculated.

HOURS = 5,92 Wh / 5,09 W 1,163 H

One battery would be capable of supplying energy to the motor for 1 hour and 10 minutes.

7.26 COST ESTIMATION OF AKILA

Properties - Akila Premium

Legs

Part name	*stk*	*Size* mm-mm-mm	*Weight* g	*Total weight* g	*Material*	*production*	*After treatments*	*Price* kr	*Total Price*	*Finish*	*Investment needed* $	*Notes*
Rubber foot	3	20x18	3,11	9,33	Rubber	Compression molding						
1st leg segment	3	40x43x250	141,83	425,49	Al - 6- T6 series	Extrusion		1,34	4,02		2.815	Based on the quote from Sapa
2nd leg segment	3	23x285	83,97	251,91	Al - 6- T6 series	Extrusion		0,70	2,1		2815	Based on the quote from Sapa
3rd leg segment	3	18x307	69,3	207,9	Al - 6- T6 series	Extrusion		0,55	1,65		2815	Based on the quote from Sapa
4th leg segment	3	13x330	48,3	144,9	Al - 6- T6 series	Extrusion		0,40	1,194		2815	Based on the quote from Sapa
1st locking silicone ring (washer	3	25x10	1,25	3,75	Neoprene	Standard		0,1	0,3		0	http://www.rubberwashers.co.uk,
2rd locking silicone ring (washer	3	20x10	1,11	3,33	Neoprene	Standard		0,1	0,3		0	http://www.rubberwashers.co.uk,
3rd locking silicone ring (washer	3	15x10	1,05	3,15	Neoprene	Standard		0,1	0,3		0	http://www.rubberwashers.co.uk,
1st leg locking knob grip	3	33x17	3,2	9,6	EVA	Compression molding		0,49	1,47		1200	CustomPart.Net
2nd leg locking knob grip	3	33x17	2,95	8,85	EVA	Compression molding		0,45	1,36		1200	Calculation of 1st locking knob
3rd leg locking knob grip	3	28x17	2,59	7,77	EVA	Compression molding		0,40	1,19		1200	Calculation of 1st locking knob
1st leg locking knob	3	32x22,5	2,95	8,85	ABS	Injection molding		0,50	1,491		15000	CustomPart.Net
2nd leg locking knob		31x22,5	3,59	3,21	ABS	Injection molding		0,50	0		15000	CustomPart.Net
3rd leg locking knob	3	26x22,2	3,39	10,17	ABS	Injection molding		0,35	1,05		15000	CustomPart.Net
2nd leg locking ring	6	10x40x25	1,85	11,1	Nylon	Inejction molding		0,3	1,9		14000	CustomPart.Net
3rd leg locking ring	6	8x40x20	1,47	8,82	Nylon	Injectino molding		0,2	1,0		14000	CustomPart.Net
4th leg locking ring	6	6x40x15	0,88	5,28	Nylon	Injection molding		0,2	1,0		14000	CustomPart.Net
1st locking cap / end piece	3	47x40x45	7,05	21,15	ABS	Injection molding		0,42	1,27		18000	CustomPart.Net
2nd locking cap	3	15,75x25	1,6	4,8	ABS	Injection molding		0,28	0,84		12480	CustomPart.Net
3rd locking cap	3	15,75x21	1,24	3,72	ABS	Injection molding		0,28	0,83		12480	CustomPart.Net
Top cap / rotation part	3	47x40x63	31,5	94,5	PC-ABS	Injection molding		0,85	2,54		24700	CustomPart.Net
End cap fastening screws	12	12x4	2	24	-	Standard		0,03	0,40		0	http://dk.rs-online.com/web/p/se
Button springs	6	6x2	0,09	0,54	-	Standard		0,07	0,40		0	http://dk.rs-online.com/web/p/tr
Button sheet metal	3	26x25x12	9,89	29,67	Steel	Cut + bending		0,3	0,9		0	
Top part of button	3	32x14x15	1,42	4,26	ABS	Injection molded		0,25	0,75		5000	
Rotation part	1	100x26	56,55	56,55	Aluminium / steel	Cut + welded		5,00	5,00			
Rotation part screws + bolts	3	8x25	1,5	4,5	-	Standard		0,12	0,35			http://dk.rs-online.com/web/p/ta
Plastic bearing	3	12(x7)x15	1,07	3,21	PC-Tube	Standard		0,4	1,2			
Total of legs	100			1370,31 g					34,914608 $		174.520 $	
									226,94495 Kr		1134382,5 Dkk	

Midter part											
Base part shell	1	105x60	76,57	76,57	ABS	Injection molding	2,061	2,061	33000		CustomPart.Net
Base part lid	1	105x70	42,39	42,39	ABS	Injection molding	1,955	1,955	24000		CustomPart.Net
Buttom bearing	1	34x2	0,41	0,41	Nylon	Cut	0,557	0,557	0		Material Price + cutting operation
Top bearing	1	105x6	6,75	6,75	Nylon	Standard	1,2	1,2	0		http://www.ggbearings.com/en/p
Stepper motor	1	32x28	110	110	-	Standard	6	6	0		http://www.alibaba.com/product-
Batteries	2	48x30x7	19,5	39	-	Standard	3	6	0		http://www.alibaba.com/product-
PCB board	1	50x25x3	2	10	-	Standard	5	5	0		Judged from the pricing of Audori
Motor Holder	1	36x32x2	2,36	2,36	Steel	Cut	0,48	0,48	0		A bit smaller, but similar product f
Battery holder	1	44x30x13	7,17	7,17	Steel	Cut + bending	0,5	0,5	0		Similar size and product features t
Attatchment screws	12	0,5x4	0,5	6	Steel	Standard	0,033	0,396	0		http://dk.rs-online.com/web/p/se
Charge plug	1	10x10	10	10	-	Standard	2,49	2,49	0		http://www.ebay.com/itm/10pcs-
Charger	1	23x71x28		0	-	Standard	2	2	0		http://www.alibaba.com/product-
Small cogwheel	1	21x2	0,66	0,66	Nylon	Standard			0		
Big cogwheel	1	46x2	1,42	1,42	Nylon	Standard			0		
Pinol screws	3	5x8	1	3	-	Standard	0,123	0,369	0		http://dk.rs-online.com/web/p/sk
Stabilize holder	1	104x70	45,5	45,5	PC-ABS	Injection molded	2,051	2,051	31000		CustomPart.Net
Thors Hammer	1	45x12x20	6,5	6,5	Abs	Injection molded	0,71	0,71	11000		CustomPart.Net
Insert gliding profile	1	22x22x20	1,5	1,5	Nylon	Injection molded	0,506	0,506	8400		CustomPart.Net
Interface	1	60x40x2		0	-	Standard	6,15	6,15	0		Quote from Seritronic
Total of base part	32			369,23 g				38,425 $	107400	$	
								249,7625 kr	698100	Dkk	
Stabilizer											
Inner profile	1	22x40	107	107	Al - 6063 T6 series	Extrusion + cut	0,54	0,54	1385		Quote from Sapa
Buttom / top handle insert	1	26x100	17,14	17,14	Nylon	Injection molding	0,78	0,78	15000		CustomPart.Net
Buttom handle	1	28x100	18,7	18,7	Aluminium	Extrusion	0,30	0,30	1000		Quote from Sapa
Top handle	1	90x45	63,05	63,05	Plastic	Extrusion	0,20	0,20	2000		Quote from sapa
Foam	1	..	10	10	Volara - EVA	Cut from Sheet	0,4625	0,4625	0		http://www.ebay.com/itm/High-D
Inside ring	4	35x1	0,21	0,84	ABS	Cut	0,5	2	0		Material costs + cut features + 20
Locking ring	2	19x7	1,81	3,62	ABS	Cut	0,40	0,80	0		CustomPart.Net
Ball head incl plate	1	45x76	285	285	-	Standard	7,5	7,5			http://www.alibaba.com/product-
Total stabilizer	12			505,35 g				12,5895 $	19385	$	
								81,83175 Kr	126000	Dkk	
Total Product	144			2244,89 g				558,5392 Kr	301305	$	
									1958482,5	Dkk	

Assembly costs

The assembly costs is calculated from the estimated assenbly time of one worker. Each product segment is treated individually.

Hourly rate of worker	250	Dkk	38,46154	$	
The legs assembly	0,75	minute	For assembly of extensions		
	0,6	minute	For assembly		
total	1,35	minutes	0,0225	Hour	
Total costs	5,625	Dkk	0,865385	$	
Base assembly	3		For assembly of the internal		
Total	5	minutes	0,083333	Hour	
Total costs	20,83333	Dkk	3,205128	$	
Stabilizer assembly	1 minute		For assembly of stabilizer		
Total	1	minute	0,016667	Hours	
	4,166667	Dkk	0,641026	$	
Total costs of product with assembly					
Product costs	558,5392	Dkk			
Total assembly costs	30,625	DKK			
Total costs of product	589,1642				
Adding costs of shipment					
105%	618,6224	Dkk			

7.27 PRODUCTION COST CONSIDERATIONS

The objective of this appendix, is to explain the different considerations that were a part of the cost analysis and evaluation. The appendix will cover how each price within each production method is explained, and further elaboration on the uncertainties during this process. Each process consideration will include some remarks about the production process in general.

General notes to the cost estimation:
The estimations of the part prices during the appendix is not to be expected to be absolute production price of the product, but rather an estimation of the production price, but though as close as the resources, materials and methods allows.

The general estimation of part costs consist of three different parts: Material costs, Production preparation, and production costs. Material costs covers the general expenses associated with the material used for the specific part, including potential waste, or later removed materials. The material costs are generally calculated in $/kg of material. The production preparations normally include the different expenses that is associated with a specific production method before the production can start. An example could be injection molding, where it is needed to produce a mold before the production can start. The mold can vary in expenses depending of the complexity and size of the part. The production preparation does not include the setup of the specific machines. The production costs include all the expenses that are included into the specific production of the part. This mean everything from man labor hours, to the cost of renting the machine.

After production the assembly time the production is estimated, to give an general production price of the part. There are of course shipment cost associated with the production of the different part, as they don't all come from the same factory. Though during the different estimation European price levels have been taken into consideration, and thus the shipment expenses aren't as expensive as compared with China. Many of the standard components are also referred to Danish or European suppliers. Because of the prices are taken from the official web-shops, it could be expected, that even cheaper agreements could be made, if the order was for fx. 20.000 piece rather than 100 pieces. Some of the standard components are found through the Asian market, as they provide a clearly difference in product prices.

Injection molding
Injection molding is a thermoforming production method for plastics. The way injection molding works, is by firstly the plastic is melted through a snail where after the melted plastic is injected into the mold. In the mold the melted plastic is allowed to solidify, before the mold is opened, and the part can be taken out. Next the cycles starts from the beginning again. Injection molding is great, because it gives some opportunities within creating very complex part, though such a part also greatly increase the production costs, as the complexity of the mold greatly affects the tooling price.

Regarding the price estimations done for the Akila project, the service custompartnet.com has been used to help estimate the production costs of injection molding. The specific part, which this tool can help with, is the estimation of the tooling cost required to make the molds., as they other vice can be very hard to estimate.
The mold prices are calculated through a series of input about the specific part, that should be typed into the price estimator. First of all the overall number of units required should be typed in. This affects the overall tools cost, because the number of units that should be produced in a mold, affects the material and tooling of the mold. Because the mold slowly wears over time, there is a limited number of units that can be produced from a single mold, depending on the quality, which greatly affects the tooling costs. Furthermore the specific material of the specific part needs to be known. The estimator uses this to get the specific material price ($/kg), and also the density of the part, so that the amount of material needed for the part can be calculated.
Hereafter a series of information regarding the physics of the part needs to be typed in. It is regarding the general footprint of the part. The footprint, size of the projected area and volume, is used to calculate the needed size of the mold, and thereby influences the amount of labor hours that would be needed on the production of the mold. This estimator also requires the max wall thickness of the part, as this allows to estimate the required cooling time of the part, before it can be ejected from the mold, without risking a not total solidified part. Furthermore the cooling time also enables to calculate the total cycle time of the specific parts, as it contains, injection of material, cooling,, opening of mold, ejection of part, closing of mold, and preparation for the next injection. By knowing the cycle time, the possible units produced pr hour can be calculated, and this give an estimate on the working expenses related to the part. Next the specific criteria for the mold it typed in. This includes the tolerances of the mold, surface roughness, complexity. The tolerances greatly affect the tooling costs for the mold, as a more precise mold would be more expensive. The surface roughness also adds to the overall mold tooling costs, as this is the polishing that the mold need to god though. The complexity of the mold consists of several subcategories. The general purpose is to let the calculator know, how complex the part is, as this adds to the tooling costs. The complexity of the mold is fx. affected by the number of cores, sides-actions and if a part is constructed with an in the mold made thread. Everything add to the overall costs, as more tools should be made, and the overall time of the production cycle is increased. Lastly the "mold-making rate ($/hr) can be changed from the standard 65 $. This is the labor of the personnel that produces the mold. This is the information that is needed when calculating the tooling costs associated with injection molding.

For this project though, instead of only using the tooling costs from the custompartnet.com estimator, the whole production price have been estimated. This is generally because of the high number of different parts and thus to save time this choice have been made. Though because the general considerations and parameters is known behind the calculations, the price estimations is not just a wild guess, but reflect the calculations that would have been done manually.

The production costs of course include a range of parameters that needs to be taken into consideration. Especially important is the defect rate (%) of the number of parts, and the material markup (%) as they add as a part of the revenue for the sub supplyer. Furthermore parameters relating to the production itself needs to be specified. From the mold calculations the estimator have calculated how much force the specific parts need, and thereby the size of the machine needed. Furthermore the setuptime (hrs) and machine uptime (%) is important for the production costs, as they affect the overall number of parts that can be produced during a specific time. Lastly the production markup (%) should be specified, as this contributes to the revenue of the producer.

Injection molding is a very initial expensive production method to utilize, as the tooling costs are very high, and thus the investment needed can be very high. Though if a high number of parts is needed, the tooling expenses becomes a fraction of the overall costs to material and labor, and thus the influence is greatly reduces. But anyhow, the initial investment is still needed.

This way of calculating the production price, requires the designer to have a fairly good understanding of how the specific part should be produced, regarding number of actions and features, otherwise the total production price simply would be far away from a realistic estimation. As stated the general theory behind the production price estimation is known, the custompartnet.com helps make that estimation more swiftly and precise.

[Douglas, Bryce, Plastic Injection Molding, 1997]
[custompartnet.com]

Aluminum extrusion
Aluminum extrusion is a metal shaping process, that transforms solid aluminum blocks into aluminum profiles. The process works by heating up a aluminum block of a specific type, to a certain temperature. When the block is heated, it is inserted into a machine that squeezes the block though a profile, and thereby shaping the profile. Afterward the profiles are straightened, before cut into the specified lengths. Depending on the post treatments wanted, the extruded profiles, are being heat treated, to harden the material properties. Furthermore an anodizing process can be chosen, to further build op the naturally occurring protection layer on aluminum.

Like with injection molding, the aluminum extrusion process requires a mold to shape the profiles. The complexity of the molds are greatly influenced by the complexity of the shape of the profile. Generally a closed aluminum profile are harder to manufacture with precise measurements, because the inside of the mold can be hard to control. Though development has enabled the producers to achieve a fairly good understanding of what happens. Furthermore closed profiles requires two molds to be made, because both an inner and outer profile is needed. An open profile on the other hand only requires a single mold to be extruded. Generally a lot can be done with the shape of the profile to lower the costs of the aluminum extrusion, and sometimes it can even pay off, to produce two different profiles that are put together afterwards.

During the project, the cost estimation of the aluminum profiles have been done by Sapa A/S. First of all, this allows us to get a realistic quote on the price of an extruded profile. Furthermore the group haven't been able to find a calculation method that works with aluminum extrusion. Like with injection molding the difficult part is to calculate the mold tooling prices. Because it is fairly easy to calculate the material prices pr. m of extruded material, and estimate the production costs, which could be done similar to the procedure done with injection molding. A further difficulty is the price estimation of the after treatments, as they can be very hard to estimate. Therefore the price estimation have been done by Sapa A/S. Sapa was provided with three different profiles and the information associated with each of them. This included length, measurements, material, and after treatments.

[Jim Lesko, Materials and Manufacturing Guide, Industrial Design]
[Sapa, Aluminum Extrusion]

Cutting
Cutting includes a range of cutting a part from a sheet of material. This can both be within metal but also plastics. The general procedure is, that a sheet material is placed into the machine, whereafter the machine start to cut out the specific part or parts, a one sheet potentially can contain several different parts.

Regarding price estimation of cutting different parts, is has been very hard to find a specific way to estimate the total costs. Opposite to injection molding and aluminum extrusion does not require an initial investion into tooling of the mold. The only thing required, is the cad model of the part that should be cut out. The expensive time though, is the specific part processing, as generally each part take more time to make, than with fx injection molding. Furthermore there is a bigger waste in the material used, as the extra material is just removed.

To estimate the costs of the part beeing cut, excisting parts ti the average same size, proportie, and features were used in evaluating the overall prodction price of the parts. It is a fairly less precise method of estimation, though it gives some indications of what the specific part can be expected to cost, with a good margin.

[Jim Lesko, Materials and Manufacturing Guide, Industrial Design]

7.28 FEM ANALYSIS

In order to evaluate the different choices made for the legs and the rotational part, FEM analysis was conducted. They were conducted with a force equal to 5 kg that is affecting the whole system.

Bending of legs
This test was conducted to evaluate the strength of the legs, when exposed to a load of 5 kg in fully extended version. Thereby the decrease in material thickness from 2 mm to 1,5 could be tested.

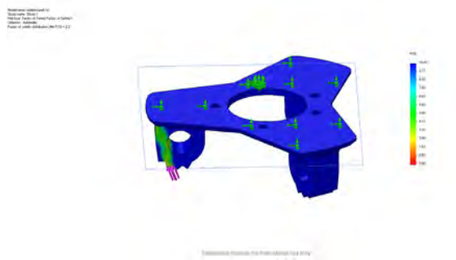
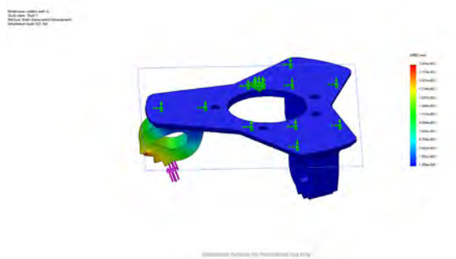
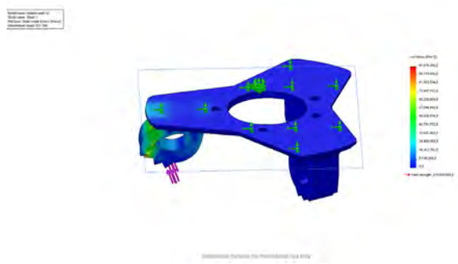


figure 1 fem

The test showed, that the legs can withstand the load with a decent safety factor. Thereby there shouldn't be any risks, that the aluminum profiles will break. Though there is a question with the locking mechanisms, as they might be affected by the bending of the legs. Though the overlap between each leg profile should minimize the forces on the locking mechanisms.



Test of rotation part
The test was conducted to evaluate the strength of the rotation part, that connects the legs with the base part. The situation is the same as with the bending of the legs, as 5 kg of force is applied to hinge and locking mechanism. First the whole assembly is evaluate, where after the single rotation part is evaluated.



The conducted test showed some strong forces applied on the system, as the moment of the extended legs is very large. Though from the analysis, the locking system is capable of withstanding the forces applied. When evaluating the rotation part, it is clearly that great forces are applied, though they do not exceed the capabilities of the material. The result of the test shows, that the part still have a factor of safety at 2.2, which allows a good margin.