Learning from the past in a photocamera redesign project

Minor project - Scientific Challenges IDE
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Introduction

The technology of the photocamera has been around for some time now. It started out very simple. One of the first consumer cameras was a plain box with a hole in it. From there it all went very fast. New technologies were invented and applied to existing photography devices. They became smaller and cheaper and incorporated more and more features. After the discovery of digital photography the development of new versions of the standard amateur photocamera has stagnated. Models look very much alike nowadays and the epicenter of photography has shifted to other devices like drones and smartphones. Analogue photography seems to be gaining popularity again as well.

Designers at various companies are trying to develop new cameras and technologies for a large market. Kodak is trying to incorporate mobile phones in a camera for example, and mobile applications like Instagram are used by millions of people every day. But a lot of the mainstream cameras that are being used today are very similar to eachother, both design-wise and in their use.

In this project we tried to find out if taking a look at the development of technologies in this field over time helps the design process of a new camera. It may provide a logical next step in the line of photocameras through history. It should also be attractive to its potential users. To achieve this we used the theory of Novelty-Typicality. This states that a design is attractive for users if it is novel and innovative, but it also should provide recognizable aspects as well to be sure that it is comfortable to use.

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3-2-2017

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Research question

In order to be able to answer the research question below, we will answer the design question by designing a new concept for a photocamera. This concept will follow from our extensive analysis of the history of photography.

Research question
How can existing photocamera-designs be of guidance when designing a new product that is modern and innovative, but that also provides ease of use and appeal through recognisability?

Design question
How does the design of a photocamera, that fits well into the current market for amateur photographers, look when it is designed to be new and innovative, but also to appeal to users in terms of design and use?

Evaluation of results
For the evaluation we want to make a physical model of the design. This model and the concept itself will be evaluated through existing theories like novelty-typicality and the product-impact model.

Glossary

Analogue camera	*Camera using film rolls or other non digital materials to capture the photo.*
Digital camera	*Camera using a digital sensor to capture the photo.*
DSLR	*Digital Single Lens Reflex Camera. A type of camera that has interchangeable lenses and a mirror.*
Film	*Material used for analogue photo-rolls (also called 35mm film).*
Instant Film	*Material the photos coming out of instant cameras are made of.*
Leatherette	*(Fake) Leather that is regularly used on cameras, especially vintage cameras.*
Rangefinder	*Type of camera with a specific focusing method.*
SLR	*Single Lens Reflex Camera.*
TLR	*Twin Lens Reflex Camera.*
Viewfinder	*The "hole" used to look through the camera.*

Chapter 1: Timeline of photography history

Table of important pre-photographic dates from The Focal encyclopedia of photography [1]

1200s	Simple glass lenses were introduced.
1472	Leonardo da Vinci: Discovered the multi-coloured nature of white light.
1676	J.C. Sturm: Portable camera obscura with reflex mirror and focusing lens.
1704	Sir Isaac Newton: Published Opticks in which he presented his discoveries in optics and elaborated on his corpuscular theory of light.
1725	J.H. Schulze: Experiments on light sensitivity of silver salts; contact images (from stencils) on liquid mixtures of chalk and silver nitrate in a bottle; no fixing.
1758	John Dolland: Invented the achromatic lens.
1777	G.C. Lichtenberg: Developed electrostatic discharge patterns with dry powder.
1777	C.W. Scheele: Blackening of silver chloride in the violet and the blue of the spectrum quicker than by other colours.
1800	Sir John F.W. Herschel: Discovered infrared radiation.
1800	T. Wedgwood and H. Davy: Contact copying of silhouettes, leaves, etc., on leather sensitized with silver nitrate; no fixing.
1801	J.W. Ritter: Blackening of silver chloride by ultraviolet radiation.
1815-1820	Sir David Brewster: Invented the optical system of the future parlour stereoscope.
1816	J. Nicéphore Niépce: Camera photographs on paper sensitized with silver chloride; partially fixed.
1819	Sir John F.W. Herschel: Discovery of thiosulfates and of the solution of silver halides by "hypo."
1822-1825	J. Nicéphore Niépce: Copying of engravings on glass, zinc, and pewter sensitized with bitumen to further attempts at direct photography.

The first consumer camera

The history of photography goes back a long way. In the beginning it was mostly experimental, as the table above shows with several important dates before photography hit the consumer market.

This started to change in the late 19th century when George Eastman, founder of Eastman Dry Plate and Film Company, introduced the Kodak camera to the market in 1888. The Kodak No.1 is a box camera that is arguably considered the first camera for the masses. The photographer could take 100 pictures and then return the camera to the factory where the pictures would be developed and the camera would be reloaded for a small fee. This camera was purchased for $25 at the time.

A box camera is a box shaped camera. This type of camera has a fixed focal length and often also a fixed shutter speed. The film has to be manually adjusted after a picture has been taken.

In his advertising, George Eastman targeted women, because he thought that they would be the people that would want to capture family activities as memories. [2]

Twin-lens reflex camera

Twin-lens reflex camera's (TLR) are camera's with two objective lenses with the same focal length. One of the lenses was the photographic lens (or taking lens) which is used for taking the picture. The other lens is used as the viewfinder lens. Behind the viewfinder lens a 45 degree

mirror is placed (reflex) which projects the light from the viewfinder lens to the viewfinder on top of the camera.
London Stereoscopic Co's "Carlton" (1885) was the first TLR camera commercially available to buy for the public. This camera was produced for an extended period of time in different variants. It seems like the company made cameras according to their current supply of lenses and materials resulting in different variants of cameras. [3]
The first real popular and often considered the so called "prize catch" TLR camera for collectors and photographers was the Rolleiflex introduced in 1929. This camera was simple to use, had the best lenses available and produced high quality (big) negatives in a compact camera. It was a must have for every professional photographer and the ultimate dream camera for enthusiasts and aspiring photographers. The Rolleiflex has been copied by several companies over the years but none could replicate the quality of Rolleiflex. [4] Even today in the age of digital camera's the Rolleiflex is still manufactured by a German company. [5]
In the 1940's several American companies started producing TLR cameras with Kodak being the most prominent one launching their Kodak Reflex in 1946. [6]

Rangefinder
Rangefinders were the most popular camera's in the 1950's. The cameras are called rangefinder because they focus using a dual image "rangefinding" device. [7] When looking through the viewfinder the image will be presented double or split. By rotating the lens the two images projected will move. When they line up you know your camera is focused correctly. Just like a disposable camera you will not look through the lens when taking a picture but through a separate window.
The No. 3A Kodak Autographic Special was the first consumer camera using this technology. The Kodak was launched in 1916. [8] The first commercially successful rangefinder however was the Leica II. This camera was launched in 1932 and had the ability to swap lenses. [9]
The more modern wave of rangefinder camera's surfaced in the 1950's. Nikon and Canon were two of the companies who started making their own copies of the Leica camera's. They both made rangefinders using the Leica lens thread mount allowing the use of Leica lenses on the Canon and Nikon rangefinder body's. Examples of these cameras are the Canon II, III and IV
The only popular rangefinder camera's still available are made by perhaps the most iconic camera brand Leica. The Leica M7 and M9 are new rangefinder camera's which work exactly the same as the old ones. [10] The Leica M3 launched in 1954 can be seen as a new start for Leica because it is the first camera of the Leica M series. This M series is still in production today as mentioned above. [11] The Leica M3 is one of the most lusted-after cameras for collectors and enthusiasts today.

SLR
SLR stands for Single Lens Reflex camera. An SLR camera makes use of a set of mirrors to project the image seen through the lens to the viewfinder. The first idea of this system goes back as early as 1676. In 1676 the German Johan Sturm described a very similar idea in his Camera Obscura description. [12] The first real SLR camera however was designed by Thomas Sutton in 1861. This camera was, as most early SLR cameras, based on the Camera Obscura of Johan Sturm. [13]
A lot of different types of SLR cameras have been made after the cameras of Johan Sturm and Thomas but the first affordable and usable SLR produced was the Ihagee Kine Exacta. This camera launched in 1936 and was the first production SLR to be commercially available. [14]
The real breakthrough of SLR cameras came with the Asahi Pentax in 1957. This camera was launched with a set of features that would influence the design of future SLR cameras. Some of these features were an Instant Return mirror and a film rewind crank. This meant that the photographer could spend more time composing his picture while looking through the viewfinder instead of adjusting the settings of the camera. The Pentax also used the M42 lens mount which would become the standard on different other cameras made in the years to come. [15]
In 1959 the two biggest camera companies today, Canon and Nikon, both launched their first SLR cameras stepping in the footsteps of the pentax. Canon launched the Canon Flex and Nikon the Nikon F. The Nikon F is often referred to as the most advanced SLR camera of its time. It was the first camera to bring all the best features of a 35mm SLR together in one camera. This was the reason that a lot of people switched to using the Nikon F which made it an instant success on the commercial market. [16]
In 1964 the Pentax Spotmatic was presented. This was the first SLR with "through the lens metering". This meant that the camera had an build in light meter which measured the light through the lens of the camera. This camera was also an instant success and possibly is the most successful camera of the 1960's. It was the workhorse for a lot of professionals of that age and also a great success for enthusiasts. [17]

Instant Camera
Edwin Land was an inventor and a scientist. He was the inventor of the Polaroid instant camera. The idea for

this camera came when he took a picture of his 3 year old daughter. His daughter asked why she could not see the picture right away. Having no good answer to this question he started making a camera that could do this. And so, in 1948, the first instant camera, the Polaroid 95, was born. The success of this camera was overwhelming. Polaroid manufactured 60 cameras for the Christmas holidays and all those cameras and all the film supply was sold out in one day. [18]
Polaroid has always been the main instant film and instant camera manufacturer. The polaroid cameras can be divided into three main generations. These generations are defined by the type of film they use. The first generation, such as the Polaroid 95, uses roll film. This roll film consists of two rolls (a negative and a positive). The second generation uses type 100 "pack film". This pack film is a combined version of the early roll film used in the first generation Polaroid's thus is this film easier to use. The Polaroid Land Model 100 is an example of a second generation polaroid. [19]
The third generation Polaroid cameras are perhaps the best known cameras from Polaroid. This generation uses the iconic square images. All these images contained all the components of the film inside so these films developed automatically when exiting the camera. The most iconic camera models from this generation are the Polaroid SX-70 and the Polaroid 1000. The 1000, also referred to as the "rainbow camera", is perhaps the most iconic Polaroid camera of them all as for example being the inspiration for the Instagram logo.
A later model in the third generation is the Polaroid 600 series. Based on the SX-70 and the 1000 but using a film which needs 4 times less light for a photo. [20]

A few manufacturers produced camera's that were compatible with Polaroid film such as Konica and Minolta. The most well-known brand producing its own instant film and camera was Kodak. Kodak made the EK and the Kodamatic series and sold those for a short period of time until they were sued by Polaroid because of Patent-infringement. Kodak was forced to shut down the production of the instant film and cameras and also had to compensate its customers because they now had cameras which were useless because the film could not be produced anymore. [21]

A more recent producer of instant film is Fujifilm which started producing film and cameras in the early 1980's. The first worldwide product launched in the 1990's was their Instax series. The Instax series is still in production today and has been becoming more available after Polaroid stopped its production back in 2008.

In the same year Polaroid stopped its production Impossible Project was founded. This company bought a factory of Polaroid with all the machinery and started producing new Polaroid film in the old factory in Enschede. In 2010 they started mass producing the film. In 2013 Impossible launched their first "camera", the Instant lab. This "camera" uses polaroid film to produce an instant photo from the light emitted from a telephone screen. This way you can make kind of a screenshot of your phone using polaroid film. [22] In 2016 Impossible launched the Type-I camera. Combining modern day technologies such as Bluetooth connectivity to connect to an app on a phone to control the camera which uses the same film as the vintage polaroid's. [23]

Cameras become digital
The origin of digital photography lies in space travel. It was used to take pictures of planets. The picture would be stored on tape. George Smith and Willard Boyle, engineers at Bell Labs, invented the CCD or charge-coupled device 1969. [24] This device is able to convert photons into electric charges, making it very suitable for use in photocameras. These electric charges coming from a CCD sensor in a camera can resemble a binary code that can be put together to form a digital image. These sensors are more sensitive to light than regular film, making it a very good fit for use in astronomy.
Steven Sasson, engineer at Eastman Kodak, was the first to try to build a digital camera in 1975. He used a CCD sensor chip and stored his pictures on tape. This was an experimental camera and not meant for the consumer market.
After this, a few experimental designs were executed but never introduced to the masses and the ones that were, were not true digital cameras. They were merely electronic analogue cameras. The first completely digital camera that was released onto the consumer market was the Dycam Model 1 and the Logitech Fotoman both produced by Dycam in 1990. They shot their pictures in black and white and has 0,077 megapixels. The flash that is built in has to be turned on or off by connecting the camera to the computer by a cable and turning it off in the desktop software. The camera could store up to 32 pictures. The Dycam Model 1 sold for $995. [25]
After the Dycam Model 1, different brands tried different things that nowadays are outdated. They used technologies like the CD to store the images on, like the Sony Cyber-shot DSC-MD1, or stored them on floppy disks, like the Sony MVC-FD5. Both of these cameras recorded their images in the JPEG format.

The world around photography becomes digital

Apple's effort to enable people to have a pc that is easy to use and stimulates creativity might also help the market for digital photography. Adobe Photoshop, photo editing software for Apple's Macintosh, was released in 1990. In 1994 Apple released the Apple QuickTake 100. A digital camera that is considered one of the first digital cameras for consumers. This camera was not a success and its production was discontinued in 1997 when Steve Jobs came back to Apple and reorganised the company. The camera could store 8 pictures and the user could then take them off by connecting the camera to a Macintosh computer. [26]

In 1992, a company called SanDisk starts working together with Kodak, Canon and other manufacturers to standardize card slots. [27] In 1994, SanDisk and Kodak released the first CompactFlash Memory Card. This type of memory card is still widely used today. [28]

A company called Ricoh released the Ricoh RDC-1 in 1995. This Japanese camera is a milestone in the history of photography and cameras because it is the first camera that allowed recording videos with sound. [29] Also released in 1995 is the QV-10 from Casio, the first camera with a built in LCD screen. The user could now view and delete their pictures in-camera. [30] The first digital camera that uses a Compact Flash card for storage is the DC25 from Kodak.

Digital Photography grows

In 1996 Canon released the PowerShot 600. The first camera in the long line of PowerShot cameras, designed for the amateur user. [31] This camera also used a Compact Flash card for storage and this type of camera made an entrance on the market in the late 1990's when a lot of brands from Asia released so called point-and-shoot or compact digital cameras at low prices. These cameras nowadays look very much alike. According to the Focal Encyclopedia of Photography: "Often, a single [digital] camera would be sold under a dozen or more brand names." [32] Making it difficult to distinguish milestone models released after the mid-nineties. Digital photography became something that almost all well known and also lesser known photography and technology brands were involved in. In 2005, Kodak earned more money with their digital products than from their film products for the first time. [33]

Different types of digital cameras

Today, digital cameras come in many sizes and shapes, but most of them fall within certain categories. Point-and-shoot, or digital compact camera, being the most basic digital camera category. They generally are focussed on ease-of-use and use autofocus, a built-in flash and automatic settings. Although there are some high-end models out there that allow for a more manual and advanced use or even shooting full-frame, which mostly is used in very expensive DSLR cameras. All point-and-shoot cameras have a fixed lens. According to the NPD Group, point-and-shoot cameras were still the main device for photography in 2010, but mobile phones were rapidly catching up. [34]

The compact system camera or mirrorless interchangeable lens camera has many similarities with the point-and-shoot camera. This type of camera is a digital camera with interchangeable lenses and does not have a mirror. The latter distinguishes them from SLR (Single Lens Reflex) and DSLR (Digital SLR) cameras. The first compact system camera is the R-D1 model from Epson. [35] Which is a digital rangefinder camera.The inner workings of this type of camera allow for a smaller design because a moveable mirror is not necessary like it is in an SLR.

From the second half of the eighties, companies have been experimenting with digitalization of SLR cameras. In 1999, the company Nikon produced the first Digital SLR camera built from scratch by one company instead of modifying an existing SLR, this is the Nikon D1.

This type of camera has a mirror in front of the digital image sensor. This mirror sends the image from the lens to the viewfinder so the photographer can see it through his camera. When the user presses the button, the mirror moves out of the way so the light from the lens is able to reach the sensor. After taking the picture, the mirror comes back down.

The first consumer-grade DSLR camera is the Canon EOS 300D, released in 2003. This was the first DSLR costing less than $1000. [36] From here on until now, all major camera brands have a line of DSLR products in almost all markets, from low level amateur to the most advanced professional use. These cameras are also often used in (low budget) filmmaking, the first DSLR that could shoot video was the Nikon D90 but the model that seems to have started this trend is arguably the Canon EOS 5D, released in 2008, because of the very high quality of the video footage shot on this model. [37]

Photography started to change when Apple released the iPhone in 2007 and to a lesser extend the app store in 2008 with apps like Instagram, released in 2010. Before the iPhone, mobile phones with built-in cameras were available, the first one often considered being the J-SH04 model by a Japanese company called J-Phone and only marketed in Japan, but Samsung seems to have been earlier with their release of the SCH-V200 in South-Korea. [38]. Even earlier was the VP-210 from the

Japanese company Kyocera Corporation in 1999. [39] But the release of the iPhone seems to mark the start of a new period in technology, including photography, the era of the smartphone, which many people now use instead of a dedicated photo or film camera.

THE HISTORY OF CONSUMER CAMERA'S

1895

London Stereoscopic Co's "Carlton"

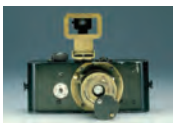
The Kodak No. 1

The first consumer camera ever

1888

1900

Kodak Browni e



1914

Ur-Leica

No. 3A Kodak Autographic Special

First consumer rangefinder camera on the market

1916

1925

Leica I

Rolleifle x

First popular TLR camera. Considered the "prize catch" for professionals and enthousiasts

1929

Leica II

First commercially succesfull rangefinder camera. Also the first rangefinder camera with the ability to swap lenses

1932

1936

Kine Exact a

1939

Argus C3

Low priced range finder popular for its size, shape and weight. The camera sold around 2 million units

1946

Kodak Reflex

1946

Hasselblad 1600F

1948

Polaroid 95

The first Polaroid camera produced. It was an instant hit selling out on the first day. In total approxi- mately 900.000 units were sold

1951

Canon III & Canon IV

1954

Leica M3

One of the most succesfull Leica's ever made selling around 220.000 units. This camera is one of the most lusted-after camera of all times .

1957

Asahi Pentax & Nikon SP

1959

Canon Flex

1959

Nikon F

Nikon's first SLR camera. It was the most advanced SLR of its time and was an instant hit for profes - sional photographers and enthousiasts

1963

Polaroid 10 0

Pentax Spotmati c

The first SLR camera to successfully market and sell a camera using spot metering technology. Combined with top of the line lenses this camera was a great succes for enthousiasts

1964

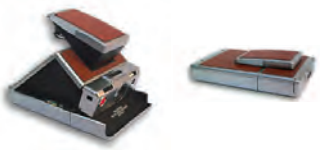
Rollei 35 Series

A camera designed to be as compact as possible. It was a great commercial succes selling approximately 2 million units

1966

1972

Polaroid SX-70



Olympus OM-1

The first SLR from the Olympus OM-series. The camera became a succes due to its size, weight and versatility and is still today a succes on the used market

1972

1975

Kodak Digital Camera Prototype

Asahi Pentax K1000

An affordable camera aimed at the amateur photographer. This camera was a great succes especially with students. It is still a must have for collector s

1975

Polaroid 1000

Probalby the most iconic and recognizable polaroid of all times. This camera was made as an cheaper alternative to the SX-70 camera

1977

1978

Konica C35AF

1981

Pentax ME-F & Polaroid 600

1990

Dycam Model 1

Apple QuickTake 10 0

1994

Considered as the first commercial digital camera. This camera was not an succes and the production was discontinued in 1997

1999

VP-21 0

Canon Eos 300D

2003

The first digital consumer SLR which was affordable for the masse s

2004

Epson RD- 1

2005

Canon Eos 5 D

iPhone

2007

First smartphone featuring apps and a camera. A year later the App Store was launched enabeling the downloading of apps on the iPhone

201 0

Fujifilm X10 0

201 3

Sony Alpha R7

Impossible Project I- 1

201 6

The first camera produced by The Impossible Project. This camera is the electronic reincarnation of the Polaroid camera using the same analogue film

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Chapter 2: Analysis of camera types in three categories

2.1 Introduction

The analysis will be conducted on consumer cameras aimed at the amateur photographer. This means that cameras that are going to be analyzed will be mainly cameras that are or could be used by amateur photographers and not cameras that are made and designed for professional photographers. The term amateur photographer contains a wide range of different camera users reaching from low level amateur photographers who have little knowledge of photography and cameras to highly skilled amateur photographers with a lot of knowledge regarding photography and camera usage. The choice to focus on amateur photographers is based on the idea that the design of a camera is more important for amateur photographers than for professional photographer. Where professionals will mainly look at what the camera can do and what the technical details are, the amateurs will probably let the design and aesthetics of the camera be a more important part in choosing a camera.

For the analysis a selection has to be made from the enormous amount of consumer cameras that have been made. The goal is to make the analysis as broad as possible using all sorts of different cameras. To get a clear overview of the analysis and different cameras the idea is to sort the cameras that are going to be analyzed in three different categories; standard cameras, mainstream unusual cameras and unusual cameras. Due to the enormous amount of cameras that have been made none of the categories defined will cover all the different sorts of cameras there are. Only the first category, Standard Cameras, will cover all the sorts of archetypical cameras available to buy.

The first category, Standard Cameras, will consist of cameras that can be seen as the normal or archetypical camera. These are the sort of cameras that are the most common and usual to consumers. This first category will be useful to give insight in why people see these kinds of cameras as archetypical but it will also be a baseline for the other two categories. The results from the more unusual categories can be compared to the results of the archetypical category hopefully giving interesting insights about the designs. The mainstream digital cameras that are being sold today can be sorted in 4 different sorts of cameras. The Digital Single Lens Reflex Camera (DSLR), the Digital Compact Camera, the Mirrorless Interchangeable Lens Camera and the Bridge Camera.

The second category, Mainstream Unusual Cameras, consists of cameras that are somewhat weird or unusual but are still widely used by many people. This can be cameras that are different from the archetypical cameras in terms of design, interaction or technology. Cameras in this category can have a specific type of usage and a specific type of user like enthusiasts of specific technology or format of camera. Cameras in this category can also be using upcoming and new technologies. These technologies are not widely used but are not unknown by a lot of people. Vintage or retro cameras which are still used by enthusiasts or collectors are also part of this category.

The third and last category, Unusual Cameras, consists of cameras that cannot really be placed in a specific category of camera. These are cameras that fulfill a specific niche in the consumer camera market or cameras that are just in a league of their own. The cameras in this category are not widely used and are probably not widely known. Just as in the second category this cameras are different from archetypical cameras in terms of design, technology or interaction. The camera can be a hybrid of different technologies or maybe even made for artistic purposes. These cameras are generally only bought by enthusiasts or followers of a brand.

2.2 Theory of analysis

2.2.1 Interaction with the world

Verbeek (2008) [1] refers to Ihde (1990) [2] when talking about mediation. He argues that products, or artefacts as he calls it, have a certain intentionality. This concept of intentionality has to do with the relation between humans and the world, arguing that humans cannot be understood without the world and the world cannot be understood without humans. According to Ihde, technology plays an important part in this relationship nowadays and "many of the relations we have with the world around us are either mediated by or directed at technological devices" [3].

Ihde (1990) distinguished four different relationships we as humans are able to have with technological products. The first one is an embodiment relation. In this type of relationship the technology becomes an extension of the user and the user experiences the world through the technology. The technology itself is not explicitly noticed. This is similar to a readiness-

to-hand relationship established by Heidegger (1927) and mentioned by Verbeek (2006) [4], saying that the attention of the user is usually not directed at the technological device but through the device and at the world.

The hermeutic relationship is the second type of relationship that a user can have with a technology, this means that the world can also be perceived through this device but it requires some interpretation from the user. Products with which humans establish this type of relation represent the world instead of providing the user with an actual experience. Verbeek uses a thermometer as an example, this device represents the world through a number instead of providing an actual experience of heat or cold. The user can get an idea of the actual world by interpreting the data that the device provides.

A third relationship is the alterity relation. In this type of relationship the attention of the user is not directed through the technology but rather at the technology. When ordering tickets from a ticket machine in a train station for example.

The fourth and last relationship is the background relation, for example the buzzing of a refrigerator, in this case the human does not really interact with the technology but it definitely is present and able to influence the user experience.

2.2.2 Interaction with the product (Product Impact Tool)

The theories of mediated intentionality, as described above, are useful when observing how technology influences the various ways that humans have interactions with the world around them. To elaborate more on the effects of a product on the human being more expansively and on a deeper level a useful model called the Product Impact Tool can be used, developed by Steven Dorrestijn [5]. This tool helps in systematically identifying a product's effects on its user. The tool identifies 4 different aspects in which a design can influence the user. These are before-the-eye, to-the-hand, behind-the-back and above-the-head.

The before-the-eye approach focusses at the cognitive interaction with the technology. The influence of technology on cognitive level could be used by the designer to guide the user towards the intentions of the technology. In design, the goal is to make products as self-explanatory as possible and, where needed, guide the user to the intended use of the design. This can be achieved by adding colours, arrows or guiding text. A more intrusive form of this concept is the so called persuasive design theory. With this theory the user is not only guided to the intended use of the design but the goal is also to change the behaviour of the user through the design of technology.

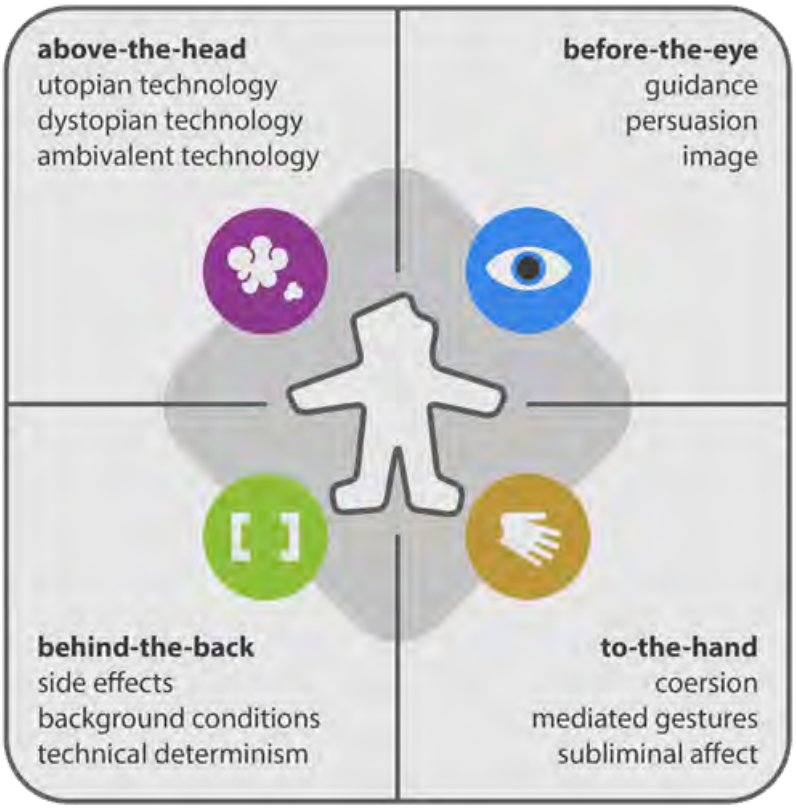

Figure 2.1: Product Impact Tool by Steven Dorrestijn. Retrieved on 13-12-2016 from http://steven-dorrestijn.blogspot.nl/p/product-impact-tool.html

The to-the-hand approach focusses on the physical interaction with technology. It assesses the physical affordances technology can have. This can be handles or shapes that guide the user to hold the product in the intended manner. But also buttons that invite the user to push them. The affordances can force a user to use a product in the intended manner and thus the technology influences the behaviour of users. Besides handles and buttons this can also include for example the weight of the product, this as well influences the way the product is used by a person.

With the Behind-the-back approach the influence that does not happen directly through physical or direct interaction with the product. This aspect is more focussed on external factors such as environment of use and knowledge the user already has. It is also concerned with any possible side-effects of the technology, mostly unintended.

The Above-the-head approach is a more abstract way to assess the influence of technology on the user. It is concerned with visions and philosophical ideas that people have regarding technology.

2.3 Standard cameras

For this category, only DSLR cameras and digital compact cameras will be analyzed. The bridge- and mirrorless interchangable lens cameras are both very similar in use and interaction to one or both of these types. The two types that are being analyzed are the lowest level and highest level of modern, conventional, amateur photography. The other types (bridge cameras and MILC) are somewhere in between these extremes when looking at complexity of interaction and use in general. Therefore there is no need to analyze them and they are excluded from the analyses since they will not add anything new.

2.3.1 DSLR (Digital Single Lens Reflex)

Introduction

DSLR camera's are the digital equivalent to analogue SLR camera's. When searching online for this type of camera, one thing really stands out: they all look very much alike. For this analysis it is probably useful to look at some of the best selling models of some of the major brands. Several webshops currently have the Canon EOS 1200D as their best selling model. It might be a good idea to include another brand as well because although the cameras look very much alike, there always are subtle differences between models from different brands. Therefore models from Nikon, Canon's biggest competitor in this market, will also be included. Especially the Nikon D3300 because this is Nikon's equivalent to Canon's EOS 1200D in terms of complexity and target group (non-experienced users).

Interaction with the world

Background

All four of the relationship types defined by Ihde (1990) can apply to DSLR cameras to a certain degree. The fourth one, the background relation, is not as obvious as the rest. For a consumer product like a photocamera this relation could be described as a degree of appeal. When the product is just situated in a room, for example on top of a cupboard or a desk, this could be a very common situation since camera's must be stored somewhere when not in use. However the camera is not used directly by the user in this situation, it can still influence the user. A camera with an attractive design can be able to invite a human into using it for example. The attractiveness of a product has to do with familiarity and also novelty and this will be further discussed later in this text.

Figure 2.2: A Nikon D5300 (left) and Canon 700D (right). These models are for amateur users who have a some experience in photography. Retrieved on 12-12-2016 from https://www.dpreview.com/reviews/nikon-d5300

Alterity

An obvious relation the user has with this type of camera is the alterity relation. The user experiences the product in this way when using the LCD screen and the buttons to change settings on the device for example. In this situation the attention of the user is directed mostly at the product itself. However, when changing settings that will influence the photo that the user is going to make, like shutter speed and aperture, the user's attention is directed both at the product and at the world. So in that case there might be some sort of hybrid alterity-hermeneutic relation.

Hermeneutic

The hermeneutic relation is quite present when taking a photo. The numbers that the device returns give the user information about the world, like light intensity. The user has to translate the photo quality to numbers and then alter it accordingly to what he wants to achieve.

In contrast to the DSLR most analogue SLR cameras do not have an automatic shutter speed or aperture setting. Depending on the circumstances like the light intensity the settings of the camera have to be adjusted manually to create a good photo. Some SLR cameras have a built in light meter but a lot of SLR's don't have one and need an external light meter to check the settings on the camera. So when using an analogue SLR the user's attention is directed more to the camera compared to when the user is using a DSLR camera since with the release of the latter, SLR photography has become a lot easier.

Embodiment

The most obvious relationship is the embodiment relation. The goal of the user is not to use the product. The user wants to take pictures, the reasoning of which might be different per user. To take pictures, the user has to use the product, but the attention of the user is not directed at the product directly, but runs through it. It is directed at the thing that he or she wants to take a picture of. Another way this type of relation might occur is for example when a user wants to take a picture while standing on a busy street. In that case, with a DSLR, he has to put the camera to his face to look through the viewfinder (the 'hole' above the lens). When he does this, his attention is quite literally directed through the product and at the world. However, his view will be very narrow and the user will not be able to notice everything that is happening around him at that moment. This last situation is very typical for this type of camera because all DSLR (and SLR) camera's have a viewfinder that works like this. With modern models, the user often has the option to use the built-in LCD screen instead of using the viewfinder, but the point of this type of camera is that the user can better anticipate what the picture is going to look like because the sunlight or light from other sources is blocked off.

Product Impact Tool

Before-the-eye

First of all, most buttons provide text or an icon that tells the user what it does as can be seen on the images below. However, there is a difference between the Nikon and Canon models. The cheaper models from Canon (first image, right camera) provide buttons with double functionalities. For example the navigation buttons have their physical directional indication: up, down, left and right, but they also have text written on them with other settings that can be changed in the camera. The key to make this work is to let the software of the camera use the right button on the right moment. So it has to be

Figure 2.3: A Nikon D7000 (left) and Canon 60D (right). These models are for more experienced amateur users and cost around €1000 for the body alone. Retrieved on 12-12-2016 from http://dancarrphotography.com/blog/2010/09/16/nikon-d7000-vs-canon-60d-vs-canon-7d/

clear for the user when the button changes functionality. In the more expensive models of Canon (second image, right camera) most buttons only have one functionality. Why Canon chose this approach might have something to do with cheaper models primarily being used by unexperienced photographers. This type of photographer does not use the very advanced functionalities of such a camera very often, so why not hide them behind other functions. By doing this, they achieved something that is very useful for photographers that are not used to advanced cameras: they reduced the amount of different buttons on the camera while still maintaining all the abilities one can expect from a DSLR camera, like being able to adjust every setting manually.

Both Canon models discussed here incorporate blue and white text and icons. The white icons are used for changing settings when shooting images and the blue icons are used when playing back media.

Nikon did something that is different yet at the same time similar to what Canon did. Similar in the way that they tried to reduce the amount of buttons and different in the way that they achieved it. Nikon incorporated more in the software instead of in the buttons. This means that the cheaper model from Nikon (first image, left camera) actually has just a few buttons and that almost all of them have only one function, all the underlying and more advanced functionalities are accessible through the software. Therefore, the Nikon camera looks less complex in its physique but Canon has less complex software. The goal of both companies is the same, to make advanced photography accessible to more or less unexperienced users, but their approaches are different.

This is also the case for the more expensive models. Canon's model almost has the same amount of buttons as its cheaper version, but more functions are embedded in dials and a screen on top of the camera, the latter of which is also incorporated in Nikon's advanced models. But Nikon's advanced camera models (second image, left camera) provide the user with a significant larger amount of buttons, most of which incorporate two functionalities, written on and above the buttons.

Canon seems to have taken an approach of familiarity and consistency between models when comparing them. They look very much the same. Nikon seems to rely on the experience and knowledge of the user for their advanced models while trying to make things as easy and straightforward as possible for their beginning user. This results in bigger differences between different models from the same brand.

Another aspect of Before-the-eye is identification. With DSLR cameras, which are usually pretty big, most people send a clear message concerning their identity: 'I like photography and I care about taking beautiful pictures'. Earlier, DSLR cameras actually provided better quality pictures. But with modern technology, the difference of photo quality between types of cameras is very small. System cameras take pictures as well as DSLR, so the choice of camera comes down to personal preference. Identity also plays a large part in this.

To-the-hand

Let us take a look at the physical shape of a DSLR camera. First at a rough, general level and later focussed more on details. At first, almost all major DSLRs look very similar, whether Canon or Nikon or any other big brand on the market. But in this analysis the focus will be on these two brands since they are the largest brands in this market.

In the picture above, two medium level amateur DSLR cameras can be seen. It is beautifully shown here that the silhouettes of both models are very alike. They both have a rectangular shape with a bulge on top for the viewfinder. Both have their controls on the right side of the same sized LCD screen and both brands put their dials for changing the settings on top of the camera on the right side of the viewfinder. The right side of the camera is broader than the left side, telling the user how to properly hold it: with the right hand, thump placed so that it can easily reach the buttons on the back and when taking pictures the thumb could or should be on the small piece of (fake) leather that has been slightly dented to mimic the shape of a finger and to invite the user to place his or her finger there.

The way of holding the camera that is communicated by its shape is very typical since cameras have been this way for a long time and people are probably used to using it in that particular way. With both hands, the right hand with the index finger on the button and the thumb behind the camera, the other fingers wrapped around, creating a solid grip that is necessary for taking crisp pictures since the camera has often be held as steady as possible, especially in low-light conditions. The left hand supports the camera from either the bottom or wrapped around the left side similar to the right hand on the right side. With DSLRs the user should put his or her eye up to the viewfinder to see what he or she is taking a picture of, hence the shape and material of the viewfinder, which is often made out of a soft material like rubber to provide comfort and block as much light as possible.

For navigation, both cameras have a circular shaped set of buttons representing all four directions with an 'ok' button in the middle. On the Nikon camera

these navigational buttons are pure for navigation across the screen, but on the Canon camera these buttons have multiple functions which are written on them with small text.

To take a picture, the user should press the button on top of the camera with the index finger. Most modern DSLR cameras allow focussing the lens by half-pressing the same button. The dial that changes the setting of the camera is located on the other side of the viewfinder on more advanced models like the Nikon D7000 and the Canon 60D, shown in the picture below. The Canon 60D also has the directional buttons but it also has a scroll-wheel, to scroll through pictures or settings the user should turn this wheel. The same way as on the original iPod from Apple.

The LCD screen on all of these cameras except the Nikon D7000 can be turned for better visibility when shooting pictures or video at extreme angles. Most cameras have a cavity next to the screen to allow for a finger to get a grip on it and at the same time communicating intended use.

The cameras below are much bigger and heavier than the less advanced models that can be seen above. A heavier model might also help communicate the message that it is able to do more than the lighter model since there is more stuff in there. Although older (analogue) models that are way less advanced than either of the cameras pictured here often are heavier than more contemporary ones. In that case the difference in the design due to fashion or materials suppress the effect of the weight in the human's idea of how advanced the camera is.

But with modern DSLRs, since all the models look very much alike, the way to mentally or physically influence what the user thinks the camera's abilities are could definitely be through weight and size. The bigger and heavier it looks or feels, the more advanced a model is.

In conclusion, DSLR cameras rely heavily on the past. They use the general shape and thus communicate similar ways of use as older, 20th century, archetypical camera types. This type of camera looks very much alike across the whole range of brands and only incorporates very subtle differences such as the side of the camera that the buttons are located on. When looked at from a very detailed level this could cause very slight differences in use between models, but overall DSLR cameras are used very similar to each other.

Behind-the-back

Of course when discussing the use of camera models, there is a difference between more advanced and less advanced models. The first one obviously requires more prior knowledge from the user, about the type of camera but above all about photography in general. The area of photography is filled with terms that might not be very recognizable for someone that is not very experienced in the field. The less advanced models incorporate these advanced functionalities but to a lesser extend and certainly less obvious, forcing the user that wants to use them to actively search for them. This prevents accidental changes in the settings that could result in too dark, too light, blurry or overall bad picture quality.

One of the side effects that might occur when using a photocamera in general is that people sometimes, when using the camera to capture their holiday, tend to use it all the time. In that case it might happen that people forget to enjoy their holiday because they are focussing on the technology and making sure that people at home see as much from what they saw as possible. These people see their whole holiday through their lens.

Above-the-head

In general, this type of camera delivers very good value for the money that it costs. It enables users to take high quality pictures and store them on small memory cards and modern digital photo formats enable a high range of editing possibilities. Users can change a lot of their pictures at home. There is practically no limit to the amount of pictures that someone can take. This could be a cause of people not thinking their pictures through anymore and just 'shooting away', only to think about them afterwards and then choosing which ones to keep and which ones not. With older cameras that use film there is only a limited amount of pictures on a roll of film and every picture costs money, which causes people to think more before taking a picture. The innovation in technology enables people to do a lot more but at the same time do it less purposefully.

This also accounts for other modern camera types that use digital formats to save their pictures on memory cards, like digital compact cameras.

2.3.2 Digital Compact Cameras

Introduction

The digital compact camera is the digital equivalent to the analogue rangefinder cameras. This camera is also referred to as a Point-and-Shoot camera. The compact cameras are specifically popular by people who are no photography enthusiasts and people who do not see themselves as photographers. These cameras are mostly used for quick pictures of holidays, parties and other things people want a photographic reminiscence of.

The idea behind this type of camera is that they are very quick and easy to use. The compact camera has a very distinctive shape and design. Pretty much all the digital compact cameras are looking very much alike. Because they are so alike three of the best-selling compact cameras will be analyzed. The Canon Powershot G7 X II, the Panasonic Lumix DMC-TZ60 and the Sony CyberShot DSC-W830 are the best-selling compact cameras at the moment on several web shops. Each of these three cameras are best selling in different webshops.[1]

Interaction with the world

Background-relation

Just like with the DSLR camera mentioned earlier the four relation types defined by Ihde (1990) can apply to compact cameras. Again the background relation might be not as obvious as the rest. However this relation can be more obvious than with a DSLR camera. Because of the shape, size and weight of compact camera it can be more inviting to take the camera with you when it is laying on a table or a desk. For instance when the user is going for a drink with his friends and he sees the camera when leaving the house the camera might invite the user to take it with him because it is easy to carry. At the same time the degree of appeal is a relevant factor in persuading the user to take the camera when it is stored on a table or desk.

Alterity-relation

Looking at the alterity relation, a compact camera does not have a viewfinder like a DSLR has. A compact camera only has a screen to see what is in the frame of the photo the user will take. The attention of the user is almost always directed at the camera when using it because everything happens on the screen of the camera. At the same time the attention of the user will be focused on the world because that is what he wants to take a picture of. A compact camera does have several buttons to navigate through but because the idea behind a compact camera is to be easy and fast the user does not use a lot of these buttons when taking a picture. Only the buttons to zoom in and out and the button to take the picture are used when taking a picture. The attention of the user will be focused more on the other buttons when adjusting settings in the menu or when looking at the taken pictures. When doing this the user uses the buttons to navigate through the menus and photos and perhaps using a delete button to remove unwanted images.

Embodiment-relation

On the other hand can the embodiment relation also be a very relevant relation. The attention of the user is always focused on the technology because of the screen but at the same time the attention of the user is focused on the world. The goal of the user is to take a picture fast and easy, a picture of the world around him. In this situation the camera is an extension of the user to enable him to take a picture. The users attention is focused on the world through the screen of the camera.

Hermeneutic-realtion

The hermeneutic relation is also present with this type of camera. Because the compact camera is almost always an automatic camera it does not give any feedback on things like light intensity and for example the corresponding shutter speed. The camera calculates these settings automatically and then takes the picture. The only feedback the user might see is if the flash is going to fire or not. Usually there is an icon present on the display that shows what the flash will do. This icon gives some information about the world by showing the user that it is too dark to take a picture without the flash. However the user does not have to change any settings or activate the flash, this will be regulated automatically except when the user explicitly changed the setting of the flash to manual.

Next to this, because of the lack of a viewfinder, the user will only perceive a representation of the real world on the screen of the camera. The screen shows the world with the use of a lot of pixels and it gives a very accurate representation of the world, but it does not let the user look at the real world like looking through a viewfinder on a DSLR does.

Product Impact Tool

Before-the-eye

The one thing that is similar for almost all compact cameras is the fact that the most buttons to control the camera are located on the right side of the camera, next to the screen. This guides the user into holding and controlling the camera with his right hand. The location of the screen and the lens also guide the user into holding the camera with his right hand. The lens and the screen are both placed on the left side of the screen (while looking at the back) leaving no room to hold the camera on this side. A thing that the Canon (figure 2.4) and the Panasonic (figure 2.5) cameras have extra in persuading the user into how to hold the camera is a grip on the front of the camera suggesting that you can put your fingers on that spot to get a better hold of the camera. The Sony (figure 3.6) does not have this grip. The Canon and Panasonic both have a small grip on the back where the user can place their thumb when taking a picture. This again persuades the user to put his finger

1: Used webshops: www.coolblue.nl, www.bol.com and www.fotokonijnenberg.nl

Figure 2.4.1: (left) A Sony CyberShot dsc w830. Retrieved on 13-12-2016 from https://versus.com/br/nikon-coolpix-s3600-vs-sony-cybershot-w830
Figure 2.4.2: (middle) The back of a Sony CyberShot dsc w830. Retrieved on 13-12-2016 from http://www.mytecharena.com/sony-cyber-shot-dsc-w830/
Figure 2.4.3: (right) The top of a Sony CyberShot dsc w830. Retrieved on 13-12-2016 from https://www.consumentenbond.nl/fotocamera/producten/sony/cyber-shot-dsc-w830/

Figure 2.5.1: (left) A Canon PowerShot G7 X II. Retrieved on 13-12-2016 from http://www.harveynorman.com.sg/cameras-phones-and-gps/cameras/digital-cameras/canon-powershot-g7x-ii-black-digicam.html
Figure 2.5.2: (middle) The back of a Canon PowerShot G7 X II. Retrieved on 13-12-2016 from http://www.ritzcamera.com/product/CN1066C001/canon-1066c001-gx7-mark2.htm
Figure 2.5.3: (right) The top of a Canon PowerShot G7 X II. Retrieved on 13-12-2016 from https://www.usa.canon.com/internet/portal/us/home/products/details/cameras/point-and-shoot/advanced-cameras/powershot-g7-x-mark-ii

Figure 2.6.1: (left) A Panasonic Lumix DMC-TZ60. Retrieved on 13-12-2016 from http://hypebeast.com/2014/1/panasonic-lumix-dmc-zs40-travel-zoom
Figure 2.6.2: (middle) The back of a Panasonic Lumix DMC-TZ60.Retrieved on 13-12-2016 http://www.expertreviews.co.uk/digital-cameras/compact-digital-cameras/53372/panasonic-lumix-dmc-tz60-review
Figure 2.6.3: (right) The top of a Panasonic Lumix DMC-TZ60.Retrieved on 13-12-2016 from http://www.expertreviews.co.uk/digital-cameras/compact-digital-cameras/53372/panasonic-lumix-dmc-tz60-review

on a specific place on the camera. Another difference between the three cameras is the amount of buttons and setting wheels. On first glance the Sony is the most simple having the least buttons. It features the basic control keys on the back and the shutter button on top. The other two cameras have, next to the basic controls the Sony also has, an extra setting wheel on top of the camera allowing the user to change the camera mode from fully automatic to semi- or even fully-manual modes. These extra buttons and settings that are present on those cameras can give an image of being a more advanced photographer when using this camera compared to people who use the more simple Sony camera.

To-the-hand

The locations where all the buttons on a compact camera are placed guide, and maybe even force, the user into using specific fingers to push them. When the user is holding the camera with his right hand he will automatically control the buttons on the back of the camera with his right thumb. The shutter button on top will almost certainly be controlled with the right index finger while the other fingers will rest on the front of the camera. These fingers will be placed on the grip on the front of the camera (like on the Canon and Panasonic) giving the user more grip to hold the camera in a secure way. The Sony camera is the only one of the three that does not have a grip on the front of the camera.
Compared to the other two the Sony is the smallest and lightest of the three and this might be the reason the grip is not present. The buttons and screen give the user enough information on how to hold the camera and due to the size and weight extra grip is not necessary. The location of these grips are very convenient and almost force the user to hold the camera in a correct way. The grips are usually made from a material that has some texture to it (like fake leather with for example small dimples in it) giving a secure and grippy feel to the user. The way all these buttons and grips are placed almost unconsciously influence the behavior and the interaction of the user with the product by only letting the users hold the product in a correct way.

Behind-the-back

The side effects of having a compact camera with you to take pictures is that if the user wants to take a lot of pictures he has to take enough memory cards with him. Also, the camera has a limited supply of energy in the form of a battery. If there is no way to charge the battery while for example traveling the user has to take several charged battery's with him. These effects could become stressful to the user when the battery supply or storage space is running low. Another side effect can be that when a user has enough battery and storage available that he wants to capture everything he sees on a picture. This can result in a situation where the user is constantly photographing everything he sees instead of enjoying the trip. After the trip the user can feel that he only looked at the things through the screen of the camera.

2.4 Mainstream unusual

2.4.1 Drones

Introduction

Drones are an emerging technology, it is gaining popularity [6] as the devices become more and more advanced. Currently we as a society do not seem very sure what to do with this technology when it comes to, for example, privacy issues. Drones with cameras are mainly used in filmmaking, but are also very suitable for aerial photography. The most popular drones where made by DJI, a Chinese company. But now GoPro, a major camera company, has started producing them as well. In this analysis, the focus will be on the DJI drones since they don't require an external camera to be attached, are producing the best selling drones and produce drones that are meant for the consumer market and not for the professional market.

Interaction with the world

Embodiment

The embodiment type of relation is definitely present when taking photographs using a drone. The user is looking at a screen, often a smartphone, located on the controller of the drone. Via this screen, the user can see what the drone camera sees. The drone is in fact an extension of the human body, since the human body typically cannot reach what the drone is able to reach.

The direct interaction that the user has with the controller can also be viewed as an embodiment relation because the controller functions as a device through which the user is able to control the drone.

So the interaction of taking a photograph of the world happens through an interaction with the drone through a controller that a human is able to control because of his smartphone that is connected with the drone. The interaction here is very complicated.

Hermeneutic

When connected to a smartphone that functions as a digital interface for the product itself, the information on the smartphone has to be interpreted by the user. Although it is a pretty direct representation of the world since it features an image built up out of pixels that form an image that represents the world very well in a visual manner.

The numbers that represent for example the altitude of the drone or the shutter speed, resolution, iso-value or aperture of the camera provide the user with information as well, about the settings on the camera. They need to be interpreted and translated to the environmental conditions like light intensity.

Alterity

The alterity type of relation can also apply in this case, especially in the beginning, because the user has to learn to use the controller. In this period he or she is probably focussed on the controller itself while at the same time keeping an eye on the drone. When the user becomes used to using the controller, the focus will be on the drone or the content that he or she wants to create, the focus of the user's attention will no longer be as much on using the controller as before, it then has become some sort of automatic process where the need to think too much about it does no longer exist, therefore this type of relationship will fade to the background.

Figure 2.7: The DJI Mavic drone with 4K camera and controller. Retrieved on 16-12-2016 from http://www.dji.com/mavic

Background

The background relation does not have a major impact on the user with this product. When not in use it is meant to be in a case and on a shelf somewhere. It depends on how much it is in sight how much it will affect the user and in what way. It might become an irritation of the user if the user has only a small space and the device will cause that space to look cluttered or full. This is the same case as with certain kitchen equipment like pasta-machines, they are too big to put in a drawer so they have to stand on a shelf or the counter but they are not used that often because they have a very specific use. When someone owns more of this type of products, they will cause the kitchen to look cluttered, possibly causing frustration.

Product Impact Tool

Before-the-eye

Of course the drone has its blades, therefore it looks like a helicopter. This really helps in communicating what it actually does, even though it is a relatively new technology. The same counts for the controller, it looks like a typical controller. It has two joysticks and some buttons. The two devices that together form the product share the same colour in both models so it is clear that they belong together. The clearly visible antennas on the controller might be necessary but they are also showing the user that there should be a wireless connection somewhere. Most of the buttons (power, wi-fi) have clear, conventional symbols printed on them.

The shape of the controller however is not really well communicating how to hold it. Especially the controller of the DJI Phantom 4. This controller has the shape of a rounded off box and although there are some subtle details on the side, some grey padding to indicate the placement of the hands, the thing that communicates the proper hand orientation the most is the placement of the joysticks. These typically have to be controlled with the thumbs and in order to be able to do that, the user should have his or her hands on both sides of the controller.

The amount of buttons on the controller and also on the drone itself is very limited. This gives the idea that it might not be complicated at all to fly it. But there are a lot of stories of people crashing their drones into the ground or a tree. Most of the information that the user needs is on the screen that is built-in or on the user's smartphone through an app.

To-the-hand

The form of the controller of the DJI Phantom 4 is very bulky, it has no gaps or dents for the user to place his or her hands comfortably, the size of the controller does not help with this either. It might be too big for people with smaller hands, they have to stretch their fingers around it. The Mavic drone has a much smaller and slimmer controller, allowing a more comfortable grip. With that one, the joysticks also help communicate the right way of holding it.

One thing that is inconsistent with both controllers is the up-down orientation. The controller of the Phantom has a screen on the top, the user's arms are in the way if he or she tries to orientate it the wrong way around. On the Mavic controller, the screen is on the bottom. This is allowed by the design because the controller itself is much smaller. The antennas on the controller prevent a wrong orientation here.

Behind-the-back

A side effect of drones is that, to ensure safe use, governments must discuss legislation. It is important to have clear rules regarding privacy and aerospace.

Figure 2.8: The DJI Phantom 4 drone with controller. Retrieved on 16-12-2016 from http://www.dji.com/phantom-4-pro

Above-the-head

With drones, this quarter of the Product Impact Tool is very interesting and closely related with current issues in society. A lot of people are afraid of drones, it seems to be just another 'innovation' that violates their privacy. They are afraid of this because drones are able to film and photograph from a viewpoint that we were not able to reach before, except with helicopters, but those are expensive and loud, therefore less discreet.

But drones are said to be going to be used for other goals as well, for example delivering packages or inspect and explore around dangerous areas where for example there might be a forest fire. In this way they could even save human lives, also when they deliver life-saving packages to stranded mountain climbers for instance. Drones have a promising future, according to some people.

Legislation and time might be necessary for people to ultimately accept drones in their lives. A lot of countries already have laws concerning drones, but a lot of other countries haven't yet, but that will come with time.

2.4.2 Actioncams

Introduction

Large cameras are not a practical solution when someone wants to film or photograph while hanging from the side of a mountain, while bungee jumping or riding a skateboard downhill at extreme speeds. Since sharing has become easier and more important in photography, people seem to have the urge to record their experiences also when practising extreme sports. For this, companies developed so called action cameras. These are small cameras that are often waterproof and shock-resistant. These cameras often have a very good image quality that compares well to that of a digital compact camera.

For this analysis, the standard of the action cameras market will be the subject: GoPro. The GoPro cameras that will be looked at are the most recent models: the GoPro Hero 5 and the GoPro Hero 5 Session.

Interaction with the world

Embodiment

With this type of camera, the embodiment relation is not very clearly present. The purpose of the camera is to be as little noticeable as possible. The user will press the record button and put the camera in place. Then, the user's attention will be with the activity that is being recorded and not with the camera. The camera can be forgotten until the user has to stop the recording. This camera type has a very passive situation in the world.

Hermeneutic

With other cameras, the user has to interpret the light intensity in the world in order to change the settings on the camera to the right configuration. With GoPro cameras, this is different. The only thing that can be changed here is the image resolution. Older models of GoPro did not have a screen so the user could not see what he or she recorded until the camera was being connected to an external device like a PC.

With the Hero 5, GoPro incorporated a screen in the camera, providing the same hermeneutic relationship as with other digital cameras where the world is being projected on the screen using pixels, providing an image that is pretty accurate with reality. The Hero 5 Session does not have a preview screen and only uses small LED lights to indicate what the camera is doing, but also incorporates a small screen displaying the time that has passed since the recording was started and what the resolution is. This provides the user with information about the camera, but not about the world.

Alterity

This type of relationship is definitely present in this product's use. For example when the user is pressing the buttons to change settings on the camera or when mounting the camera to a helmet or any other type of mount. The focus of the user is with the camera at that moment. However, the user also has to think about what the camera will take an image of, meaning that the user's attention is also a little bit with the world around him or her.

Background

With this product, the background relation is an interesting one. Action cameras are often mounted to places that a camera normally would not be placed. These are places like the roof of a car or the top of a helmet, but also on the deck of a surfboard or on the bottom of a skateboard. When this is the case, the user has no direct interaction with the camera itself. But the device is a pretty expensive piece of gear for most people. When riding the skateboard or surfboard or driving that car, the user's attention might be with the camera. This can influence the actions of the user. He or she might drive more carefully when there is an expensive camera placed on the roof of the car they're driving. So although the camera and its mounts are made for these kinds of uses, people often find it very difficult to trust it enough to not let their actions be influenced by it.

Product Impact Tool

Before-the-eye

When looking at the GoPro cameras, it seems just a small black box with a square lens. The camera looks like a shrunk-down version of an ordinary digital compact camera, especially with the newly added screen on the back. A big difference is that GoPro cameras only have three buttons, one for power, one for mode selection and one for Wi-Fi. The mode-button has the word 'mode' printed on it and is placed on the side of the camera. The power-button has three functions: turning the camera on and off, select the current option in the menu and also starting and stopping a recording or taking a picture. That last function seems to be the reason for the specific placement of this button: on top of the camera, where the shutter button would also be for ordinary photocameras like digital compact cameras or DSLRs.

There seems to be no specific way of holding the camera and there are no clues for this in the physical design. The rectangular shape seems the easiest solution for mounting the camera in a frame that is tightened around the camera and that is probably why the camera has the shape it has.

With the GoPro Hero 5 Session, it is more difficult. This looks in no way like a regular camera. One of the reasons that people seem to know how to use it is because of marketing by the company that makes them. They release lots of videos of people using their products to set an example of what users would be able to do with their products.

To-the-hand

The hands of the user are not guided by the design of the camera. Users often hold the camera like they would hold a block of the same shape and size. The physical features of the camera have almost no influence on the way of use. Or maybe this is the intended way of use, since the camera has to be able to function in a lot of different environments and positions. Therefore: no guidance might be intentional in this case.

Behind-the-back

Side effects might include the carefulness that was discussed before. Although the cameras are made for rough conditions and designed to be shock- and waterproof, people tend to be careful with expensive gear. This might also have something to do with the fact that sticking mounts on wet and slippery surfboards might not be the most trustworthy way of fixing a camera into place, despite the company saying that it is trustworthy.

Figure 2.9: GoPro's Hero 5 (left) and Hero 5 Session (right). Retrieved on 18-12-2016 from shop.gopro.com

2.4.3 Smartphones

Introduction

The smartphone is a huge upcoming photography technology. It is widely used by a lot of people and almost all smartphones have a built-in camera. It seems to rapidly be catching up to traditional amateur photography devices with regard to usage. For this analysis, the iPhone will be used, since most mainstream smartphones are similar in use of the camera app. Although some parts of the analysis will be focussed on the smartphone as a whole, most of it will be focussed solely on the camera functionality.

Interaction with the world

Embodiment

The smartphone as a whole functions as a product that has a strong embodiment relationship with its user. It enables the user to connect with people and services that would normally not be within reach. The camera of the smartphone however is pretty basic and traditional. In that sense it is used similarly to digital compact cameras. The difference being the amount of other functionalities and through that the core function of the product itself.

Hermeneutic

The same as with more traditional cameras that feature a screen, the smartphone camera also is able to provide information about the world through specific numbers and through an image built-up from pixels as well. But most camera applications that come with the phone do not have these functions. A reason for this could be that phones are bought by photography enthusiasts, but that phone owners are not always photographers. They do not buy the smartphone because there is a camera, they buy a smartphone because it is useful and able to do a lot of things for them. Therefore, the focus of the device is on communication and multifunctionality and not on how advanced the camera application is. However, apps can be downloaded where this kind of information is available and the user can change the settings of the camera, making it practically a digital compact camera. Especially with phones increasingly being able to take high quality pictures.

Alterity

This relationship is present, although it depends on the software to what extend. Camera applications that feature photo editing for example have this relation with the user to a greater extend than camera applications that only feature the ability to take pictures and require a separate app to edit them. Most cameras have functions that enable the user to take pictures with a filter or press a button to switch between different cameras that the phone has. These buttons are often few and simplistic and use clear icons. The most important button is the shutter button that takes the picture and therefore it is also the biggest button on the screen. Most smartphones work with touchscreens nowadays so the buttons can change with the software.

Product Impact Tool

Before-the-eye

Focussing on the software first. This can be adapted to whatever the developers want it to be. Some choose to refer to older, more traditional cameras for recognisability. Others create a complex interface with a lot of sliders and buttons. Apple's default camera application makes use of a big screen where a preview can be seen of what the camera sees and next to it are buttons that are labelled with their functions.
Concerning the physical shape of the product does the smartphone kind of look like a digital compact camera: a box with a lens and a screen. It does not provide much clues on how to use it from its appearance.

To-the-hand

There is no physical interaction with the application itself since it consists only of software. There is an interaction with the phone, but this is mostly that the lens is positioned in a way that to photograph what the user wants to photograph the phone must be held in a certain position. With the lens pointed in the right direction.

Figure 2.10: iOS camera application on iPhone 5S. Retrieved on 21-12-2016 from http://www.theiphonemom.com/wp-content/uploads/2015/01/Screenshot-2015-01-03-06.38.02.png

Behind-the-back

The use of the smartphone as photocamera brings side effects with it. It enabled users to seamlessly go from taking a picture to uploading a picture to an external application like Instagram. The smartphone with camera incited other companies to create apps that use the taken photos, from sharing it with friends to editing them (or both).

Above-the-head

The smartphone is a technology that is widely accepted, at least in western societies. Photographs are a large part of social media experiences. Smartphones enabled people to easily and quickly take a photo of something and almost immediately share it with everyone else on the internet. This may lead to a different way of photography, where the purpose is not to create a creative piece of art or a memory of a special family occasion. Sometimes its goal might be communication of visual data, when choosing clothes to buy and discussing it with someone else over an online chat for example.

People with smartphones have photocameras in their pockets all the time nowadays, when something happens they can take a photo or make a video in a matter of seconds. It is cheap to store them and they are removable as well. This often leads to a rougher and less thought-through way of photographing. The quality is not as important as before and the subjects of the images are often more subjects of daily life. The purpose of photography is changing as it becomes easier to do it. The purpose often isn't the photograph itself, but it is sharing it with others. Photography as a mean to a goal instead of the goal itself, like journalism, but then for everyone.

2.4.4 Rangefinder cameras

Introduction

Rangefinder cameras (or telemeters) are cameras equipped with a rangefinder, hence the name rangefinder camera. This analogue type of camera is still used by enthusiasts today. This type of camera is seen as the predecessor of the modern digital compact camera. A rangefinder camera has a separate viewfinder and lens, they are not connected so the image the user sees through the viewfinder is slightly different from the actual photo that the camera will take through the lens. The cameras that will be analyzed are the Leica M3 and the Canon Canonet 28. The Leica M3 was the first Leica in the new M series launched in 1954 [7]. The Leica M3 is the most successful and best-selling camera Leica ever made [8] around 220.000 units [9]. Today it is a collectors and enthusiasts favorite. Leica is one of the only few companies left that still manufacture (now digital) rangefinder cameras. They still produce cameras in the M series [10]. The Leica M3 is a Rangefinder with interchangeable lenses.

The Canon Canonet series launched in 1961 was Canon's first camera in the intermediate-class market and their first successful auto-exposure camera [11]. The Canonet was an instant success selling over 1 million cameras in the timespan of 2,5 years. [12] The Canonet has been made in several different editions like the Canonet QL19 and the Canonet 28. The numbers in the names of these cameras correspond with the maximum aperture the camera has. These difference in aperture is also almost the only difference between the different Canonets. For this analysis the Canonet 28 will be used due to the fact that this was the last version of the Canonet ever made.

Figure 2.11 (above): The front (left image) and the top (right image) of the Leica M3 Rangefinder. Retrieved on 16-12-2016 from http://www.kenrockwell.com/leica/m3.htm

Interaction with the world

Embodiment

The embodiment relation is definitely present with this type of camera. Due to the fact that analogue cameras do not have a display to show what the photo will look like the attention of the user is more focused on the world around him. This makes the camera just a tool to be an extension to the user. It enables him to create memories and photos of different thing but does not give the user feedback on how the picture turned out directly.

Hermeneutic

The hermeneutic relation is also very present with this type of camera. When taking a picture the user will quite literally experience the world through the viewfinder of the camera. This image that the user sees through the viewfinder is however just an representation of what the real world looks like and also how the photo will look like. Due to the fact that the user is not looking directly through the lens like with an SLR camera but rather through the viewfinder placed on a different location on the camera the images seen through the viewfinder and through the lens will always be slightly different. Some rangefinder cameras, like the Canonet 28, have a built in light-meter. The Leica M3 does not have a built in light-meter. The light-meter of the Canonet gives the user information about the light levels of the real world and thus gives the user a representation of the world in the form of a number. It does this by having a small needle that shows the user what shutter time the camera is going to use and need to get a well exposed image. This needle is placed in the viewfinder and can only be seen when the user is looking through the viewfinder.

Alterity

The alterity relation is definitely different from cameras discussed earlier. A rangefinder has a viewfinder where the user has to look through to see how the image he will take looks. When focusing the camera the right way a split image of the world which is visible has to be aligned by rotating the focusing ring on the camera. While the user is looking at the image of the real world when doing this he is at the same time focused on the rangefinding technology the camera has to focus the camera correctly. Different from the Canonet 28 the Leica M3 is a fully automatic camera. It does not have a light-meter and does not have an automatic exposure or aperture setting. All those settings need to be manually adjusted depending on the available light. Most of the time users have to use some sort of external or add on light-meter next to the camera and change the settings on the camera corresponding. When using these tools the user will get a representation of the real world through the light-meter which is more or less a hermeneutic relation but at the same time the user is focusing on the technology to change the settings of the camera with switches and buttons.

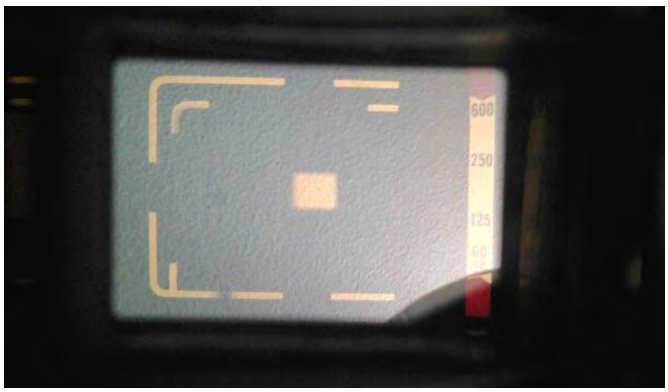

Figure 2.13: The viewfinder of the Canonet 28. Retrieved on 16-12-2016 from https://socialwilliams.us/2013/01/28/3-canon-viewfinders/

Figure 2.12: The front and top (left image) and the back (right image) of the Canonet 28. Left image retrieved on 16-12-2016 from http://www.meewezen.nl/blog/cameratest-de-canon-canonet-28/ and right image from own collection

Background
The background relation with these kinds of cameras is not very different from other cameras analyzed earlier.

Product Impact Tool
Before-the-eye

Due to the fact that there are automatic rangefinders and manual rangefinders the amount of buttons, levers and switches is different among those two. The Canonet is an automatic camera which sets its own aperture and shutter-speed settings. The only button it has is the shutter button to take the picture. This button is incorporated in a lever to advance the film when a picture has been taken. Neither of those two has any text or icons written on them so to know what they do you have to read a manual or have experience with these kinds of cameras. They do however invite the user to push the button and pull the lever. The same goes for the film rewind knob. It looks like it does something and it has a lever that unfolds but it does not tell the user what is does. On the lens there are two rings to rotate and a switch. The switch can be moved along a scale of different numbers. This switch does have a text next to it telling the user what it does. The two rings which rotate also have numbers and letters on them. One ring is to set the aperture to a manual number or to the A standing for auto and the other ring has distances written on it. These distances correspond with the focus distance.

The fully manual Leica has next to the same buttons and switches the Canonet has several other switches. On top of the camera there is a rotating switch with numbers on them but no icon or text telling what it is for. On the front of the camera are two levers, one with an arrow and the letter R next to it and one without text. Next to those levers there is a button, again with no icon or text explaining it.

Neither of the cameras really provides visual hints on how to hold the camera. There are no grips to show where to place your fingers. The only thing they have is the black leatherette that is on the body of the camera which looks softer and more grippy than the metal.

To-the-hand

Despite the fact that there are no clear pointers on how to hold the camera the leatherette does guide the user slightly into holding the camera with one hand on either side of the camera. The leatherette wraps around the whole camera. The leatherette also has a soft and grippy feel to it giving a sense of security. When holding the camera the weight of it also persuades the user into holding the camera with two hands firmly on the sides of the camera. These rangefinder cameras are mostly build from metal and are quite big compared to the modern day compact cameras so they are quite heavy. When holding the camera the shutter button and the lever around this button can only be used comfortably with the index finger and the thumb respectively.

The lens on a rangefinder camera is always used to focus the image. This is done by turning a focusing ring on the lens. These rings have grips or textures guiding the user into holding the lens on that position to focus the ring.

Behind-the-back

The side effect of using an analogue rangefinder is that the user has a limited supply of photographic material. The cameras use 35mm photo rolls which commonly can take 36 photos before it is full and has to be developed. Because the user has to make sure each photo is well exposed and focused to ensure no film or money is wasted on ugly photos it could influence the user in to taking pictures too carefully. Also when a user goes somewhere to take pictures he has to make sure he has enough photo rolls with him to take the pictures. And when the user uses a camera without a built in light-meter, like the Leica M3, he has to take an external light meter with him assuming most of the amateur photographers cannot read the light intensity with their own eyes.

2.4.5 Instant cameras

Introduction

The only company that is really known for its instant photography is Polaroid. Polaroid was the first company to start selling cameras that could instantly make a tangible photo. Polaroid went on to become the world largest manufacturer of instant cameras and instant film with producing 50 million packs of instant photos every year in its high days. The company made a variety of different cameras like the 600, 1000 and the SX-70. The sx-70 is a SLR instant camera which was a more expensive instant camera. Despite the price the sx-70 was a great success. Within a year Polaroid manufactured 5.000 units per day [13]. The Polaroid 1000 was the cheaper alternative to the sx-70. The Polaroid 1000 quickly got the nickname "rainbow camera" due to the, now iconic, rainbow on front of the camera. When this camera was produced, it arguably sold better than any other camera on the market.

Interaction with the world

Embodiment

Because the Polaroid cameras are purely focused on creating an instant memory to enjoy and it does not have any settings that need to be adjusted or checked and therefore also no feedback about settings the user can purely focus his attention on the world around him through the camera. This makes it a real extension of the user to create nice, tangible images while not focusing on the technology.

Hermeneutic

The hermeneutic relation is very much present. The user is looking, quite literally, through the camera to the world to compose a picture. With both cameras this gives just a representation of the world in a small viewfinder which needs some interpretation to precisely frame the picture but the Polaroid 1000 needs a little more interpretation than the SX-70. This is due to the fact that the SX-70 is a SLR, which lets the user see the world through the same lens as the photo is taken through, and the 1000 has a separate viewfinder like a rangefinder camera. Because the Polaroid 1000 has a separate viewfinder which is placed left from the lens the user has to take in to account that the image he sees through the viewfinder will be slightly more placed towards the left compared to the image the camera finally produces.

The final photo the camera ejects also is a tangible representation of the real world which needs some interpretation to understand.

Alterity

Both the polaroid SX-70 and the 1000 do not have any digital features or feedback. They have a viewfinder which allows the user to look at how the picture will look like, they have a button to take the picture and they have a knob or switch to manually adjust the exposure, that's it. Both cameras have a light meter which calculates the shutter speed automatically but these do not give any feedback. So the alterity relation is not very present with these types of cameras except for when the user manually adjusts the exposure setting to more or less light.

When a picture is taken however the alterity relation is somewhat more present. Because it are instant cameras the Polaroid cameras directly "print" a picture when it is taken. When this picture is ejected a chemical reaction starts that starts developing the picture and slowly the taken image appears on the paper. This process can be quite mesmerizing to watch and can attract the attention of the user.

Product Impact Tool

Before-the-eye

When looking at both the Polaroid 1000 and the Polaroid sx-70 there are no real pointers on how or where to hold the cameras. The only thing that is obvious is the round red knob on front of the camera which invites the user to press it. Apart from that the Polaroid 1000 has another round knob on the front that can rotate. It has a texture to it, letting the user know the knob can be rotated. The Polaroid SX-70 has two round disks which also have a texture that shows it can rotate.

Next to the buttons both cameras have viewfinders on the back of the camera. With the Polaroid 1000 it is clear that the user has to put his eye against the viewfinder due to the texture and shape of the material around it. This material looks soft and flexible. The Polaroid SX-70 just has a lens the user has to look through. This lens has no further clues on how to use it.

Both cameras also have a small window where a number is displayed behind. This number represents the amount of pictures there are left inside the camera before a new pack of film is needed.

To-the-hand

There are no real design features on both the cameras that persuade a user into holding the camera in a specific way. The Polaroid cameras, especially the Polaroid 1000, are mostly designed to fit the technology used to make the pictures. The form follows function principle is used by the design. But although there are no pointer on how to hold the cameras there are also not really that much ways to hold the camera so most of the

Figure 2.14: Polaroid 1000 camera. Retrieved on 19-12-2016 from https://commons.wikimedia.org/wiki/File:Polaroid1000.jpg

Figure 2.15: Polaroid SX-70 unfolded (left) and folded (right). Retrieved on 19-12-2016 from https://eu.impossible-project.com/products/polaroid-sx70-camera-original

time the users hold the camera in the correct way which is supporting the camera on the bottom with one hand and on the right side with the other hand. This hand on the side of the camera is slightly guided to this position by the placement of the shutter button on front of the camera. This button invites the user to press it with his right index finger. The biggest reason most of the users will hold the camera correctly is that it is obvious that you should not hold any hands or fingers in front of the camera lens. The camera also does not provide a lot of other options to hold the camera so the user is physically forced to hold the camera in a specific way, although this is not the most ergonomic and comfortable way of holding a camera.

Behind-the-back

One condition is that the user has to take enough film packs if he want to take many pictures. Original Polaroid film packs has 10 frames in it and the new produced film packs only have 8 frames. So the amount of images there can be taken is quite limited. The cost per photo is also quite high compared to other analogue photo technologies. This can be a factor for people to become very careful with taking pictures. Also the lack of feedback on the exposure of the images can be a factor in this. Because the camera does not give any feedback and always make a picture when the shutter is pressed some photos will be messed up if the light conditions are not good enough.

Due to the big commercial success of the Polaroid 1000 and its recognizable rainbow on front of the camera this Polaroid became one of the most iconic and recognizable cameras ever manufactured. This resulted in for example Instagram using the Polaroid 1000 as their logo. Another effect is that the square white frame pictures the Polaroids made became very recognizable and iconic, people tend to like the small framed Polaroid pictures. This and the fact that Instagram used the square picture format inspired by the classic Polaroids generated a big comeback for the square photo format.

Above-the-head

The Polaroid instant photos were developed because of the whish for having direct access to the taken picture. More specifically, the daughter of Polaroids inventor asked her dad why she could not see the picture her dad took of her instantly. This question triggered a whole new way to take and enjoy photography. This instant way of making and seeing photos might even be the first steps towards the digital cameras with screens we know today.

2.4.6 Instant cameras: Impossible project I-1

Introduction

The Impossible Project is a company that took over the Polaroid factory and the last 500.000 packs of Polaroid film when Polaroid announced they would stop manufacturing instant film in 2008. Impossible stepped in to continue manufacturing instant film for Polaroid cameras and in 2016 they launched their first own camera, the Impossible I-1. This camera is the result of merging the modern technology with the old instant film which is the same used in the classic Polaroid cameras. This camera can be seen as the modern reincarnation of the classic Polaroid cameras. The camera has its own rechargeable battery instead of using batteries that are built in to the film packs like with the old Polaroids. It also features Bluetooth which connects to a mobile phone enabling the use of different modes like remote triggering, voice activation and complete manual mode. Unlike the classic Polaroid cameras the I-1 does not have a single focus lens. The I-1 has several focus lenses built in that rotate in front of the actual lens, enabling the use of several focus distances. The camera has autofocus built in which regulates which lens is needed when. The Impossible I-1 is the first instant camera in the line of Polaroid cameras since 1997 when the last Polaroid instant camera was made.

Interaction with the world

Hermeneutic

The hermeneutic relation quite present with this camera. It has a viewfinder on top of the camera which is nothing more than a plastic lens that pops up for the user to frame his picture. When looking through this viewfinder the visibility of the user is not limited to the area the viewfinder captures but the visibility is rather good. The user can still see the whole world around him when using this camera. The user is enabled to see the world and the frame of the viewfinder at the same time which give the user the possibility to capture the world better in his viewfinder.

Some of the added modern features also can have a hermeneutic relation. The app for example has a mode where the user can set all the settings manually. The user can choose the depth of field, the exposure time and flash mode. The user has to look at the world and convert this to how he wants the camera to capture this world. The built in flash also can be turned on and off without the app, this also asks the user to interpret the light intensity available to determine if a flash is needed or not.

Alterity

The technology in the Impossible I-1 is basically exactly the same as in the Polaroid 1000, the only difference is that the Impossible I-1 has a set of modern features added to this technology. These features include a digital LED flash ring around the lens, which has a second function which is giving the user feedback about the battery charge and the amount of pictures left in the film pack, and Bluetooth connectivity. The Bluetooth connectivity is used to connect the camera to an app on a smartphone. This enables the user to control the camera via is smartphone in ways that is not possible to do on the camera itself like long exposures, voice control and remote shuttering. This app is only meant to control the camera and does not give the user any information about the world. This interaction is purely between the user and the technology with the goal to create creative and fun instant photos.

Product Impact Tool

Before-the-eye

The Impossible I-1 has several buttons on the camera. A three step button on the right side of the lens and a switch on the other side. Both these buttons are accompanied by icons telling the user what it does. On the side of the camera the button to take the picture is placed. This button is surrounded by a ring which tells the user it can rotate by the texture and the different icons on it. More specifically the shutter button has a bright horizontal yellow line on it which lines up with the yellow line on the outer ring when the camera is turned on. When the camera is turned off this line does not align. The camera also has a very obvious viewfinder on top of the camera which guides the user into looking through it when taking a picture. Also the latch on front of the camera invites the user into using it. This latch opens the front of the camera to enable access to where the film packs should be placed.

To-the-hand

"The main shape of the camera is dictated by the technical requirements" is what the CEO of The Impossible Project said in an interview. [14]
So the main focus of the design of this camera is to let as be as honest as possible. The form follows the technology. This means that, just like the original Polaroids, the camera is a little odd to hold and does not feature real ergonomic ways to hold the camera. The back however is designed in such a way that when the user is looking through the viewfinder his chin can rest on the back of the camera giving the user more stability to hold the camera steady. Further there are no real physical things that restrict or force the usage of the product in a specific way.

Behind-the-back

The behind-the-back of this camera is similar to the behind-the-back of the original Polaroid cameras mentioned earlier. The only difference is that there are some things the user has to think of when using this camera. Differently from the original Polaroids the Impossible I-1 does not work on the batteries that are included in the film pack. The I-1 itself has to be charged and will not work when the user forgets this. Also if the user wants to have access to the full range of features this camera has he has to also have a charged smartphone with the I-1 app downloaded on it with him.

Above-the-head

Figure 2.16: Impossible Project I-1. Retrieved on 19-12-2016 from https://www.bhphotovideo.com/c/product/1239029-REG/impossible_9001_i_1_instant_film_camera.html

Figure 2.17: The Impossible I-1 App. Retrieved on 19-12-2016 from http://www.theverge.com/2016/6/21/11989136/impossible-i-1-review-polaroid-instant-film-camera-analog

The reason such a camera can exist and be sold in modern times says something about the type of camera and the format. Apparently there is a demand and need for having tangible pictures and a more real interaction with the camera and photography itself. Photography with such a camera gives a sense of tangibility towards the photo the user is taking, the user is more involved in the process and is more aware of what pictures he is going to take. The fact that this type of camera and photography is rapidly gaining more interest today might have something to do with the saying "you only know what you had once its gone". Where Polaroid could not see any success in continuing the instant photography products back in 2008 Impossible stepped in and made it successful again.

2.5 Unusual

This is a chapter about more conceptual and emerging technologies. Often they are not yet ready for the market and are still experimented with. They also might have no specific use or place in society because they are on the edge of innovation. These analyses will be more speculative and open.

2.5.1 Google Glass and HoloLens

Introduction

Whether they will be released or not, Google Glass and Microsoft's HoloLens are very promising technologies. They make use of augmented reality and are wearable computers that people can wear as glasses. They people then see an extra layer that is placed 'over' the world.

Interaction with the world

Embodiment

With these glasses-like products, the embodiment relation is very prominently present. The user literally experiences the world around them through the product, like everything is filtered. This possibly happens for both vision and hearing. In fact, when the technology is well developed enough, these products could be able to change how a human experiences reality as a whole.

Hermeneutic

This relation is not as present as the embodiment relation, although there is a possibility that it becomes present. That depends on the kind of camera application that is used in the device. In general, the user watches the world through the product that is made of glass or plastic so there is no further interpretation necessary most of the time. If the camera app uses number to represent the settings, then the hermeneutic relationship will be as present as with normal digital cameras.

Alterity

Of course the user has to press buttons, move their fingers in a certain way or nod their head a bit. But with software this can all feel very natural. The device can select the thing that the user is currently looking at for example. The alterity relation will then develop more into an embodiment relation.

Background

These devices are always on and most of the times someone is wearing them. So for the user there is no background relation. However, for the people around the user, there is. These people obviously see the device on the user's face and probably know what it can do. It

Figure 2.18: Microsoft's Hololens (top) and Google Glass (bottom). Retrieved on 19-12-2016 from http://hololens247.com/microsoft-hololens-is-basically-a-wireless-pc-in-form-a-goggle/

could be taking pictures or video without them knowing. For a lot of people this plays around in the back of their heads when they see a person with such a device.

Product Impact Tool

Before-the-eye

The product looks like a pair of glasses, therefore most people know what to do with them. They put them on their face. The rest of the product is mostly guided by software of which not much information is available to this day. It makes use of motion and there might also be promising new features like eye-tracking.

To-the-hand

Since most of the product depends on software, this aspect is not so present. Although, because of the bulky shape of these products, it is very hard to hide them when using them. So if a user has the intention of secretly filming or photographing someone or something, he or she will find this very difficult to do.

Above-the-head

It is very easy to film or photograph someone without them knowing with these kinds of products. This may cause issues with people feeling safe around other people if everyone has a product like this. People might feel like their privacy is being violated even though the person that wears the device is not filming all the time. The possibility of being recorded might be enough.

People may also be less interested in other people eventually, due to the possibility of going online in the middle of a conversation for example. A person could be talking to someone who is at that same time watching a movie. We as humans might lose our interest and ability to focus on someone else for a longer period of time.

2.5.2 Other unusual cameras

There are many concepts wandering around the internet. As well as there are many more regular cameras, all with subtle differences. Most concepts that we found where theoretical and were never produced as real products either because it would be technically undoable or that it would for example be too expensive.

Many of these concepts and products have similar results in this analysis as previously analysed, regular models.

A noteworthy model that is currently being produced by Samsung is their 360 degrees camera. This camera brings a new thing to the discussion. With this camera it is both difficult to see when it is recording as well as it records in all directions. It will not be possible to dive away to avoid being on-camera.

Besides that, online platforms like YouTube are not very suitable for this kind of media, although they are experimenting with it. People do not yet seem to know how 360 degrees video or photographs can be used. The idea seems to be 'too new'.

2.6 Novelty-typicality analysis

2.6.1 Introduction

To give an overview of the novelty and typicality of the different cameras that have been analyzed graphs have been made. A modern DSLR camera has been chosen as reference for both novelty and typicality and all the other cameras have been placed in the graph compared to the DSLR and their novelty and typicality. The graphs for the novelty and the typicality have been made separately and those will be combined in the end to give an overview of which camera stands where.

2.6.2 Analysis Typicality (figure 2.20, page 41)

1: Canon Eos 1200D, As mentioned in earlier analyses the Canon Eos 1200D is one of the best-selling DSLR cameras today. Due to the fact that DSLR cameras are one of the most popular camera types today it has been chosen as the neutral point in the analysis.

2: Sony CyberShot W830, This is one of the best-selling digital compact cameras. Today this type of camera is quite typical although it is not as archetypical as for instance a SLR camera. It is clearly a camera that is the digital equivalent to the classic rangefinder cameras but the fact that is does not have a viewfinder this camera is not as typical as the Canon Eos 1200D. The reason that this type of camera is typical comes from the fact that it is a very widely used type of camera today. The styling and material usage is not very typical compared to archetypical cameras.

3: Canon G7X mk.II, Where the Sony CyberShot (nr.2) is as simple and clean as possible to use the Canon G7X is a more advanced digital compact camera. This camera has more buttons and fake leather covered grips. Especially those fake leather grips give the Canon G7X more typicality compared to the Sony Cybershot (nr.2) and therefore it is placed slightly higher on the typicality scale.

4: Canon Canonet 28, A vintage rangefinder camera for the masses. This type of camera is the predecessor of the modern digital compact camera. The material usage like the silver metal and the black leatherette alongside the big lens on front and the obvious viewfinder gives it a typical look.

5: Canon Eos 300D; This was the first DSLR camera for the masses and it is a camera in the same category as the Canon Eos 1200D (nr.1) chosen as a neutral point. Compared to this neutral point this DSLR is more typical due to the color scheme om the body. In essence the materials used in this camera are the same as on the Canon Eos 1200D (nr.1) but on the 300D the plastic is silver referencing to the vintage metal cameras.

6: Leica M3, A camera from the same category as the Canonet 28 (nr.4). Compared to the Canonet this camera is a little bit more typical due to its styling and shape. The camera is more manual to control which results in characteristic buttons and switches on the camera. The lens is also more classically shaped which results in this camera being more typical.

7: Polaroid 1000, This might be one of the most typical cameras ever made. Not so much because of the shape and styling of the camera but due to the popularity and reorganizability of the camera. The Polaroid 1000 is one of the most iconic cameras ever made and is recognized by many people. Today most people know it as the logo of Instagram but still this camera is instantly recognized as a camera.

8: Canon AE-1, This camera is an example of one of the first affordable and reasonably sized SLR cameras for the masses. It was one of the most successful SLR cameras Canon ever sold. This type, and more specifically this shape, is what a lot of cameras are based on. It can be seen as one of the most archetypical sort of cameras available. It has a centrally placed lens, black leatherette and it is made from silver metal. The shutter button is placed on top alongside the settings buttons and the film advance lever. This shape and design has inspired the design of many cameras and therefore it scores high on the typicality scale.

9: Kodak Box Camera, One of the first types of cameras. This camera is literally a box with a hole in it that focusses light on a light sensitive material. The design is as basic as it gets. It's a box with a hole, it does not have a clearly visible or recognizable lens and also no shutter buttons or any setting buttons at all. The typicality of this camera is very low.

10: Polaroid SX-70, This was Polaroids first camera that used the pack film still manufactured today. The camera is a combination of an instant camera and an SLR camera and therefore it gives the camera a very unique design, especially when the camera is folded in. The camera is not very recognizable as a camera

and the interaction with it is also not comparable with more regular cameras and therefore it scores low on the typicality scale.

11: Kodak Reflex, This is a TLR camera. The TLR camera is one of the early types of cameras and the main thing that sets it apart is the fact that it has two lenses placed above each other. The interaction with the camera is also not like any other camera. The viewfinder is placed on top and can only be used when the user holds the camera at waist level and looks through the top of the camera. The typicality of this camera is low.

12: Impossible Project I-1, The modern reincarnation of the original Polaroid cameras. The design and appearance of this camera is unlike any other cameras on the market. The form of this camera is strongly influenced by the technology inside. It has some characteristics From the Polaroid 1000 (nr.7) but not many. The only thing that tells that this is in fact a camera is that it has a big lens on front but that is it. Only people who have interest in Polaroid photography might recognize this camera and therefore it scores low on the typicality scale.

13: Iphone 1, Although smartphones with cameras are very normal today the smartphone does not instantly tells the user that it is a camera. It looks like a phone, not like a camera. Therefore it scores low on the typicality scale.

14: Apple QuickTake, Apples (failed) attempt to create a digital camera for the masses. It was one of the first attempts to create a digital compact camera but the appearance and design of the camera was so different and not recognizable that it did not sell. It scores low on typicality.

15: DJI Phantom, One of the latest innovations on the camera market. This is not a camera that is quickly recognizable as a camera. It will remind people of a helicopter instead of a camera but the lens underneath the drone can remind people of action cams that have been on the market for a while now.

16: Holga D, This is a conceptual camera trying to capture the feeling of analogue photography with a digital camera. It does not have a screen nor does it has many settings. The camera is shaped classically with a centrally placed lens and black leatherette. It has the shutter speed settings on the same location as old cameras, around the shutter button on top. On the other side on top a small ink display is placed showing the remaining photos left.

2.6.3 Analysis Novelty (figure 2.21, page 41)

1: Canon Eos 1200D, This camera offers the best technology available at an affordable price for amateur photographers. It is not the most advanced camera but it does offer good performance and technology for the price. This and the fact that it is one of the best-selling DSLR cameras available makes it the neutral point on the novelty scale.

2: Sony CyberShot W830, This camera is meant to be as simple as possible to use for people who do not have knowledge about photography. The technology and especially the software in combination with the design and size of the camera makes it a novel camera but it is not as advanced as the neutral point.

3: Canon G7X mk.II, This camera is a more advanced digital compact camera compared to the Sony CyberShot (nr.2). This camera features comparable settings as the DSLR (nr.1) but in a compact format. The quality of photos is not comparable but the fact that they can incorporate these kinds of settings and manual control in a digital compact camera makes it a more novel camera than the Canon DSLR (nr.1).

4: Canon Canonet 28, Because this is a vintage camera the novelty of this camera is low compared to the modern cameras. But this camera does however has a full automatic mode which regulates the sutter speed and the aperture automatically making the camera more novel compared to other vintage cameras.

5: Canon Eos 300D, This is in the basics the same camera as the Canon Eos 1200D (nr.1). It is however an older version and thus less novel.

6: Leica M3, This is also a vintage camera and thus not very novel. Compared to the Canonet 28 it is less novel due to the fact that it lacks automatic settings.

7: Polaroid 1000, The technologies used in this camera are as basic as it gets and thus this camera is not novel. The design of the camera also is not that novel or new anymore because it is well known.

8: Canon AE-1, This is a vintage SLR camera and its novelty fits between the Leica M3 (nr.6) and the Canonet 28 (nr.4). The Canon AE-1 has semi-automatic settings

and is thus more novel than the Leica (nr.6) but less novel than the Canonet (nr.4). The design of this camera is also less novel.

9: Kodak Box Camera, The design and technology of this camera is as basic as it gets so it is the least novel camera in this list.

10: Polaroid SX-70, The novelty of this camera is relatively high for its age. Because the camera is a combination of instant cameras and an SLR camera, in fact the only one of its kind, the novelty is high. Alongside with the ability to fold the camera up when not in use and the use of brown or black leathers gives it a unusual and novel look.

11: Kodak Reflex, The Kodak Reflex had two lenses placed above each other giving it an unusual look. The technology also Is quite unusual being some sort of hybrid between and early SLR and a Rangefinder. The combination of the looks and technology gives the camera some novelty but not as much as the neutral point.

12: Impossible Project I-1, The design and look of this camera is very novel. It is very unusually shaped and the only thing that tells it is a camera is the round lens on front. The interaction with this camera can be combined with an smartphone app giving the user a whole new dimension in using the camera. This and the fact that is still a camera that shoots original Polaroid photos makes it a unique and novel camera.

13: Iphone 1, A camera incorporated in a smartphone is quite normal these days but the progress in quality of pictures and the possibilities phone cameras have makes the camera phone concept really novel compared to the neutral point.

14: Apple Quicktake, The technology of this camera compared to the neutral point is not that novel but the appearance of it still is very novel. The design looks nothing like any other camera and that was one of the reasons this camera failed to become a success. This design was to novel for people to be triggered to buy/use it.

15: DJI Phantom, Drones are relatively new to the market and the development is going very rapid. The idea to make a small version of a camera helicopter for the consumer market is very novel and renewing, people are still figuring out how to use the drones and for what purposes they might be interesting so the novelty for the technology as well as the appearance and design are high.

16: Holga D, The technology and the idea behind this conceptual camera is new and interesting. Trying to make a digital camera with a vintage feel and experience makes it novel concept. The design of the camera is strongly influenced by other cameras giving it typicality but at the same time it is a modern interpretation of the vintage designs giving it some novelty.

2.6.4 Novelty-typicality graph (figure 2.22, page 42)

Both the novelty and the typicality graphs have been merged in the graph on page 42, giving a complete overview about how novel and typical each camera is. The goal is to have a camera on the right side of the dashed line.

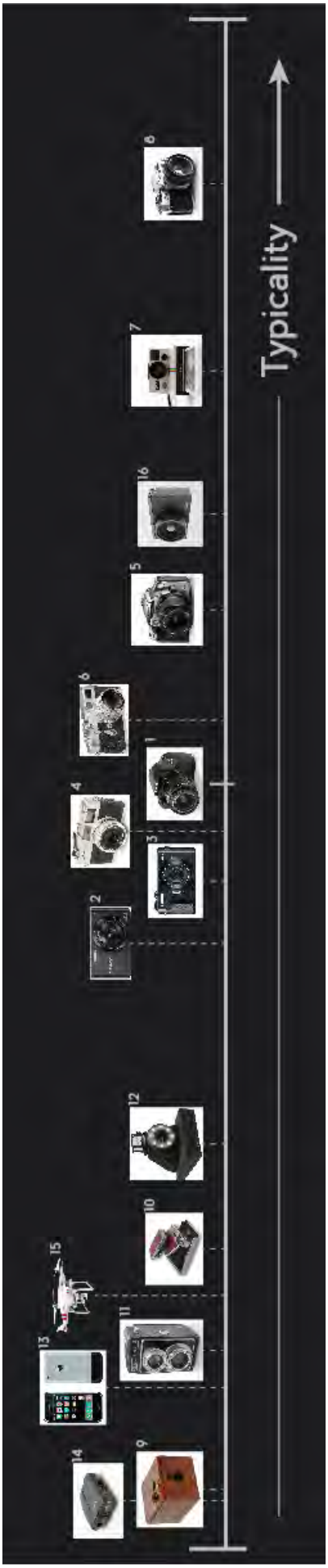

Figure 2.20: Typicality scale

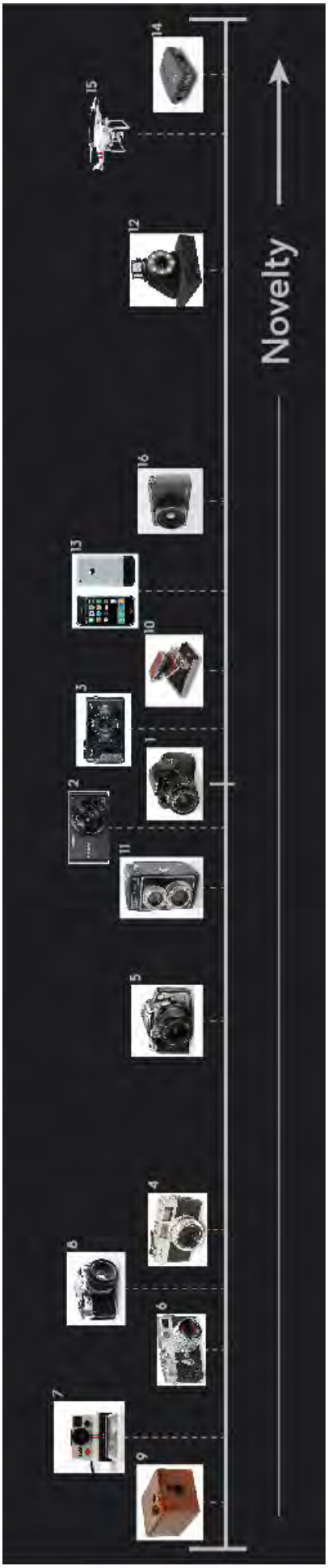

Figure 2.21: Novelty scale

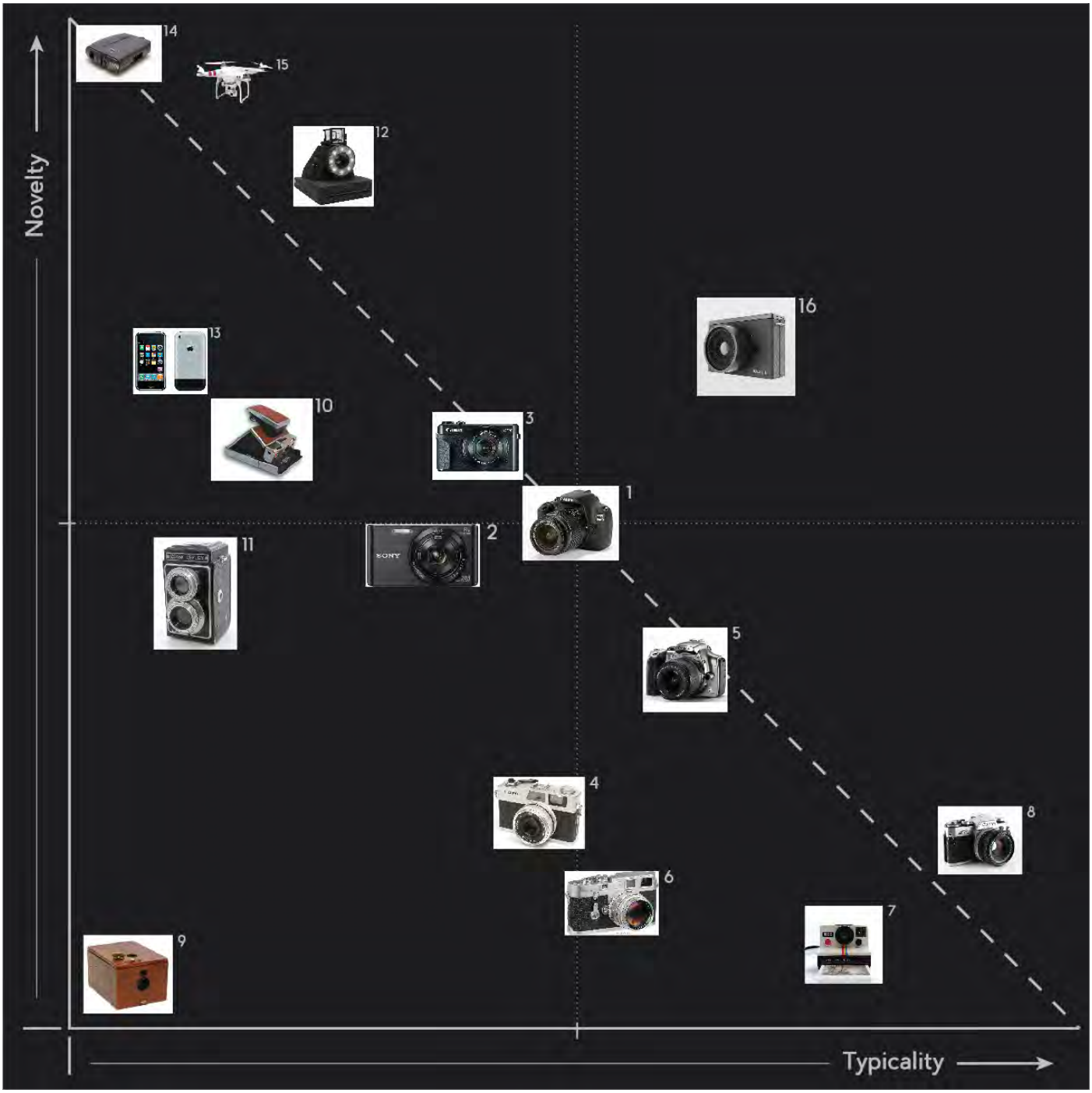

Figure 2.22: Novelty-typicality combined graph

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Chapter 3: Analysis conclusions

3.1 Change of interaction through the years

The way people use and interact with cameras has changed since the introduction of consumer cameras. Photography gained popularity in the late 19th century. At this point in history the first affordable camera for the middle class was introduced which enabled more people from lower classes to buy a camera. From then people started to explore the possibilities of the camera which first was only used for scientific purposes such as evidence material documenting people or places.

Because the camera was still new and unique and not that easy to use without sufficient knowledge for the regular people the cameras were mainly used for big and important moments and portraits. The fact that you needed a lot of bulky equipment to make good photos also did not motivate people to take lots of pictures. Only after the first world war the camera technology had greatly advanced. At this time the first quality and reasonably compact cameras like the Leica's were introduced on the professional market. The cameras became more common and easy to use. At this moment the cameras were mostly used by journalists who tried to capture a story with their cameras. These technologically advanced cameras were at first too expensive for the middle class but this changed rapidly which made it possible for people to make more photographs. People started to document family moments and possibly even holidays. This is a trend that is still going. The more easy and affordable cameras were to use the more pictures people started to take. When the digital camera era arrived the problem of only having limited space on film rolls was no more a problem and people started to take pictures of more and more things they, even small trips out or even having a drink in town. The introduction of the camera phone took this to the new level. People nowadays almost always have some sort of camera with them enabling them to take a photo on every given moment. With the introduction of social media's people start to use photos as a way to communicate to others showing what they are doing at the moment with a photo.

Observations

- Social media is becoming more important
  - Better if sharing is quick and easy
  - Context of photo is important
- Camera being surpassed by mobile phone, usable at any time and place.
- Techniques getting better. Better photos in low-light and with smaller cameras.
- Other media like video are becoming more important.

3.2 Novelty-typicality aspects

To find a conclusion following our analysis, we will look at the novelty-typicality analysis and interaction analysis and find the aspects that cause a model to score points on either novelty or typicality. We came up with a table that states the aspects in an orderly fashion (figure 3.1)

3.3 Interaction analysis

It might be interesting to look at discussing above-the-head aspects of the different cameras to see what impact they may have on society. An interesting thing in the world of photography is the focus of the photos. This focus, or the purpose, of the photos has been shifting since digital photography made its entrance. Artists and photography enthusiasts mostly focus on the quality of the pictures and things like composition. Most people who take pictures nowadays however, take pictures with their phones. These people are also considered amateur photographers and for them, the focus might not be on the picture itself, but on its content. With smartphones, sending a picture might be a logical thing to do in order to explain something instead of typing it all out. It can be easier to show someone where you are than to tell them. The purpose of these photographs is not beauty or craftsmanship or reaching any artistic goal, it simply is communication. With analogue photos, every picture costs money, but with the ability to delete pictures from your memory-card without using a separate device people can take almost an unlimited amount of pictures. Every picture has less value this way and therefore people treat them with less care.

Another consequence of this is that people end up with a lot of pictures, because they are not forced to make a choice and be selective in the process. Memory-cards enable them to do the thinking afterwards instead of when taking the picture. Theoretically this could lead to people being more observant of their environment because they don't have to think about photo quality, they can just shoot away and think about it later. This can lead to a negative experience because it often is a lot of work to select the right pictures. This process is ironic because while enabling people to see the pictures they took directly on the device, the overload of pictures also causes it to take a long time before they are actually sharable. In this regard actually nothing has changed. People still have to sort of wait for their holiday pictures to be ready in some way.

The fact that smartphones are so popular today and that they are also very often used for their ability to photograph brings another huge change in photography. Namely that people almost always have their phone with them in their bag or pocket, therefore they almost always carry a camera. And even when they do not have their phone with them, in (extreme) sports, they still can have an actioncam. People carry cameras everywhere. It is also easier to do than before without having to take rolls of film with you. Whenever something big happens, people start to document it with their phones and then share it with their online followers. This last aspect is also a big thing nowadays. People want to share. Smartphones make this easy by allowing different apps, from photo editing apps to communities on social media. The ability to share something is very important to people today, especially to people who never practised photography with another camera than their phone, they now have the ability to gain followers with pictures on Instagram and be creative with just a smartphone. More importantly, because of these kind of devices, people are used to getting things quickly and easily.

Most analysed cameras feature a screen or a viewfinder through which the user previews the image. While taking the photo, the user only sees the world through the device. The focus should lie on the picture and its subject, and not on the screen or viewfinder of the device. Some cameras do this, like the traditional DSLR. They try to make it easy and transparent for the user, causing the camera itself to move to the background in the interaction and the focus of the user to still be on the subject of the picture. It might be interesting to keep this in mind as an important aspect of a new designed camera. Drones and actioncams often use an app for this. The user can use a smartphone to connect with the camera and control it. This also allows pictures to be transferred directly to someone's phone without intervention of a computer or a cable.

These small cameras, actioncams and smartphones but also drones, give people the ability to film or photograph others more or less invisibly. It may be difficult to see if someone is taking a picture or just browsing their music or messages while holding the phone in a weird way. This brings privacy issues to the table. Do people have the right to know that they are being photographed? With so many people carrying

	Novelty aspects	**Typicality aspects**
Materials	- Usage of plastics	- (Black) Leatherette - Silver coloured metal
Positioning	- Movable screen - Shutter button on front - Front and back facing lens -Flash wrapped around lens	- Centrally placed lens - Settings on top - Shutter button on top - Lens on front -Viewfinder on top
Shape	- Flat - No clearly visible lens - No real shutter button in combination with box shape - Dual lens - Form derived from internal mechanics - shaped like other type of product	- Rectangular body - The "Polaroid" shape (Instagram logo) - Round lens - Fitting to hands (sizewise)
Interaction	- Screen replacing viewfinder - Flip up screen - Software to change settings - Holding camera not in front of face - Flash seconds as indicator - Remote control via app - Touchscreen - Wearable - Zooming with buttons	- Shutter button controlled with index finger - Changing settings with thumb - Rotating lens to zoom
Other	- Automatic settings - Film packs(Polaroid) - Folding camera - Hybrid camera - Device not primarily a camera - Fashion accessory -Ability to shoot photos or video from locations that are normally unreachable for humans without help	- Camera strap - Chararcteristic sounds, mechanic clicking - Picture taking process is recognizable (eye to viewfinder, finger to shutter button, composing picture)

Figure 3.1: Novelty-typicality analysis table

cameras, the chance of being in someone's picture, either intentionally or not, is quite big. It may be better to try to avoid these kind of issues altogether. To achieve this, the design should communicate openness and limit the user in their ability to secretly take pictures. Although not at the expense of any other design requirement. It would be a good idea to think about societal aspects of designs such as this.

With the return of some people to analogue photography and lots of people still using Polaroids instant cameras, it can be concluded that people have an urge to find something tangible in a digital age. Especially with the large amount of pictures that are being taken, being unique is very rare. A tangible experience is a way to be unique in a world of touchscreens and digital applications. In the design of a camera, this is an interesting aspect to look at. People should feel that what they do does not only exist in a world of ones and zeroes, but is also present in the real world.

3.3.1 List of requirements from analysis

As a conclusion of our analysis, a list with points of interest was created. These can be seen as requirements for the concept of a new camera. (figure 3.2)

3.3.2 Concept idea

Can we get a clear concept idea out of these large and extensive analyses? It should be a product that is novel and thus exciting but that is typical and recognizable as well so people know what to expect. It should be fitting to current demand within the world of photography which has been rapidly changing over the last years as we have seen. Although the context of photography has changed, photo cameras themselves have not changed that much, at least not photo cameras in the traditional sense. A lot of cameras that are being released are focussed on a specific use scenario, like drones are only focussing on aerial photography or video. Camera's with photography as their only purpose for the amateur market are being surpassed by smartphones. We came up with a table that categorizes aspects of design that cause certain parts of models to be seen as novel or typical. We also came up with a list of focus points for our own design.

Our concepts should thus incorporate several aspects that would make it novel and innovative, but also has some typical aspects for the user to feel comfortable using it. It should also take the guidelines or our analysis conclusion into account.

- The user should be able to take the camera with him or her anywhere he or she would also take a smartphone.
- The pictures that are being taken with the camera should be able to be shared online easily. Either directly or through another device.
- The camera should surpass the smartphone in image quality and possibly provide a better user experience overall.
- If possible, the camera should communicate openness to people around the user.
- While using the camera, the attention of the user should not lie with the camera, but with the subject of the picture that he or she will take.
- Taking a picture should be relatively fast and easy.
- If possible, the camera should encourage the user to think about their pictures while taking them instead of having a long selection process afterwards.
- The camera design should provide a more tangible interaction than the smartphone

Figure 3.2: List of requirements from analysis

Chapter 4: Conceptualization

4.1 Solutions

Now the analyses are mostly finished, the actual designing of the product can start. Some designers might be able to get a pretty good product from the set of requirements that was formed at the end of one of the previous paragraphs. But we want to develop a product that scores as good as possible on the novelty-typicality scale. Our approach to this is quite simple. We are going to discuss every design requirement that we came up with one-by-one and propose solutions to their problems. At the end we are going to discuss these solutions to see if we can figure out what combination will score the best on the novelty-typicality scale. Let us start with the first requirement.

The user should be able to take the camera with him or her anywhere he or she would also take a smartphone.

This could be achieved by just making the product small enough to be carried in someone's pocket. Most people already have a smartphone in their pocket if they have pockets at all, the camera should thus co-exist alongside the smartphone. It could be incorporated in the phone, the phone could be embodied by the camera as well. A foldable camera might also be an option.
Another thing that could be done is to make the camera an accessory for the user instead of a separate device, it could be worn on someone's clothes for example.
It could also be made more easy to carry it, in that case the camera could be bigger. Ergonomic handles and grips can help with this.

Another option could be to incorporate or embody the smartphone in the camera. This means that the camera uses the phone as the display and possibly the controlling of the camera itself. The downside of this is that there is a huge amount of different types and sizes of smartphones making it difficult to make a camera that fits to every smartphone and that can work together with every smartphone. Another variation of this idea is to embody the camera in the smartphone, making it an accessory to the smartphone. This can mean a click on lens for the smartphone with a camera app or maybe even only an app and just use the standard camera on the phone. The pros of this idea are that the camera can be extremely small, or with the app idea it will not even be a physical camera. The downside is that, especially with the app only idea, that the quality of the smartphone camera is not that good compared to real camera lenses. Another downside to both ideas is that the camera is depending on a smartphone to work. This means that the smartphone always needs to be charged when the user wants to use the camera, so he has to charge two devices to make a picture.

The pictures that are being taken with the camera should be able to be shared online easily. Either directly or through another device.

A possibility for this could be to equip the device with a wireless internet connection. A smartphone-like touchscreen interface would then be of guidance. The device could also be connected to the user's smartphone with an app through which the user can download and edit pictures taken with the device. GoPro does something like this, but that process is very slow, the user has to cycle through different applications in order to connect the phone to the camera's Wi-Fi, then connect to the camera's internal storage or to it's live preview that has a major delay and then he or she is finally able to download pictures from the camera. This is something that we definitely want to avoid. The process, if present, should be smooth, also to ensure a great user experience. Instant sharing could also meet this requirement. This means that if you take a picture and decide to save it, it gets shared immediately. It could be either uploaded to your own personal cloud or to a public website. The biggest downside to this is that the user has to confirm every picture he takes which makes it impossible to make more than one photo quickly, a solution to this could be some sort of "sports" mode which allows the user to make a series of photos and then lets the user choose which ones to keep and which ones to delete. One of the benefits of this idea is that the photos the user takes are either immediately shared online on a public space or on a personal cloud which is easily accessible. A second thing is that the user might think about the photos he is going to take before clicking the shutter because he has to decide immediately to share it or not.

To make sharing easy the camera almost certainly has to have some sort of communication system with either internet or an other device. The camera could be equipped with Wi-Fi technology to communicate. Wi-Fi could let the camera communicate with a smartphone but this would mean the smartphone has to connect to the camera and Wi-Fi only allows one Wi-Fi connection meaning that the smartphone and the camera have to disconnect to the internet connection they use for example at home before they can connect to each

other. A solution is to equip the camera with integrated software that can share the photos without the help of a smartphone.

Integrating NFC in the camera could also be a solution to make sharing photos to smartphones easy. When the camera has NFC technology the user could select the photos he wants to copy to his phone and then just tap the phone to the camera and the files will be copied. The only possible downside is that not every phone, especially cheap ones, are equipped with NFC. NFC however is becoming more and more common to have in smartphone because of the modern contact free paying methods becoming more popular these days.

The camera should surpass the smartphone in image quality and possibly provide a better user experience overall.

This goes together with some of the next requirements. The better user experience could be achieved by fulfilling the requirements below, especially the ones about the user's attention being directed at taking pictures in the moment. This requirement can be easily met when the lens of the camera is a bit bigger than the smartphone one. This allows for more lens technology and giving the lens for example the possibility to make photos with shallow depth of field, something smartphones these days can not do.

If possible, the camera should communicate openness to people around the user.

People around the user should be able to notice when he or she is taking a picture. One way to do this is to only allow pictures to be taken when someone is looking through the viewfinder. Either way, the device should have some kind of indicator. A light would be the most straightforward way to do it, since LED lights are used for this kind of thing a lot. Of course the environment of the user will only notice that the user is taking a picture when looking at the light. This type of indicator has very clearly a direction. A sound would be more universal and noticeable for everyone within a certain radius from the user. The indicator could be a feature of the camera, but it could also originate from the user, a gesture of some sort. The question here is how noticeable we would like to have this indicator. It could also just be annoying to people when something is making a loud noise every once in a while. It is important to see the indicator's purpose here. Why would it be there? The thing we want to achieve with it is that people trust the camera more, they should know that they are not secretly being recorded as a drone might do. The thing is that people are used to being watched in public space, so it might not be necessary to let everyone around someone know that that person is taking a picture at the expense of people not being able to comfortably walking in public space without being irritated by noise. In public space the indicator should be present, but not too obvious. But in the private space of someone's home for example, the indicator should be clear and not overlooked.

SLR camera's have always made sounds when taking a picture. The sound of the mirror inside moving up and down is very distinct. A lot of digital camera's took over this sound as an indicator that tells the user when a picture has been taken. This sound is clearly noticeable indoors, but environmental noise outdoors causes it to be barely noticeable sometimes.

(LED) lights could also be used as an indicator. Lights are already used as a way to communicate to people that the camera is counting down when using a timer to take pictures but this principle could also be used to communicate what it is doing to its surroundings. The camera could equipped with multiple lights that start to turn on when the camera starts focussing. When the picture will be taken all the lights will be on. Using lights to communicate can be very effective but it will only be effective to the people who look directly at the camera. These are, most of the time, also the people who want to be in the picture and already know that a picture will be taken. To communicate to the other people in the surroundings of the camera this system might not be suitable.

A more physical solution is to force the user to make some sort of gesture or movement to make a picture. This gesture or movement should be clearly visibly and obvious for the surroundings and the surrounding people should also be able to identify that the movement is intended to make a photo. The benefits of this solution is that the user has a more physical interaction with his camera while at the same time he is communicating his intentions to the other people around him. A downside might be that it is not comfortable to make big and unnecessary gestures and movements just to take a picture. Small gestures might not be noticeable for other people.

The camera also can be fully covered in screens on the front and back of the camera and possibly also on the sides. The displays give infinite possibilities on what to display on the screens such as countdowns, icons or words. It could even let the camera blink in a certain colour to grab attention. Using displays is still quite directional but when the display is wrapped around the whole camera it can be seen from multiple angles. The downside might be that displays can be very power consuming and bad for the battery life of the camera.

A more mechanical solution is to let certain parts of the camera move very obviously when taking a picture. This can be the lens that folds open when focussing or the viewfinder opening when the user starts looking through it.

While using the camera, the attention of the user should not lie with the camera, but with the subject of the picture that he or she will take.

This has a lot to do with ease of use. Either the learning process of the product should be very short or the interaction should score very high on the typicality scale. A lot of people use the automatic setting on their digital cameras to achieve this ease of use because they do not understand how to set their ISO, shutter speed and aperture or do not care to learn it. We could provide an interactive interface that helps them set these settings. It could incorporate sliders for each of these settings, not only with numbers that can be used by some more experienced users, but also images for example.

Besides ease of use, it might also be interesting to take a look at how the camera is being held. This might be a very traditional way, holding the camera up to your face and then pressing a button, but to move the attention of the user from the camera to the subject, it might be interesting to look at an interaction that can be done without looking at the camera.

An interaction that limits how much the user is looking at the camera could be when the viewfinder is placed on top of the camera rather than inside the camera. This give the user the possibility to look around to the world instead of having a sort of tunnel view focussed on what the camera is pointed at. With a freestanding viewfinder on top the user can see what fits in the frame of the camera but also what goes on outside this frame. And the things that happen outside the frame could possibly be even more pleasing to take a picture of. With traditional viewfinders the user might miss these moments because he simply cannot see them. The viewfinder on top gives the user the possibility to really frame what he wants to have on his picture without really looking at the camera.

Taking a picture should be relatively fast and easy.

This means that the design should meet the user's needs as best as it can. It should be as typical as possible within the design itself. This could be achieved by giving the user the ability to change the functions of buttons on the device as they please. A button could incorporate a small screen through which it can change its appearance to its function accordingly. This can be easily realized with the idea of putting screens all around the camera mentioned earlier.

To make the process of taking a picture as easy as possible it can be helpful to design the camera and its controls as familiar as possible. Looking at earlier camera designs and cameras that are widely used by people can be of guidance here.

If possible, the camera should encourage the user to think about their pictures while taking them instead of having a long selection process afterwards.

The tiring selection process that comes with digital photography could be a lot quicker and less of a drag when it is done directly in-camera. This would really highlight the unique advantages of digital photography. Only then will it be really quicker and really take advantage of its possibilities. The post-production process of developing that comes with analogue photography will not only be replaced by another process, but it will have completely disappeared. Instant sharing could be the solution to this. An idea mentioned earlier also is a solution to this requirement. Making the user decide if he wants to keep a picture or not directly after taking it can encourage him to think about his pictures before just shooting random pictures.

The camera design should provide a more tangible interaction than the smartphone.

The smartphone camera has a lot of great functions and possibilities but most smartphone cameras are controlled by touch screens. While touch screens are incredibly versatile in how they can be used they lack some tangibility compared to cameras with physical buttons. The chance to accidentally touch a setting or take a picture is significantly higher on a touch screen than on a camera with physical buttons. The design thus has to have a more tangible interaction but with the versatility of a smartphone camera interface. This again can be done with ideas mentioned earlier. The idea to have a display around the camera combined with (physical) buttons that are adaptable to what the user wants them to do can help to make a tangible interaction that feels natural to the user due to the possibility to adjust each button according to his preference.

4.2 Concept

4.2.1 Introduction

The goal is to create a camera that has a better overall user experience compared to existing cameras. The picture taking process and the sharing of this picture should be quick and easy. At the same time the attention of the user should be directed at what will be the subject of the photo instead of on the camera itself. The user has to be forced to think about the pictures he takes. All of this should be packed in a device that looks like an archetypical camera which is easy for the user to take with him.

4.2.2 How it works

The final concept has a new and innovative way of taking pictures which forces the user to think about the composition of his picture. The viewfinder of the camera is placed on top of the camera and it has the same proportions as the picture the camera takes. The idea behind this viewfinder is that what the user sees through the viewfinder is the same as what the picture the camera will take looks like. This enables a new way to interact with the camera. As shown below (figure 4.1) the viewfinder will cover a wide angle when the viewfinder is held close to the eye. When the user moves the camera further away from his eye the area covered within the viewfinder will crop. It almost zooms in to the point the viewfinder is aimed at. The camera will measure the distance between the eye of the user and the viewfinder to calculate what the user sees through the viewfinder and at the same time the camera will automatically zoom in to match the area covered in the viewfinder with the lens. So zooming the camera happens when the user moves the camera away or towards his head.

4.2.3 Taking a picture and sharing it

The process of taking a picture is, apart from how to compose the picture, very similar to how people are used to take a picture. A shutter button is placed on the same location as on most other cameras, on top of the camera on a location where it can be used with the index finger on the right hand of the user. The shutter button on this camera is shaped in such a way that it wraps around the body of the camera enabling the user to press the button from different angles that only from above. For example the user can press the shutter button from the side.

When a picture has been taken the user has to immediately decide to keep the image or not. If the user chooses to not keep the image it will be deleted permanently. If the user chooses to keep the image it will be uploaded either directly to a public social media or a private online cloudservice if there is an internet connection available for the camera. Once the picture is uploaded to the cloudservice the user can easily share the images through an app on his smartphone connected to the cloud. The camera does have the option to browse through the taken images on the camera and select one to share. With NFC the photo will be copied to a smartphone to add a description and to be shared.

4.2.4 Feedback and a tangible interaction (figure 4.2)

The camera is covered all around with a display. The display will be the modern replacement of the typical black leatherette that can be found on vintage and some modern cameras. This large area of display enables the possibility to display a lot of information and feedback all around the camera. On the back of the camera there are several buttons integrated in the display. These buttons are physical buttons and not touchscreen buttons. This gives a more tangible experience to using the camera. The display that surrounds the buttons enables customization

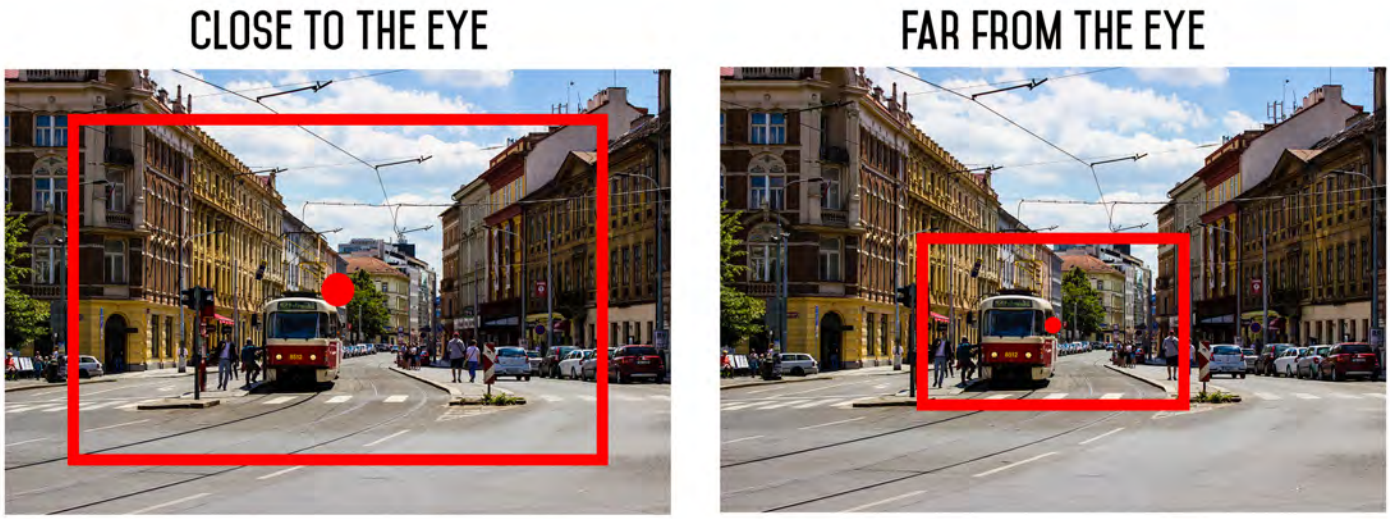

Figure 4.1: What you see is what you get with this method of composing a picture

and mapping of each button on the camera and at the same time the display can supply additional information about what the button does.

The display also has a feature on the front of the camera. On front of the camera the display shows the state the camera is in. If for example the camera is in the process of taking a picture a progress bar will be shown around the lens. This bar will start running when the user starts focusing, when the bar is full the picture will be taken. A second function of this display on front is to give a small preview of the picture when taking a selfie. This enables the user to take a quality selfie without having to guess if he has aimed the camera correctly.

On top of the camera, on the opposite side of the shutter button a selection wheel is placed. (figure 4.3) This is a physical wheel with a display incorporated on top of it. Turning the wheel enables the user to scroll through the different modes the camera has. The display in the selection wheel shows which mode is selected.

Figure 4.2: Renders of the front (top image) and the back (bottom image) of the concept. It shows the screen with possible feedback and the different buttons, as well as the viewfinder.

4.2.5 Design

The design and appearance of this camera is mainly based on the popular classic archetypical cameras everyone knows and identifies as a camera. This means that the body of the camera is made of silver metal with black leatherette. The concepts body is made of aluminum. The leatherette has been replaced with a display. This display is black when nothing is displayed on it giving it the same look as classic cameras. To make sure the user can hold the camera comfortably and secure a grip is placed on the front and back of the camera. This grip is a smaller version of the grip that can be found on modern DSLR cameras. It consist of a protruding shape on the front of the camera where the fingers of the user can wrap around. The grip is covered with leather that wraps around to the back side of the camera to give the user more grip also on the rear of the camera.

On top of the camera the shutter button, the viewfinder and the mode selection wheel can be found. Each of these are placed on logical positions. The shutter button is placed so that it can be used with the right index finger. The viewfinder is placed centrally above the lens. This is because the viewfinder has to be pointing in exactly the same position as the lens to make the concept work but it is also an aesthetic position. The viewfinder is integrated in a protruding shape that can be found on top of a lot of cameras, especially vintage SLR cameras and modern DSLR's. Combining the viewfinder in this shape gives the camera a classic look and at the same time it protects the viewfinder from damage. On the other side of the top the mode selection wheel is placed. This wheel that is used to scroll through the different modes on the camera is placed on a location where on vintage cameras the lever to roll up the film was placed. Placing the settings wheel here again gives the camera a classic and familiar look.

Figure 4.3: Render of the top of the camera with the selection dial.

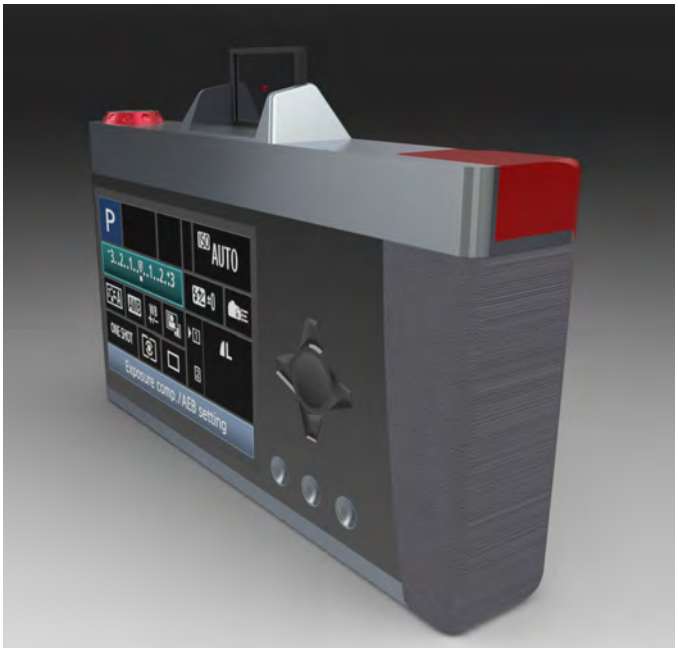

Figure 4.4: Solidworks render of the complete concept front (left image) and back (right image)

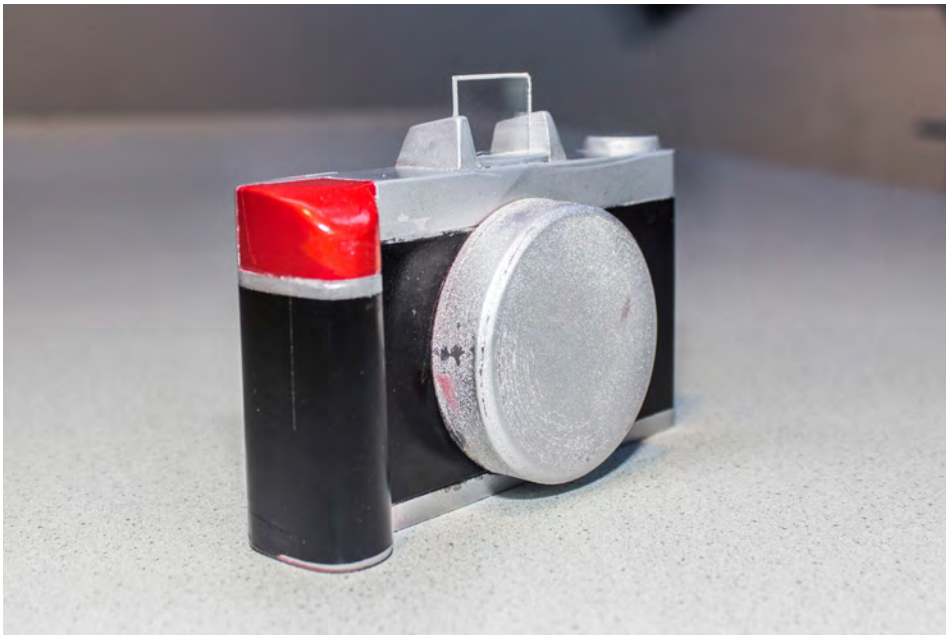

Figure 4.5: Actual sized model of our concept

Figure 4.6: The model of the concept as held when taking a selfie

Figure 4.7: How the model fits to the hands

4.3 Reasoning

The goal of the concept was to create the next step in amateur photographer cameras. To make this concept a success the goal is to make a design that is innovative but recognizable at the same time. We have chosen to make the appearance and design of the camera as recognizable as possible give the camera a typical feel and allow for a more novel interaction with the camera. The design is based on the results of the analysis, using the design features and styling parts that were considered typical in the analysis to create a typical design.

The way to use this camera, especially composing a picture, is quite different from how people are used to interact with a camera. The way the camera zooms is the biggest difference. The camera zooms according to how far away the user holds the camera from his head. The camera zooms according to what the user sees in the viewfinder from that specific distance between his head and the camera. Doing this makes the interaction with the camera a lot more physical and this will let the user think more consciously about how the picture will actually look. This way to zoom the camera together with the location the viewfinder is placed at also gives the user the possibility to take a picture and look at the world around him rather than having his attention focused on his camera. This is possible due to the fact that the viewfinder is placed on the outside of the camera without any obstructions around it. The user has free visibility around the viewfinder to see what is going on around him and if needed he can adjust his framing so that he is able to capture a sudden moment he would otherwise had missed. The fact that there is no need to have the camera close to your body to zoom the camera by turning the lens or pressing a button also gives the user more possibilities to look at the world instead of having his attention focused at zooming the camera. The user just has to move one arm to zoom the camera at the thing he wants to frame.

To take the picture the user can just easily press a button in the same way people are used to. The most typical feature of a camera is that the shutter button is placed on top of the camera, in reach of the right index finger. We chose to keep this button the way it has always been to make the interaction as natural and easy as possible. The button is however made slightly larger than on other cameras and it also wraps around the body of the camera better. This is because it enables the user to press the shutter button from different angles. For example the user could press the button from the side of the camera while he makes a selfie and holds the camera in front of himself with his left hand.

The user also has to decide if he wants to keep a taken image or delete it before the user can take another picture. This helps the user to make the selection process easier and quicker afterwards. Instead of clicking a lot of photos and having to select and sort them afterwards this process will be done on the camera. After the photo has been taken it will be instantly shared to a public social media or a personal cloud. This makes the sharing quick and easy and combined with the choice that the user has to decide which photos to keep or not gives the photos a lot more value because it is a picture that is unique and one where the user had to really think about before taking at.

When the picture is shared with the personal cloud it can still be easily shared to public social media by having an app on a smartphone connected to the cloud in which the user can select which photos to share. If the camera has no internet connection to upload the photos to the cloud the user can select the photo the user wants to share on the camera and with NFC it will be copied to the smartphone to share it online.

A large area of the camera is covered in displays. This enables the displaying of a lot of feedback on what is happening and what the camera is doing but it also gives a lot of possibilities on showing the user what every button does. Apart from that it is also possible to change what every button does, the display just simply displays a new icon or word next to the button if the user changed what it does. This gives the user the possibility to change the way the camera is controlled to their own taste making the control and interaction with the camera easier.

The display on front gives the possibility to show people in the area around the camera what the camera is doing. An animation of, for example, a progress bar can be played to show the camera is focusing and when the focusing is done the progress bar will be full and the picture will be taken. This communicates to the people around what the intentions of the user are. A bonus feature is that the camera can display live what it sees when the user wants to take a selfie, making the interaction with the camera easier.

Apart from this the displays also have an aesthetic purpose. Most of the time the displays are dark and black, resembling the typical black leatherette found on a lot of vintage and archetypical cameras.

The mode changing wheel on top of the camera is covered with a texture of dimples showing the user that the button is able to move. On top of the button a display is placed on where the different modes are projected. When the user turns the wheel the camera will scroll through the different modes and the user will see clearly which modes are selected. This again makes the interaction quicker and easier.

4.4 Novelty typicality

4.4.1 Novelty

The final concept has been designed with a clearly different set of requirements and goals than any other camera on the market today. The way the user has to interact with this camera, especially when zooming and framing a picture, is quite new and novel. It is unlike any other camera. The camera forces the user to think about his pictures more which results taking having pictures that have more value to the user than the pictures he would have taken with a normal digital camera. The way this concept is used brings a sense of analogue photography with the benefits of digital photography. This means that the camera tries to force the user into making good photos on first try, just like with an analogue camera with a film roll. The advantage of this is that the user does not have to make tons of photos which have to selected afterwards and thus the one picture that has been taken will be a lot more valuable. The concept does however have a lot of similarities on how to control the basic features of the camera. The mapping and locations of the buttons are, intentionally, kept in the positions people are used to. Because of the displays placed all around the camera the buttons could however be customized to create a personalized interaction with the camera for the users resulting in an improved interaction. This feature has also not been implemented in popular cameras and thus is a novel feature. So the idea and interaction is quite novel but not as much as drones or for example 360 degree cameras. The concept is in essence still very much a camera such as people are used to.

4.4.2 Typicality

The goal was to create a concept that was as recognizable as possible. The novelty aspects of this concept are mostly incorporated in the interaction and the way people user the camera. The design and appearance of the camera has been designed looking at the history of all cameras and taking all the design features that have been used often and can be considered as features of an archetypical camera design and picking those aspects that are suitable for the interaction features that are part of the concept. This consists of both colours and material choices but also physical design features and shapes that are based on archetypical cameras. This resulted in a design that is instantly recognized as a camera which places the concept quite high on the typicality scale.

Combining the two scales again give the final novelty-typicality scale. The concept is positioned on the right side of the centreline, which is the side you want to be on because this means you have a concept that has both novelty and typicality.

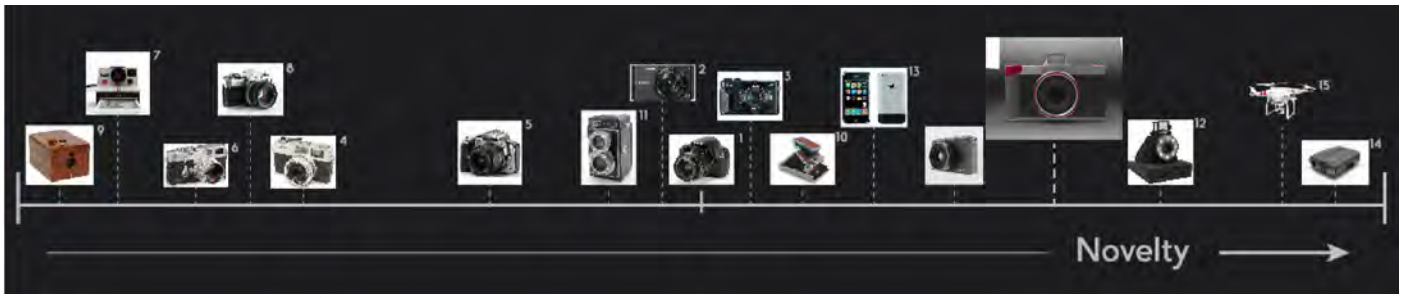

Figure 4.8: New novelty scale with our concept

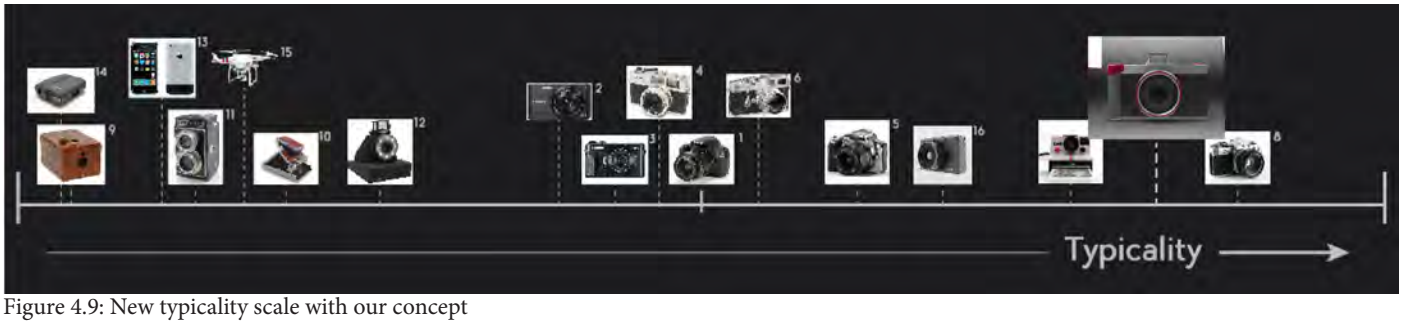

Figure 4.9: New typicality scale with our concept

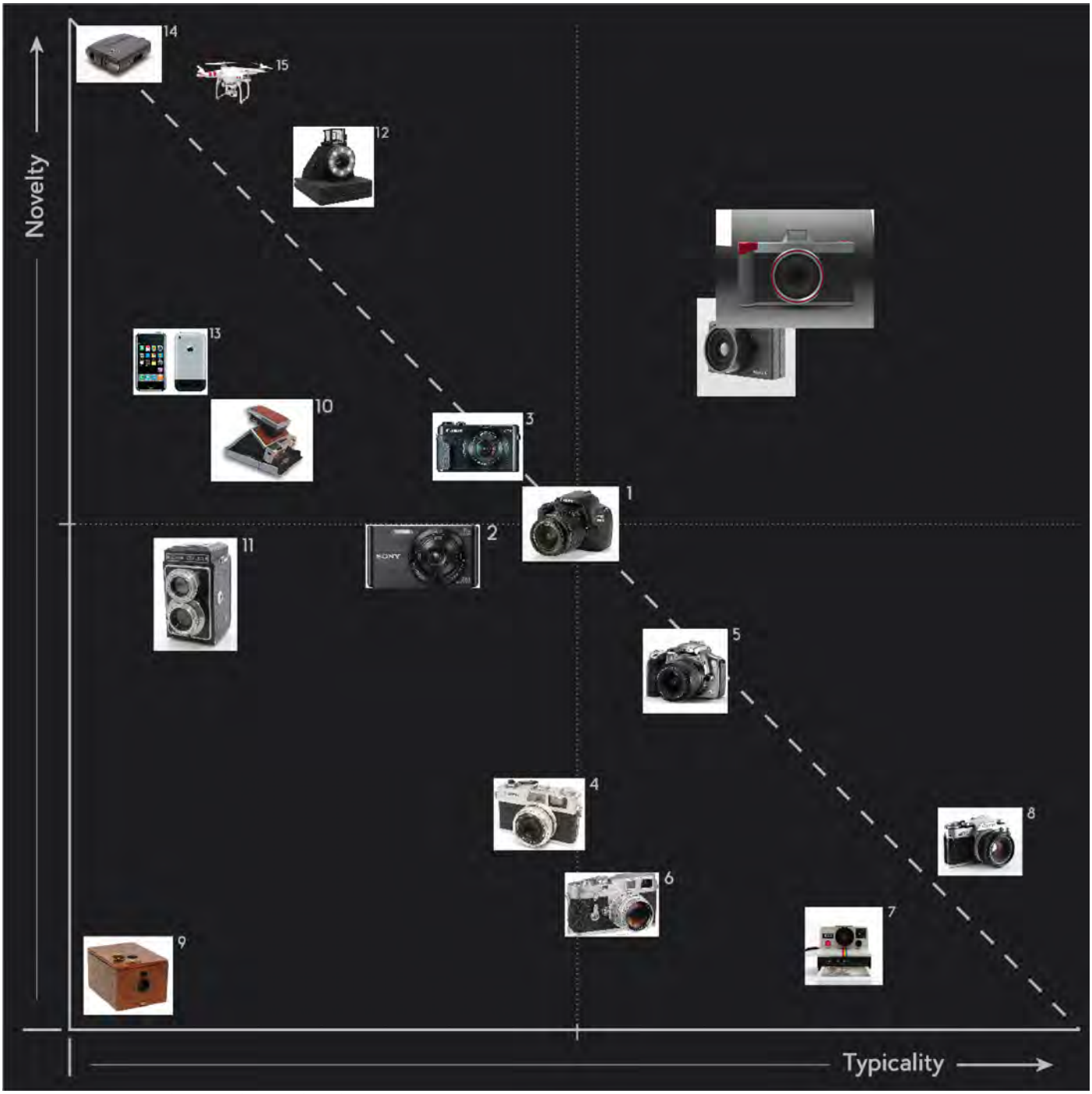

Figure 4.10: New novelty-typicality graph with our concept

4.5 Product Impact Tool of new concept

Before-the-eye
The concept uses physical buttons incorporated in the screen on the back for basic navigation through the camera. Because of the screen these buttons can provide both text and icons that tell the user what they do. This text and icons could even be animated or expanded when the user is using the button to give extra feedback on what it does or means. The shutter button on top of the camera is coloured red. This might tell the user that this button is important to use. The mode selection wheel that is also placed on top of the camera has a texture of dimples that shows that the wheel is able to turn. The display on top of this wheel can show text and icons showing the user that the selection wheel is to scroll through the different modes of the camera.

To-the-hand
The physical shape of this camera is designed to resemble an archetypical camera. The camera is shaped rectangular and has a bulge on top where the viewfinder is housed. On front of the camera there is a protruding grip placed for a comfortable and secure grip on the camera this grip wraps around the side of the camera to the back to cross over in to the display. The grip is covered in black leatherette to tell the user this is a comfortable and secure place to hold the camera. The fingers will wrap around the grip on front and the thumb of the user can be placed on the leather on the back of the camera. The way the grip is shaped and placed guides the user into holding the camera correctly.
The buttons on the camera, especially the ones on the back of the camera, are placed on the positions people expect them to be. Although the functions the buttons fulfill could be completely customized the buttons are placed in a logical standard configuration. The camera standard has a select button with four buttons around it for the basic navigation through the menu. The shutter button is placed on top of the camera to be controlled with the right index finger and on the other side the mode selection wheel is placed to be controlled with the left hand.

Behind-the-back
The fact that the interface and interaction of the camera is customizable makes the camera suitable for users which have different amounts of skill and knowledge about photography. Basic users can choose to map the buttons with basic features and advanced users can choose to have the advanced functions mapped on the buttons. This can be useful tom make the camera suitable for different users but some users also might find it difficult to decide what functions are useful to have in short reach.

Above-the-head
The idea is that this camera enables the user to take pictures that are of high quality with a camera that is a lot smaller compared to a DSLR camera. At the same time this camera forces the user to decide which pictures to keep directly after the picture has been taken and this can help the user to think about what pictures he wants to take and how they should look instead of just clicking along and having to sort all the pictures afterwards. When the user really thinks about how the picture should look and if he really just makes one picture of this the picture has a lot more value to the user. Just like the old analogue cameras where the user was forced to make a good picture first try, and if they come out good, the pictures will be of value to the user. This can bring back the excitement and pride to pictures taken with a digital camera.

Design question
By explaining our concept and having done the novelty-typicality and the product impact tool analysis the design question of “how does the design of a photocamera, that fits well into the current market for amateur photographers, look when it is designed to be new and innovative, but also to appeal to users in terms of design and use?” has been answered and now we can continue to answer the resaerch question.

Chapter 5: Conclusion

5.1 Answering the research question

Our research question is: How can existing photocamera-designs be of guidance when designing a new product that is modern and innovative but that also provides ease of use and appeal through recognisability?

In answering our design question we came up with a concept. This concept serves as an example through which we hope to answer our main research question. First we created a rough outline of the overall history of the type of product that we wanted to design. Through doing this we acquired a clear overview of the development of the product in the context of history, making it easy to choose certain types or models to perform our analysis on. The history as seen in this report of course contains only a portion of the stories that we read during our early research. We noticed that it is crucial to get a clear idea of how the type of product has been developed over the years and what changes were made to it and when. All these changes have of course been made for a reason and it is good to know in what order people tried things. We noticed periods when change was very present in the market and periods such as the early 2000's when the big brands were all pretty much producing the same products. It was also a good thing to look at how the interaction and the purpose of the products changed over time. These aspects provided a foundation for the guidelines of our own concept.

On what models of a product type the analysis should be performed depends on the nature of the product itself. For cameras there is a clear division of cameras that are generally considered 'normal' and certain models that technically are cameras, but they are seen as or wanted for something else, for their feeling of nostalgia or their ability to fly for example. With cameras, it is also easy to take the very core of the product (taking pictures) and identify every aspect that is provided, but does not make it a camera by itself. A camera is a camera because it takes pictures, no matter how it looks or what its interaction is like. This makes this group of products very suitable for a project like this. A table would be more difficult for example, if you can put thing A on thing B, or you can sit at thing B, can you be certain that thing B can only be a table? For cameras this is more clearly defined because of the very specific use of a complex product like a photocamera.

The analysis itself is quite extensive. Overall it proved to be useful, but not everything that was found was useful in the concept or was already discovered in an analysis of a previous model of camera. The analysis was thus inefficient but necessary. Possibly it could be done in another way, by first doing an exploring analysis to figure out what models really need to be analysed for the project to succeed. It might then be interesting to look at innovative aspects of designs. We already grouped the cameras to improve the efficiency of the method. The first group being 'standard cameras', this group contains the cameras that are widely used today solely as cameras and have no other function than taking pictures. This group taught us things about what makes a camera an archetypical camera. This could later be used to raise our typicality score.

The second group is 'mainstream unusual cameras', which contains cameras that are popular and still relatively used a lot, but are not standard cameras, they might have a whole different main function or they might be wanted for their retro-ness. These tell us something about how people use cameras since most of them are wanted for really specific things. People mostly use actioncams for example in situations where the camera should not break from falling or getting wet, not many people would use an actioncam as their main camera for their holiday pictures, which significantly changes the interaction. Almost all the cameras in the second category have special aspects why people like them, which makes it interesting to our project. We want to know how people use cameras and why and this category can therefore not be missed.

The third group is 'unusual cameras', this group contains cameras that do not fit into one of the other two categories. This category could be made as extensive as the designer wants to make it. The purpose of this group if mainly inspirational. These models most of the time are still in their concept phase. However, these models help the designer to think about why they are still in that early phase. Sometimes this is due to technical problems, but often there are problems in society, people might for example not yet have figured out what to do with a certain model camera such as the 360 degrees camera. However, looking at this category of products could help the designer see possibilities and bring him or her inspiration.

The novelty-typicality analysis is very useful to identify what aspects to use to reach the goal. During this type of analysis the designer really has to think about what makes a model typical and what aspects increase its novelty. This is very useful since reaching a high novelty-typicality rate is part of the goal in this project. Putting it

in the graph is very useful for the evaluation of the model, to see how it finally compares to the other cameras on the market and whether the goal is accomplished or not.

So how does this method help the design process? It definitely works, but it is also, as all design processes are, hugely dependent on the creativity and skill of the designer. It might suit product groups like the photocamera very well that have been improving and developing since they were invented, but later stagnated in their innovation. In combination with an analysis of the socio-cultural context of technology interaction, with all its influences like social media and the reducing size and improving quality of smartphone cameras. The method can provide handles and works pretty well when putting together a set of requirements for a product. The phase where ideas have to be generated is not very well represented in this method, but the phases before and after that phase fit well in this method.

Finally, the concept might be novel and typical, and it might fit well to the current market, but these are of course not the only requirements to a successful product. Successfully finishing this method does not guarantee a product that does well with the consumers and the market. It also might not be doable financially or even technically. This method is a method through which the designer might come up with a concept that may work. However, its process takes a very long time and requires a lot of work that he or she might nog even use in the end. Our recommendation for further research would be to develop the method in such a way that it could be done quickly and easily, just as taking pictures is in this modern time of smartphones and social media.

5.2 Discussion

What could we have done to improve our research? First of all, the third category could have contained more concepts and experiments and other different types of cameras. This is a category that is never really complete, there are countless possible concepts out there. The second camera category could miss some models as well, there is no guarantee that the models that are in there are a sufficient representation of the whole set of models that could fit in that category.

However, the goal of the method is to come up with a new design that scores well in the novelty-typicality graph. It is possible to succeed in doing that without a complete set of camera models in the different categories. To get the optimal or best result, it would be necessary to have a complete set. But it is definitely arguable that in a case of working with humans and their interaction with products, especially for the very large market of amateur photographers, the diversity of users might lead to an optimal design to not exist at all.

The way the different models are placed in the novelty-typicality graph is very subjective. It depends on the feeling of the designer whether some aspects put more weight in the scale than others and how much they do so. Although in this project there were with two designers who discussed and finally agreed on the current set-up of the graph. Therefore it might be a little bit less subjective and more an average of opinions. In larger teams of designers this would be even more the case.