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BUSINESS POTENTIAL FOR AUGMENTED REALITY APPLICATIONS

Attitudes and concerns inside the focus groups consisting of JAMK students

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Bachelor's Thesis
October 2013

Degree Programme in International Business
School of Business and Services Management

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DESCRIPTION

Author(s)	Type of publication	Date
Oinonen, Ville Happonen, Ville	Bachelor´s Thesis	25102013
	Pages 103	Language English
		Permission for web publication (X)

Title

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Tutor

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Assigned by

Abstract

This paper studies the expectations, beliefs and concerns that students of JAMK University of Applied Sciences have towards augmented reality. The goal is to map out potential future augmented reality applications and to understand what kind of concerns do the university students have about the technology and its applications.

The theoretical framework consists of thorough information about augmented reality; its history, the current situation and the future of the technology. In addition, specific traits of high tech markets were studied in order to understand in what kind of an environment do these types of applications exist. Also focus group method is thoroughly explained for the reader.

The research is based on qualitative focus group research. Four focus group interviews were conducted in April 2013 with 22 people. Participants were Finnish and international students from JAMK.

Participants found augmented reality applications that offer additional information, guide the user or help them make for example purchasing decisions valuable. Use of augmented reality in educational and business areas was seen as a potential direction. Applications that were designed for fun purposes did not interest the participants, the lifespan of such applications was a major concern.

Future research could be conducted with people of different age groups in order to understand better how they perceive augmented reality and how they see the future of it.

Keywords

Augmented reality, high tech market, productization, focus group interview, augmented reality application, Gartner hype cycle, FUD

Miscellaneous

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KUVAILULEHTI

Tekijät Oinonen, Ville Happonen, Ville	Julkaisun laji Opinnäytetyö	Päivämäärä 25.10.2013
	Sivumäärä 103	Julkaisun kieli Englanti
		Verkkojulkaisulupa myönnetty (X)

Työn nimi
BUSINESS POTENTIAL FOR AUGMENTED REALITY APPLICATIONS
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Koulutusohjelma
Degree Programme in International Business

Työn ohjaaja(t)
Saukkonen, Juha

Toimeksiantaja(t)

Tiivistelmä

Opinnäytetyössä tutkitaan Jyväskylän Ammattikorkeakoulun opiskelijoiden odotuksia, uskomuksia ja huolia Lisättyyn Todellisuuteen (Augmented Reality) liittyen. Tutkimuksen tavoitteena on selvittää minkälaisia Lisätyn Todellisuuden sovelluksia nähdään potentiaalisina tulevaisuudessa. Lisäksi tavoitteena on ymmärtää minkälaisia huolia opiskelijoilla on kyseiseen teknologiaan ja sovelluksiin liittyen.

Teoreettinen viitekehys pohjautuu perusteelliseen Lisätyn Todellisuuden historian, nykyisen tilanteen ja tulevaisuuden läpikäymiseen. Lisäksi high tech-markkinoiden erityispiirteitä tarkastellaan tarkoin, jotta voidaan ymmärtää minkälaisessa ympäristössä tähän teknologiaan pohjautuvat tuotteet tulevat olemaan. Lukijalle kerrotaan myös tarkasti fokusryhmä-metodista ja sen käytöstä.

Tutkimus pohjautuu kvalitatiiviseen fokusryhmä-tutkimukseen. Huhtikuussa 2013 pidettiin neljä fokusryhmähaastattelua 22 ihmiselle. Osanottajina haastatteluissa oli suomalaisia ja kansainvälisiä opiskelijoita JAMK:sta.

Haastatteluissa kiinnostaviksi koettiin lisätyn todellisuuden-sovellukset, jotka tarjoavat lisäinformaatiota, opastavat käyttäjää tai auttavat käyttäjää muutoin, esimerkiksi tekemään ostopäätöksen. Opetuksellinen ja ammattillinen käyttö nähtiin kiinnostavana, uskottiin että tällä teknologialla olisi potentiaalia näillä alueilla. Sovellukset, jotka oltiin suunniteltu pelkästään viihdekäyttöön eivät herättäneet paljoa kiinnostusta osanottajissa. Tämänkaltaisten sovellusten käyttöiän epäiltiin olevan lyhyt.

Tulevaisuudessa tutkimuksia voitaisiin tehdä eri ikäryhmille, täten voitaisiin paremmin ymmärtää heidän näkemyksensä Lisätystä Todellisuudesta ja kuinka he näkevät sen tulevaisuuden olevan.

Avainsanat (asiasanat)
Augmented Reality, Rikastettu Todellisuus, Lisätty Todellisuus, Fokusryhmä, Tuotteistaminen, FUD

Muut tiedot

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1 Introduction

In today's business world there are a lot of new technologies coming to the market. Enterprises need to see what sort of possibilities these new technologies create, and how the possibilities could be used. Companies have different interests depending on their field of business. Some companies might be interested in getting more satisfied consumers or improving sales, or how the new technologies can improve efficiency at work. For some companies it is important to stay up to date with the development of certain technologies do that the competitors would not have a competitive advantage over them. Another motivation to stay up to date is to know what possibilities these new technologies create for the enterprises themselves and for the others. Since there are a lot of potential technologies, and even more technologies in development it might be hard for a company to know what would be the potential technologies that are worth ~~of~~ investing money and time. One of these new and potential technologies is augmented reality.

Augmented reality is a technology that enables the user to see additional virtual information on top of real-world environment with the help of devices that support this technology. This virtual information can, for example, help the user to perform better in certain tasks, e.g. the virtual objects overlaid on a smartphone screen can guide the user to nearby restaurant. Gartner, an American information technology research company has estimated that the mainstream adoption of augmented reality is to happen during the next 5-10 years [Gartner, 2013b). According to a respected mobile analyst Tomi Ahonen [CNET 2013], AR is expected to be adopted by a billion users by 2020, which means that there is a big business potential in augmented reality in the near future. Analyses like this alone do not reveal if a technology really has a future, but the recent investments by big enterprises like Google and Apple show that it is not just the analysts that see potential in it [CNET 2013]. It is important for companies to realize that augmented reality is coming and to know what sort of augmented reality applications consumers want.

VTT assigned the authors to research what sort of attitudes, beliefs and knowledge the students of Jyväskylä University of Applied Sciences have towards augmented reality and its applications. This project was part of the authors' High Tech Management course, the main task of which was to conduct and thoroughly analyze four focus group discussions. The participants in the focus groups discussions were international and Finnish students of JAMK. After the research was done for VTT, the authors became interested in further investigation of augmented reality to understand what sort of augmented reality applications could be potential from the business perspective in the future. The reason for concentrating on the research of augmented reality applications instead of devices is that augmented reality is nowadays mostly experienced through applications, which can be downloaded to your smartphone, tablet or laptop. It is also cheaper for a company to create an application compared to designing and manufacturing a device to experience augmented reality. The authors used the vast amount of data collected during the focus group sessions as a basis for this research.

2 Research problems and methods

2.1 Research Problem

VTT assigned the authors to research what sort of attitudes, beliefs and knowledge students of Jyväskylä University of Applied Sciences have towards augmented reality and its applications. Four focus group sessions were held and after analyzing the results and presenting them to VTT authors became interested in finding out what sort of augmented reality applications could be potential in future business ventures according to the focus groups. The authors had a big pool of primary data that the authors collected for the VTT research. Thus, the authors decided to use that in order to get the research problems answered.

The purpose of the thesis is to find out what sort of Augmented Reality applications are expected to be potential in the future. The thesis will go through this problem by answering the following questions:

1. What types of augmented reality applications are potential in the focus groups in the future?
2. What are the concerns regarding Augmented Reality applications in the focus groups?

The authors decided to also include the concerns regarding augmented reality applications because the scope would be too narrow if the focus was only on the potentially successful applications with hardly any criticism towards them. Concerns highlight the issues and features that need to be changed or removed or necessarily be present in successful Augmented Reality applications.

2.2 Research Design

”The research design server as a master plan of the methods used to collect and analyze the data.” How to choose the correct research design depends highly on what kind of information is wanted to result from the research. There are many things that the researcher has to think of before conducting the research. Things like what kind of data is needed, how the data will be collected, whom the data should be collected from and what kind of budget is needed to carry through the research should be thoroughly thought of before starting the research itself [Hair, Bush & Ortinau 2006, 63.]

There are three main research design types: Exploratory, Descriptive and Causal. In exploratory research, the data is usually collected by using primary or secondary data and then using an unstructured format to interpret them. According to Hair et al. [2006, 63], this type of research includes the smallest amount of scientific method compared to other research designs. Typical exploratory research techniques are for example focus-group interviews, in-depth interviews and pilot studies. Exploratory research is not used

to get conclusive information about a certain subject; it is used more as a tool to find out if there are problems or opportunities.

The goal of descriptive research is to collect raw data and create data structures that describe current phenomena. (e.g. attitudes, preferences). It is a good tool if the researcher wants to find out information about, for example competitors, certain markets, customers or other phenomena. The data is collected by using different kinds of scientific methods [Hair et al. 2006,63-64.]

Causal research is usually the most time consuming and expensive method. Therefore, it is not always easy to conduct from the researcher's point of view. This is due to the goal of this type of research in that causal research tries to find cause-and-effect relationships between variables. An example of this from a marketer's point of view could be how advertising affects a certain phenomenon, e.g. sales. Causal research is a good tool for decision makers as, if done correctly, it can allow them to make "if-then" statements about different variables. A decision maker could, based on causal research, try to estimate how a 15% increase in price would affect the sales volume of a certain good [Hair et al. 2006, 64.]

2.3 Collection of data

The main sources for data are usually primary or secondary data. Secondary data is information that already exists in some kind of a format, in places such as libraries, Internet, companies own databases and so on. Primary data on the other hand consists of so called raw-data that has been gathered by conducting exploratory, descriptive or causal research. This data is collected to better understand a certain research problem [Hair et al. 2006, 64.]

Researches can be divided into two categories based on what kind of information they provide: qualitative and quantitative research. Quantitative research revolves around gathering information from a large number of respondents. It is also very typical in

quantitative research that the questions only have a few predetermined options that the respondents can choose. The key to conducting a successful quantitative research is strongly dependent on the design of the survey instrument. This means that the questionnaire should be designed with care. Some of the key strengths of quantitative research is that it usually gives a good representation of the target population due to large samples, and usually the generalizability of the results is good. Quantitative research is mostly suitable for descriptive and causal research [Hair et al. 2006, 171-172.]

Where quantitative research deals with a large number of respondents, qualitative research concentrates more on in-depth information gathered from fewer respondents. The goal is to gain preliminary insights into a certain topic. Compared to quantitative research, qualitative researchers usually pay attention not only to information and answers that respondents provide but also try to analyze their behavior by observing them. The small sample size and usually the unstructured format of questions hinder the researcher's ability to make generalizations on the basis of the results. Nevertheless, the richness of the data that can be acquired with qualitative research can be of great value for the researcher. It is said that qualitative research is an appropriate tool when researchers are trying to understand consumer qualities such as preferences, beliefs, attitudes, and so on. Also getting some ideas for new products or services are mentioned [Hair et al. 2006, 173-175.] The aforementioned information like attitudes and new ideas are things that we are really interested in to find out in our research.

VTT gave the authors a task of conducting four focus group sessions in a project that was part of the authors' high tech management course. VTT wanted to find out what university students think about augmented reality, what kinds of beliefs and attitudes they have towards it and, in general, what they know about augmented reality. This type of research had been earlier conducted by VTT and they wanted to find out how to situation had developed since last year. VTT offered us a template to use for the focus group sessions that included the questions, introduction and general walkthrough of the focus group. It was quite clear that quantitative research methods do not go deep enough into the subject. Showing some kind of questionnaires for the respondents could

not have given us the information that we were assigned to seek. Of course the respondents could have been told to write down their attitudes, expectations and so forth but the key thing, the ability to further probe the respondents, could not have been done that way. Therefore, authors think that VTT's choice of exploratory research design with primary data collection and qualitative research methods was quite clearly the right path for this research. The strengths and advantages of qualitative research mentioned in the previous chapter and the traits and qualities of exploratory research made it clear for the authors that this choice of data collection and analysis was justified.

Augmented reality is still little known among the public, excluding the so-called techies. Thus, the thought of having one-on-one interviews with the students might not be the best option for this research as the respondents might feel uncomfortable during the interview if they are interviewed about a subject that they do not have vast knowledge of. After researching traits of quantitative and qualitative research and different research designs carefully, authors also agreed with VTT that having a focus group discuss this rather exotic subject would both encourage the participants with less knowledge and also enhance the results as the participants could more easily interact with each other.

2.4 Focus group interview

"Using a semistructured group session, moderated by a group leader, held in an informal setting, with the purpose of collecting information on a designated topic" Morse (1994, 226).

Parviainen [2005, 55] thinks that focus groups are a good tool that can help a researcher understand needs, preferences, subjective reactions and that they can also provide new ideas for the development of products and services. Consequently, authors thought that this is a good tool to gather information from handpicked students of JAMK about the experiences and beliefs related to augmented reality. Authors can get valuable ideas for

the future use of augmented reality and see if they have any concerns about augmented reality.

It is said that “data regarding perceptions and opinion are enriched through group interaction because individual participation can be enhanced in a group setting” (Morse, 1994, 225.) He states that "the data collected by using a focus group can be more informative than the data collected by other methods". For this reason, it is very important that the focus group works well together and that the flow of discussion is good. According to Krueger and Kasey [2000, 7-9],the goal of focus group interviews is to promote self-disclosure among the participants. It is important to know what people really think and feel about the subject. People should also be encouraged to share their opinions freely without fear of confrontation. Krueger et al continue that the environment should be permissive and nonjudgmental, and the participants should feel comfortable in order to maximize the amount of disclosure.

Typically, the size of focus groups is from five to ten people, but there can always be some variation. The group has to be small enough so that everybody can share their insight, but in the same time large enough so that there are enough different perceptions in the group [Krueger & Casey 2000, 10].

2.5 Preparation

Morse (2005, 226-234] divides focus group into three phases: preparation, implementation and analysis & interpretation. According to him errors in early phases will have an effect in the results gathered in later phases. If for example the recruitment of the members is not done well and the group is too diverse the level of discussion might be “lower” and therefore the analysis and interpretation might be affected. In next chapters authors will go through the three phases and how authors will implement them during the focus group discussions.

In preparation phase researchers develop the guideline questions and the study the research topic, in this case augmented reality. In this phase they will also recruit and select the members, reserve the space for the discussion, get the recording equipment and also the food for the participants. Those are the main things that are part of preparation phase according to Morse [1994, 228.] As mentioned earlier, the guideline questions were provided by VTT, they also provided the authors with a preliminary questionnaire that all the participants were asked to fill before the session started. Krueger & Casey [2000, 44] state that the goal of these kind of introductory questions is to get the participants to think about their connection with the topic, in this case augmented reality. These types of introductory questions, in this case a preliminary questionnaire, should also inspire conversation among participants.

To make the situation as comfortable and as relaxed as possible for the interviewees authors decided to hold the four focus group discussions in a familiar setting in our university's premises. Krueger & Casey [2000, 9] say that the groups should be held in locations where participants feel comfortable; they also note that these locations can vary according to the group of people you are about to interview. There are differences where participants will feel comfortable between groups of say, students and corporate employees. By holding the discussions at school premises authors could also minimize the expenses of hosting the interviews since authors did not have to pay anything for the use of the facilities and since the university was kind enough to let authors borrow their recording devices during the sessions.

It is good that there are two people conducting the focus group research since each author can concentrate on different things during the focus group sessions. Morse [1994, 228] says that group leader or moderator can lead the discussion and for instance, if the focus group gets stuck on one aspect the moderator can guide the discussion back to track. The other researcher can then easily concentrate in recording, taking notes and if need be, look and analyze the expressions of the ones discussing.

The guidelines that the authors received from VTT were to hold the focus group discussions to approximately 25 Finnish and 25 international students of JAMK. Due to

the time constraints and due to the fact that all of the invited participants were not present, the authors were able to host and moderate four focus group discussions. Having 12-13 members in each discussion would have been in authors' opinion too many people, especially considering that authors had not hosted focus group sessions before. Krueger & Casey [2000, 73] argue that when dealing with complex topics the group size of over 10 people is too large, they also say that groups of this size are harder to control and people do not get to share their opinions as much. Hence, hosting four focus groups sessions with three to nine participants would allow the authors to keep the group sizes appropriate both for the authors (moderators) and for the participants. One of the two Finnish groups was rather small (three people) due to people being absent on that day, nevertheless the level of discussion and insights towards augmented reality and its applications remained good when compared to other focus group sessions.

Typically in focus group discussions groups are somehow homogeneous; maybe the group members are of different age, but the common nominator is that they have similar kind of interests. For quite some time it has been thought that it is ideal if the focus group participants are strangers to each other. Recently researchers have been questioning this way of thinking (Krueger & Casey, 2000, 10-11). We were able to recruit all participants from our own study track, the common thing between all of them was that they are all students and they all were somehow familiar with the concept of augmented reality and with each other before the discussions. Authors thought that this had two major pros considering the discussions. First, augmented reality is not yet widely known concept among the public, therefore authors thought that it is a good thing that participants had an idea about augmented reality before the discussions. It helped them a lot that they not only knew the current situation of augmented reality, but they were also able to provide opinions about the direction that augmented reality might take in the future. The aforementioned was very valuable for this thesis, as it helped us think of the possible future applications for augmented reality. Second, participants in all of the four focus group discussions seemed to be very comfortable during the discussions, we thought that having people who knew each other beforehand

helped with this matter. Krueger & Casey [2000, 11] say that grouping people who know each other well may cause people to disclose less on certain topic areas. Authors thought that augmented reality is a subject that is not very personal for any of the participants, therefore authors did not see the fact that people knew each other as a problem.

2.6 Implementation

According to Morse [1994, 231-232] the skill of the discussion leader is crucial in order to gain useful research data. He states that "establishing trust and an accepting atmosphere is imperative". He says that the introduction of the focus group session should include information about the purpose of the study, information about the organization that gathers it, how the participants were chosen and how the data is planned to be used. This should help to enhance the trust. Also the rules for the discussion should be made clear for everyone at this point. It is important that the leader does not take part in the discussion, he should not agree or disagree with the opinions or thoughts of the participants. Therefore it is important that leader's both, verbal and nonverbal behavior is in line with each other. Morse continues that one of the most important parts of guiding a session is to know how and when to probe the participants. Leader can for example search for inconsistencies in participants' behavior. If one's verbal and non-verbal behaviors do not match, it might be a good idea to probe that participant with further questions to know what he or she really thinks. Morse thinks that it is a good idea to summarize the discussion after every guideline question so that the members can correct if the discussion leader has understood something in a wrong way.

Authors started the sessions by welcoming the participants and by asking the participants to fill out the preliminary questionnaire in order to get the participants' mindset to the correct topic. After this three videos of different augmented reality

applications were shown to the participants. VTT wanted us to show these videos, they can be found from appendix 1.

First video was about an application that a Finnish beverage maker had made in collaboration with VTT. The user pointed her smartphone's camera towards a certain point on the page of a magazine which caused a virtual sparkling wine bottle to appear on the screen. The user was then asked to hold the virtual bottle standing for 15 seconds in order to be able to participate into a competition of which she could win prizes. If the smartphone device was tilted too much, the bottle would fall and the task was failed.

Second video was about a Lego's innovative way to show its customers how the product will look like once it is assembled correctly. In the video a girl stood in front of a screen holding a product package of a Lego airplane in her hands. When she took the package close enough to the screen, a virtual airplane that resembles the real physical product appeared on top of the package on the screen. She could then move the package to whichever direction and see in real-time how the product looks like from different angles.

Third video was about an application that was designed for smartphone users. In this video a girl had an application that helped her to try on glasses, virtually. The application asked the user to take a picture of her own face with the smartphone's front facing camera. After this the application projected a virtual pair of glasses on her on the screen in real time. She was able to move her head to all directions to see how glasses look from the sides. The face tracking followed her face smoothly so that everything looked quite natural. She was allowed to try on various glasses to find which one suits the best. Application also showed the nearby locations where the glasses could be bought from.

After the filling the preliminary questionnaire and showing the videos, the rules for the upcoming focus group discussion were made clear for everyone. After this the authors proceeded on to the discussion part that lasted from 30 minutes to 50 minutes, the shortest discussion was quite naturally with the smallest group that had only three people in it.

2.7 Analysis & Interpretation

Main thing for the researcher is to understand the meaning and the nature of research topic from the perspective of the research participants [Morse 1994, 2332] Focus group sessions are not intended for generalization. Other research methods, where researchers use closed-ended questions, can be more suitable for using for purposes of generalization. The goal of focus group sessions is to go in-depth into a topic with relatively small number of people [Krueger & Casey 2000, 203.] Morse [1994, 233] says that according to Krueger (1988) the level of generalization is appropriate for people that are in same kind of situation or settings as the participants of the focus group sessions, but this should be of broad nature at maximum] Morse continues that specific data collected cannot be straight compared across groups as the group dynamics and chemistry can have an effect on the outcome of the discussion, he suggests that broad themes across sessions are fine to be compared. The purpose of a study is what largely guides how the data should be examined and analyzed. Morse [1994, 234] states that the guideline questions can be used as a common structure for the analysis across the sessions, in our case four of them. For this thesis study, authors thought that is ideal to mostly concentrate in broad themes across the groups that were extensively mentioned and try to find similarities in them. Of course individual participant's ideas should also be examined when thinking about the potential future applications of augmented reality. Morse also states that a member's contribution often elicits other members' contribution about a certain topic, this is one of the major advantages of focus group technique according to him. This further contribution is something that authors noticed to occur a lot during the sessions, as it was often that one person came up with an idea and others got excited about the same idea and elaborated on it.

3 Theoretical and Knowledge base for the research

3.1 Definition and History of Augmented Reality

"Augmented Reality (AR) is the technique of superimposing virtual objects in the user's view of the real world, providing a novel visualization technology for a wide range of application" [VTT, 2013]. In other words, virtual elements and physical elements can coexist. The purpose of augmented reality is not to replace the real physical elements; instead it can supplement the real world. For example augmented reality can show virtual information on a display that the user would not be able to see with his own senses. Ronald Azuma, one of the pioneers in development of augmented reality has defined augmented reality. Augmented reality should fulfill all three of the following:

1) combines real and virtual

2) Interactive in real-time

3) Registered in 3-D [Azuma 1997, 2].

Another popular definition for augmented reality was done by Paul Milgram and Fumio Kishino in 1994. In figure 2 you can see their concept of virtuality continuum. It consists of a horizontal line where on one end is Real Environment and on the other end Virtual Environment. Everything between these two extremes falls under the term Mixed Reality. Real environment consists of real objects that can be seen with a naked eye or that are e.g. displayed realistically on a screen. In augmented reality something virtual is added to the real environment (see e.g. Figure 7) Augmented virtuality means that something from the real world is added to the virtual environment. A good example of this is video gaming with a device like Kinect™ (Microsoft, 2013) that adds you in real time to the virtual surroundings. Kinect is a camera device that is connected to a gaming console. The device records the player's movement and gestures in real time and transfers them to a television screen, this allows the user to play games that are based on his or her movement. On the very end of the horizontal line is virtual environment,

where everything is virtual. An example of this could be the so called normal video games where everything happens in virtual surroundings [Milgram and Kishino 1994]

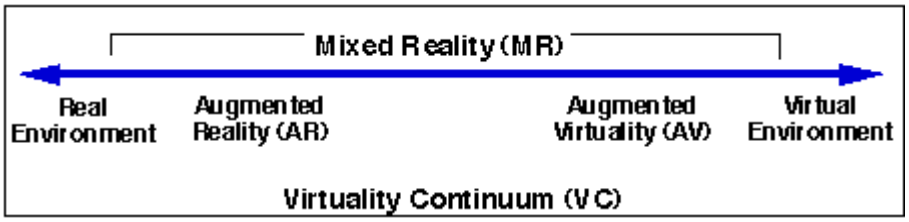

Figure 1: Reality-virtuality continuum according to Paul Milgram and Fumio Kishino (Milgram and Kishino, 1994).

Augmented reality is an interesting topic to research since it is a tool that allows the user to enhance his or her view of the world and allows the user to interact with the world. The virtual objects that are there to be seen with the help of augmented reality technology can allow the user to see information that the user would otherwise be unable to see with his own senses. This can help the user perform real-world tasks easier [Azuma 1997, 3]. Already then, when augmented reality was still a rather small thing, he mentioned that augmented reality applications had been explored in the following areas: "Medical visualization, maintenance and repair, annotation, robot path planning, entertainment and military aircraft navigation and targeting" [Azuma 1997, 3]. As augmented reality can enhance the user's performance in countless ways there are many business areas that can benefit from developing augmented reality applications. Under the "augmented reality today" topic authors will go through some of the commercial augmented reality applications that have been released for consumers, but of course the capability to enhance the user's own senses is a very interesting topic for many business areas, not just for consumers.

The history of augmented, virtual reality goes back to 1950's when a film maker Morton Heiling built a device that combined movie, smell, wind, vibration, stereo sound and movement together in a device called Sensorama. Unfortunately for him the device was never a success commercially and it was very expensive to make films for the

Sensorama. It was thought of as a virtual reality adventure, but it still had many elements of augmented reality of today in it (Pocket-Lint 2011).

Figure 2: A picture of Sensorama, an ambitious augmented reality project of Morton Heiling [Grau 2007].

In 1966 Professor Ivan Sutherland from Harvard University invented something that is thought to be one of the most important devices in augmented reality – a head mounted display. Unfortunately this device was too heavy for anyone to hold and it computing power was quite limited but nevertheless it was one of the first steps for nowadays' augmented reality devices. Tom Caudell, a researcher for Boeing's Computer Services is told to be the first to use the term augmented reality in 1990 when he was working on to enhance the company's manufacturing and engineering process by developing a software that had virtual reality technology in it. When working on this project, he came up with a software that could show where certain cables were supposed to be installed that made the work of mechanics easier (Pocket-lint 2011).

The year 1992 was a big year for development of augmented reality. LB Rosenberg worked on a project for US Air Force, a project in which he was able to create something

that is thought of as the first functioning augmented reality system, the system was called Virtual Fixtures [Pocket-lint, 2011.] It was kind of a virtual ruler if that is what one could say. Just like a normal ruler allows the user draw a straight line on a piece of paper easily, the virtual fixtures that are overlaid on a workspace could do the same, virtually [Rosenberg 1993, 76-77].

Another group that consisted of Steven Feiner, Doree Seligmann and Blair MacIntyre wrote a paper about their prototype AR system that was called KARMA (Knowledge-based-Augmented Reality for Maintenance assistance). They built a head mounted display that had trackers attached to it and the object they were working with, which was in this case a printer. The goal of this device was to instruct the user on how to load and service the printer by providing a ghost image [Pocket-lint 2011].

Figure 3: A picture of KARMA, an AR system that was designed to instruct the user on how to load and service a printer [Pocket-lint 2011].

Augmented reality stayed as a tool of scientists and researchers until the late 20th century. The devices were big and uncomfortable to use and therefore the technology was not a big thing among consumers. A big change happened when Hirokazu Kato from Nara Institute of Science and Technology developed an ARToolkit, a software library, as an open source tool for the public [Pocket-lint 2011]. It helped to make it a lot easier for developers to develop augmented reality applications, as it helped with tracking of the camera position and orientation in real time, one of the key problems of augmented reality back in those days [HITlab 2013].

3.2 Augmented reality today

Many companies have adopted augmented reality and its' possibilities and have used it as a tool to enhance their marketing. Huge global companies like Google, Nokia and so forth have already released their own augmented reality applications and devices. In addition, companies like Microsoft and Apple have been rumored to be looking carefully into possibilities of augmented reality [Olivarez-Giles 2013; Kastrenakes 2013]. Companies have gotten very imaginative in the way they have started to use augmented reality for their own benefit. For normal consumers the easiest way to start using augmented reality applications is to use them with a smart phone or a similar type of device. It is indeed the mobile platforms like Android™ and iOs™ that the most applications have been developed to.

Google brought augmented reality to the lips of a wide audience when they released their new project, Google Glass as a public beta in February 2013. This meant that people all around the world could apply for the beta testing phase. The product is a wearable device with a head-mounted display that looks a bit like a normal pair of glasses. Glass has a small display attached to it and it has many of the functionalities of today's smartphones like navigation, a camera, possibility to share information, just to name a few. The device is controlled by either touching the frame or by voice communication [Google 2013].

Figure 4: A woman wearing Google Glass, an augmented reality device [Google 2013].

Many companies have realized that augmented reality is really useful for customers who want to see how a certain type of product will look in their own home or how a product looks on them. Ikea has decided to release their 2014 product catalogue as an augmented reality application. In this application the smartphone users can test how the Ikea products will look like at their home or at their office. (Ikea 2013).

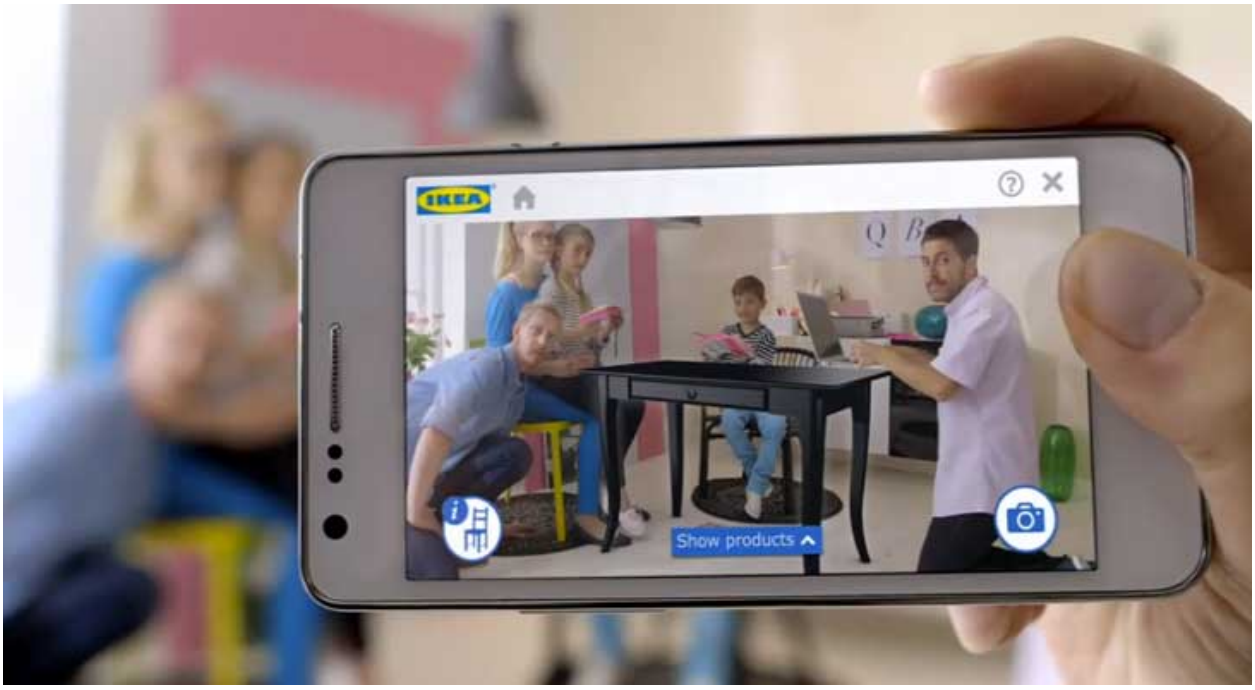

Figure 5: Ikea's augmented reality application shows how furniture will look in the real environment (inhabitat 2013).

In the recent years McDonald's has been known in public as a company that produces very unhealthy food. Their Australia's department has come up with a clever way to show their customer's how and where their ingredients are made. A customer needs to point his iOs™ device on a product and after that customer can see information where and who has produced the different ingredients. This application uses augmented reality, GPS-tracking and internet connection to get you that information from McDonald's supply chain database [TrackMyMacca's 2013].

Figure 6: McDonald's augmented reality application shows the origin of the ingredients [TrackMyMacca's, 2013].

Nokia released an augmented reality application along with its new Windows Phone 8 devices in the year 2012. This application lets the user see point of interests on their own smartphone display when they point their camera to a certain direction and it will also provide navigation to each place if the user chooses to do so. These points of interests can be for example restaurants, hotels, museums and so on (Nokia 2012).

Figure 7: Here city lens by Nokia shows the user points of interests in the direction where the smartphone camera is pointed to [Nokia 2012].

3.3 Theory about high tech markets

Developing new high tech products is a very difficult task because companies usually have to educate the users more carefully about the reasons why they should want or need a new device or a new application. Athana [1995, 52] says that the largest part of the market, the so-called mainstream customers, tend to avoid buying newest technology products as they do not understand the advantages and benefits of the new technology. He says that they usually wait until the technology is 'stable' and that they have gotten some positive feedback about the technology from the people they trust. It makes it easier for customers to adopt the new technology if the new product looks quite the same as previous products and if the usability is similar to the old. If the users have to learn a new usage pattern the market acceptance will take a longer time. Mohr, Sengupta and Slater [2005, 7] talk about the same phenomenon when they describe the market uncertainty factors in high tech markets. They talk about fear, uncertainty and doubt (FUD) that the customers have when they are introduced to a new technology. The uncertainty of how and what needs the technology will address is present and this may delay the adoption of the new technology. This doubt, according to them, can be tackled by e.g. keeping the customers well informed and educated and by offering them some post purchase reassurance.

Later on, if a company manages to develop a desirable product it might be that the needs of the customers change overnight. High-tech markets can change quickly and unpredictably. Mohr et al [2005, 7] use pharmacy industry as an example, a medicine that is used to treat a certain illness today can be totally obsolete the next year if a new way to treat the illness comes up.

Lack of standards is sometimes a large cause of anxiety among consumers in high tech environment because this can slow down the adoption process of a certain technology if

it is neither clear for the consumers nor manufacturers, what the standard will be like in the future. This will make consumers to delay their purchasing decision as they try to avoid making a “wrong” choice. Therefore, it is important for companies to evaluate the risk of using some unique system in their products compared to using standardized systems currently in the market [Mohr et al. 2005, 7]. There are countless examples of this phenomenon. A quite recent example is when there were two competing standards for high definition films, HD-DVD and Blu-Ray. Both formats had numerous supporters, but after about two years (2006-2008) of battling, the Blu-Ray was chosen as a standard format for various reasons even though it was more expensive than HD-DVD [Techhive 2008]. Dave Lorenzini, a founder of Augmented Reality Company, also stated his concern of lack of standards among augmented reality companies that might slow down the growth of the industry [CNET, 2013.]

It is always a risky decision for companies to choose whether to continue developing and improving the current product portfolio or choosing to invest in a new technology, thus removing resources from the already established products [Athana 1995, 53] This is a decision that companies thinking about investing into augmented reality have to think of carefully as it is not yet known if augmented reality will ever reach the plateau of productivity mentioned in the Gartner's hype cycle (see the Gartner Hype Cycle-chapter.) Newcomers have an advantage compared to big well-established companies, as they can boldly invest in new hopefully market changing technologies because they do not have existing profitable product lines or customer sets that are distracting them [Athana 1995, 54].

Authors thought that a successful example of educating the market is when Apple introduced iPad in 2010, a tablet device that has since then become the benchmark device in that market which others try to copy. Many people and technologists were not very interested in the device at first that Apple introduced early 2010 as it was seen as an expensive large toy that could not replace a laptop, but these people have been proven wrong. In the case of developing augmented reality devices and applications companies might have a hard time ensuring their customers about the benefits of their products and educating on how to use them, but if they are successful they can quickly

take a large share of the new market just like Apple did with iPad. McGrath [2000, 220-222] says that there are three key advantages for companies that can enter the market first. As mentioned previously, a pioneering company can easily take a large market share early on and make it harder for others to compete. Second, the first-to-market companies can get valuable experience when it comes to the new market. Experience about customers, technology, suppliers and the distribution channels can be of great value and it can really help the company to develop a product that the customers really want. Third, being first can also help set the market standards for the products. However, this does not necessarily give the company a control of standards. Therefore in the quickly changing high tech markets some competitors might come up with another type of product that changes the standards for the time to come.

3.4 Technology adoption life cycle

"Innovativeness is the degree to which an individual or other unit of adoption is relatively earlier in adopting new ideas than the other members of a system" [Rogers 2003, 22]. He thinks that it is practical to divide people into five adopter categories on the basis of their innovativeness instead of just saying, for example, that one person is less innovative than the average. These five adopter categories are the following: innovators, early adopters, early majority, late majority and laggards. Based on his studies, he was able to make a curve that showed the adopter categorization in a graphical form measured by the time that it takes for an individual to adopt innovations. The basic idea of this can be seen in Figure 8, a revised version of Rogers' bell curve. Rogers [2003, 280-281] noticed in his studies that about 2,5% of consumers adopt innovations first and they are called innovators. The second group, early adopters stand for 13,5%. Both, early majority and late majority stand for 34%, and finally, the laggards who are last to adopt a new innovation account for 16%.

A revised version of the Technology adoption life cycle-model was developed by Geoffrey Moore for his book Crossing the Chasm. It is a widely recognized tool that

divides people into five groups based on their habits of adopting new technologies. Innovators are people who are willing to try new technologies only because they are new and even if there are no guarantees that this specific technology would help them in their lives. Early adopters are a group of people that can easily imagine how a new technology could be used and do not therefore need a lot of references or recommendations from other people before they try it [Moore 1991, 11-12]. Authors think that FUD starts to increase when reaching for the early majority group as consumers need more reassurance and references before they want to buy the products. Moore says that people belonging to the group early majority usually want to see how others have adopted the new technology. Therefore they need references before they want to invest large amounts of money in something although they are usually quite comfortable in handling new technologies. The members of late majority group are quite much like the early majority but they do not adopt new technologies easily and they usually want to see a certain technology become a standard before buying it. Laggards are people who do not like technology and therefore avoid buying it unless it is absolutely necessary [Moore 1991, 11-12].

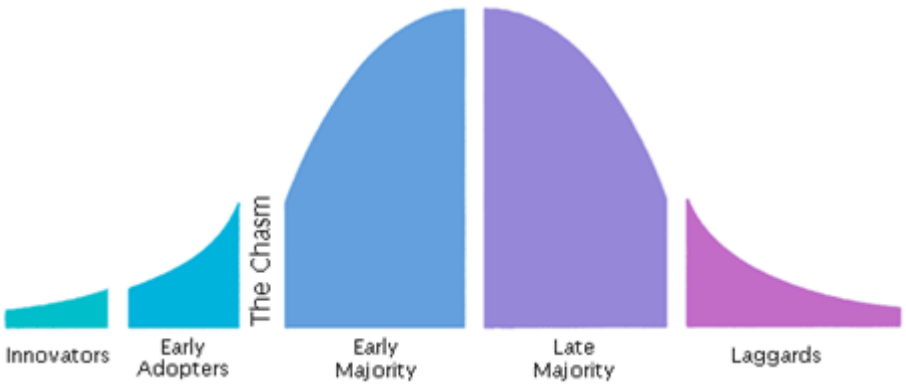

Figure 8: Revised technology adoption life cycle model by Geoffrey Moore [Moore 1991, 16].

Moore says it is important that each of the five groups is approached differently. Hence, if for example Google has been able to get a good momentum with innovators who have

started to use their Google Glass-device, it is vital for them to use the knowledge and feedback gotten from the Innovator group to modify the device or change their marketing in order to reach the early adopters. Again, once early adopters have started to use the product, Google should approach the next group, early majority, with e.g. a new twist in their marketing and so forth. The key is to keep the momentum on at all times [Moore 1991, 13-14].

3.5 Gartner hype cycle

Gartner is one of the leading world's leading information technology research and advisory companies. The business started in 1979 and it has since that been offering insight into IT business for its customers [Gartner 2013c]. One of the most well-known products of Gartner are the hype cycles that they release annually. These hype cycles are graphic presentations about maturity and adoption of technologies and applications. They also provide information on how the technologies can potentially solve business problems. Hype cycles are estimations how certain technology's development path looks now and how it might look in the forthcoming years. Hype cycles can help the heads of firms' make decisions whether to start a risky investment in a new hyped technology that might be commercially viable in 10 years' time or if they want to take a more moderate approach and invest in a technology that has already matured and can be of great value for the firm in a shorter time span. [Gartner 2013a].

Gartner [2013a] divides the development of emerging technologies into five main phases: Innovation Trigger, Peak of Inflated Expectations, Trough of Disillusionment, Slope of Enlightenment and Plateau of Productivity.

Innovation trigger: is the earliest phase in the development of the technology, the really steep upward curve can be seen in figure 9 as expectations grow exponentially. Potentiality of the technology is recognized when early proofs of concept and media interest occur, this usually creates a significant amount of publicity for the technology.

Usually there are no usable products in this phase and it cannot be known yet if the technology has any real commercial viability. It is often that technologies that are in this phase have, according to Gartner, over five years and for some technologies well over 10 years before they can be adopted by wider audiences.

Peak of inflated expectations: As seen in the figure 9 this is the highest peak on the hype cycle curve. In this phase the earlier publicity has increased the interest in a certain technology and therefore there are many successful experiences with this technology, but of course there are a lot of failures. In this phase some companies have started to take action with this technology but many have not.

Trough of Disillusionment: The phase where the expectations towards a certain technology start to diminish as the previously done experiments and implementations have not been as successful as they could have been. At this point companies usually have to shake things up a bit and continue development to satisfy both the early adopters and the investors to ensure that money keeps coming in.

Slope of Enlightenment: The hype cycle curve starts to ascend again in this phase as a wider audience starts to understand how the technology can benefit the companies. Also pioneering companies usually manage to release enhanced second or third generation versions of their products. Increasing amount of companies start to invest in their own pilot projects at this point.

Plateau of Productivity: This is the final phase of Gartner hype cycle and in this phase mainstream adoption becomes a reality. The technology usually has a broad market applicability and relevance at this point and therefore mainstream adoption starts. It is often that in this point the time needed for mainstream adoption is estimated to be less than five years, sometimes even less than two years [Gartner 2013a].

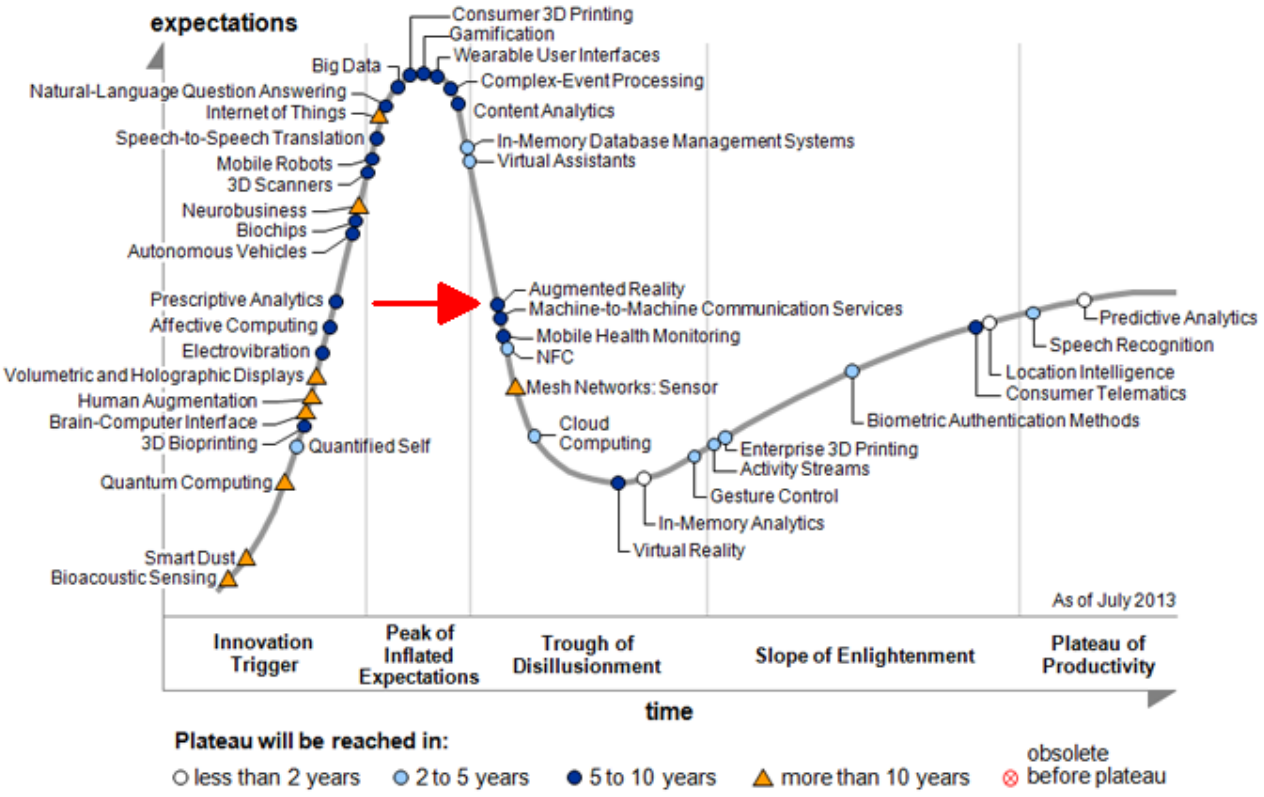

Figure 9: Gartner Hype Cycle for emerging technologies, released in August 2013 [Gartner 2013b].

Nowadays augmented reality can be thought of as a trendy technology. Augmented reality entered Gartner hype cycle for emerging technologies for the first time in the year 2008 and it has since that stayed on the curve. Augmented reality has already passed the two first phases, innovation trigger and peak of inflated expectations and is now placed on the steep curve on Trough of disillusionment. In 2008, when it entered the hype cycle, it was estimated that it would take more than 10 years for mainstream to adopt the technology and currently the estimations stand somewhere between 5 to 10 years. Like described earlier, in this phase usually some experiments have failed, but then again some of the pioneering companies have come up with second or third generation products.

The development of augmented reality is now in a stage where those who are willing to develop applications that are based on this technology should think carefully why earlier

projects have failed, what is slowing down the adoption. Like mentioned earlier, some entrepreneurs have fears that the lack of standards might slow down the growth of augmented reality industry. Authors themselves have tried various augmented reality applications and have felt that only one or two of them have actually had potential for long-term use. One of the authors has been using Nokia's Here City Lens (see Figure 7) at times, as practical as the application seems, it still did not feel natural or convenient to use. The author also felt a bit embarrassed to stand in the middle of a town, turning around and staring at the smartphone screen. Authors think that this embarrassment or awkwardness might be a problem that occurs among consumers when something new is introduced to them. In this case the author was forced to do things that he had not done before or felt unnatural doing, thus, feeling uncomfortable. These negative feelings might have something to do with the aforementioned FUD-factor and are likely to occur less often when the technology becomes more widely known and more convenient to use.

Although the current stage might look grim and steep is downward, there seems to be light in the end of the tunnel so to speak as big companies like Nokia, Ikea, Google and so forth have really started to invest in this technology. In addition, a widely recognized technology publisher CNET [2013] described augmented reality as the "next big thing in tech" in June 2013.

3.6 Productization

In the following paragraphs authors will go through the concept of productization and in general things that need to be thought of when developing new products. Things that companies that are developing augmented reality applications or products should think about if they are willing to step away from the aforementioned 'trough of disillusionment' stage and reach wider audiences. There are many layers of processes and complementary tasks that many companies have to go through when they are developing new products that they want to be of value for the customers. These

complementary tasks and activities can be called productization [Simula, Lehtimäki & Salo 2008].

Productization is not an official word in the English vocabulary but authors will try to explain what is meant with it in the following chapters. There is no clear definition for productization but basically it consists of tasks and activities that are required before a firm can launch a product commercially. The term has been used for example in service business when a firm wants to modify intangible services into something clearer for the customer. The goal of the productization is to come up with output, e.g. technology or service that the customers can understand easily. It consists of tasks like defining, describing, improving, producing and unending development of the output so that maximized value for the customer can be offered. Firms that deal with physical products have a bit easier situation with the aforementioned tasks as their output is always tangible. Nonetheless, these firms have to make sure that their physical products are easy to understand and use for the customer. In addition, it is often that the product alone is not sufficient in the eyes of the end customer but the company has to offer more value with additional services. As an example, a normal video game console is a great product itself, but when the user is allowed to connect the device to internet it adds a lot of value for the user as the user can access the whole gaming community that way [Simula et al. 2008].

Simula et al [2008] divide productization into two main parts: Inbound productization, which is in other words the ability to make products and outbound productization, which refers to the ability to sell the product. They say that the "main purpose of inbound productization is to harmonize and systemize the delivery process of the offering and its outcome inside an organization". There is a fear that too much harmonizing and systemizing might cause the firm to have a lack of innovative thinking. They argue that minimizing the routine work by using readymade templates, platforms or modules allows the more time for innovative thinking. The key is to find balance between standards and customization. Companies have to find their own way of turning some technology into their own core product, which is then the backbone of that company. It is important to benchmark the development often enough, not just within

the company but also outside of the company. Simula et al state that this can be done with help of building prototypes that can be shown to potential customers, the feedback that they provide can be crucial when determining what kind of products are needed and wanted. Authors think that the way Google decided to release a public beta version of Google Glass is a brilliant example of how to get valuable feedback from users. To sum it up, inbound productization consists of the steps that are needed to be taken during the development work, steps like: designing, material selection, production and manufacturing tools, testing, certifications and so on [Simula et al 2008].

Outbound productization is the other phase in productization. The main goal is to improve the visibility and also to make the offering of the company concrete and easy to understand for the customers. Company can add value to the core product by concentrating in various tasks like: developing a brand, marketing tasks, differentiating with design and providing after sales service for the customers. These are done to increase the value of the product in the eyes of the customers, hence making the purchasing decision easier. Also decisions about what customer groups should be targeted are vital in this phase. Therefore it is crucial, like mentioned in the previous chapter, to co-operate with customers and get feedback from them. Vital part in new product development is the different marketing functions that Simula et al [2008] collect under the term extended product. Extended product consists of tasks like:

- Branding
- Warranties and technical support
- User guides and documentation
- Advertisements, brochures and white papers
- Customer testimonial
- Contracts and/or license terms
- Sales channels and commissions
- Sales tools and price lists
- Logistics and packaging [Simula et al. 2008].

After outbound productization phase is done, in other words the extended product is ready, the company can start to sell the products to customers. The core product is just a realization of the firm's potential, but it is the extended product combined to it that truly conveys the message to the customers of what kind of value, performance and worth does the product really possess [Simula et al. 2008].

Sometimes so called over engineering happens in firms, this means that the company concentrates in developing the products too much, forgets about the customer needs and therefore the final products might not have many of the assets that the customers want. According to Prahalad and Ramaswamy [2004, 4-5] companies cannot act autonomously anymore (i.e. developing products, creating marketing strategies and controlling sales channels] without interaction with consumers. Consumers have many tools available for them in the modern global world. They can easily find information, reviews, performance indicators and such from different networks. This can have a high impact in the success of a company, Prahalad and Ramaswamy mentioned pharmaceutical industry as an example. There a word of mouth feedback (i.e. peer reviews/feedback) had a greater impact on demands of a type of a drug than the claimed benefits of that certain drug. "Armed with new tools and dissatisfied with available choices, consumers want to interact with firms and thereby co-create value." [Prahalad & Ramaswamy 2004, 5]. It will therefore be important for companies that develop augmented reality products or applications to be aware of the customer wants and needs by co-operating with them. Also the value of word of mouth type of information should be clear for companies. By convincing the innovators and early adopters, the positive feedback should spread and it might speed up the adoption process.

Another way to avoid over engineering is according to Simula et al [2008] the use of cross-functional teams, e.g. engineers and marketing people, who should be aware of customer needs, collaborating together in the new product development phase. Usually extended product part falls under the marketing functions' tasks, but it would be wise if cross-functional teams would be used in that as well [Simula et al. 2008]. Cross-functional teams can usually get better results in situations in which different skill sets,

experience and judgment are needed simultaneously compared to individuals trying to work towards the same common goal of the company without proper ways of communicating to each other. The capability to have dialogue and understanding across departments, hierarchies and regions can be of great value as it can increase the organizational effectiveness and thus, create more value for the end customers [IMA 1994, 3].

"Selecting appropriate positioning can make the difference between success and failure. It determines what the organisation tells the market about the product, whom it tells and how it tells it" [Trott 2012, 392]. It is vital for companies that are to start developing augmented reality applications or devices to determine early on what customer segments they will want to be their main target. According to Trott positioning that is done in wrong manner can be costly for the company if consumers do not understand or find the company's products or services credible. As seen in the augmented reality today chapter and what authors also noticed during the focus group discussions, there are differences between people on what they would like to see augmented reality offer. Some men were interested in wearable devices like Google Glass, women mentioned assistance for shopping and some were thinking about the professionals like architects that could benefit from using augmented reality. It is up for the companies to carefully determine the group they are to target and how to reach their needs and wants.

4 Research results

4.1 What types of augmented reality applications are potential in the focus groups in the future?

It became obvious from the focus group sessions that the groups were able to find features that should be present in successful Augmented Reality applications. The groups enjoyed talking more about applications which have a commercial aspect in them such as shopping applications. They also saw value in the applications that does not have a commercial value in them such as applications designed for the printed media and applications that could be used as a tool at work and in teaching.

According to our results, the printed media could start to implement augmented reality as part of their content since it became clear from our focus group sessions that the participants felt that it could be practical for them even if they had not tried that before. Augmented reality should add a voluntary dimension to the reading experience available for those who want to see extra or more detailed information in the form of videos or more detailed weather forecasts.

> *"Moderator: Does it have to be useful? So you know it's fun is that enough? Or does it also have to have some kind of use for it?*
>
> *P3(M): More value if it's useful and. If its useful people usually do it more often and do it all over again. If it's just fun maybe just few times. But if it's very useful on daily basis... On frequent basis then... Then it could bring value from that side.*
>
> *P2(M): If it's only in the advertisements so that perhaps might not be that ok I will always use this kind of things because I can see adverts in different light. Then if it's included to the... If it's sort of like normal magazine and there is basically in every page something extra weather it is article or advert then also the adverts can be looked more truly. Because if you see that this is so useful that I get these videos and these from the article maybe I can get some more value from these adverts also."*

Especially companies in the fashion and clothing industry could start to create augmented reality applications designed for customers trying on clothing and seeing more details of a piece of clothing or a product compared to the pictures of catalog magazines or online stores.

> *"Moderator: Could you make a purchasing decision based on this. For example the glasses, if you only look at them with the virtual thing. Could you make the decision with only help of that or do you need to go to the store?*

> *P1(F): Yes, I am not so big fan of online shopping. You know just look at stuff in the internet and after you buy something. For me anyway I need to touch it, see it on me, I would not just buy by looking at this virtual thing. I would cry if I would spend money on something that doesn't fit me*
>
> *P4(M): I think that if a person has to have an opportunity to touch it, it shouldn't influence the decision. For example, if I cannot touch it, if I have to order it from online, and they cannot actually physically touch it. I can use AR to see it and buy that thing. If I need to touch it, then this (AR) won't help me.*
>
> *P3(M): I personally already bought clothes on the internet, AR can help me buy more things. It can help me decide to buy or not. For example buying a t-shirt is easy, but if it can help then it is good.*
>
> *P8(M): Personally for me it is a plus. Online shopping before AR has been dead. It will help me make the purchasing decision, I can see if it looks nice. In addition, return guarantee will help me with my purchasing decision."*

Applications should also have a feature showing the customers the nearest outlet where you can find the product you are looking for since it was seen helpful. The participants saw these kinds of applications potential and especially women who shop a lot as the most potential users. The participants would prefer buying inexpensive products such as clothing, accessories, watches, glasses and sunglasses with the help of augmented reality applications so shopping applications should include products belonging to this price level.

Hairdressers, surgeons and plastic surgeons, engineers, architects, interior designers could start to apply Augmented Reality even more as part of their work. It would satisfy the buyer even more if they could for example see the expected end-result before getting a haircut or a plastic surgery.

> *"P7(F) These could also be used in saloons. I could see what kind of haircut would suit me. If I use this application and check which haircut suits me I could tell the hairdresser easily how to cut my hair."*

Engineers and surgeons could use it as a tool to make their work easier as they could see more detailed working instructions through augmented reality. Augmented reality could

be applied in teaching to bring out more practicality in lectures and to make learning more visualized especially in the engineering and medical schools.

> *"P6(M): Like we talked about this earlier but I think it might work in medical areas. I'm thinking about this from medical point of view that.. doctors.. Like someone is going to have a surgery and he could see how for example his legs would look after the surgery. It freighting and dreadful but it something that prepares people to see themselves*
>
> *P8 (F): It could be also used in the medical things for the students who are in the medical for the in the medicine*
>
> *Moderator: In medical schools?*
>
> *P8(F): Yeeeaah.. Visualize the insides of the person or whatever so make it more practical and everything and how it looks like after surgeries or..*
> *Moderator: It was also interesting topic you were talking about P5. That you could use it as part of work when fixing something?*
>
> *P5(F): Like if you are having a surgery and it could give you instructions and advises how to do that.*
>
> *P6(M): Yea it could be good for medic surgeries"*

4.2 What are the concerns regarding Augmented Reality applications in the focus groups?

The main concerns were related to the lifespan of the applications since they found it difficult to find long-term usages for Augmented Reality applications. The majority of the participants were ready to try the applications but just for the amusement part of them. The applications must feel practical, natural and voluntary in order for their lifespan to be extended. There were also participants who saw that augmented reality applications need~~s~~ to be built on a specific device such as Google Glass. According to them, the smartphone would not be the most practical device to experience Augmented Reality.

The focus groups were willing to try applications just for the fun of it but most of them did not feel like buying through Augmented Reality. If they felt like buying through

Augmented Reality they would only buy inexpensive products. Perhaps the technology is still quite new for them and the trust and the knowledge towards it is relatively low. They would rather go to a shop and make the actual purchase there after they have tried on the product at home via help of Augmented Reality. Augmented Reality applications were seen more as a supporting function when making purchases. There was a concern regarding the lifespan of the applications especially in applications aimed for commercial purposes. The groups found it difficult to find long-term usages for these applications.

> *"Moderator: What are your first impressions on the applications of AR ? Like, dislike, funny, not funny, beautiful, not beautiful, useful, useless…*
>
> *P2(M): The first thought I had is that I have some experience in AR applications from before and still now I have the same thought that they are nice toys and you know they look handy there, but are you going to need them more than once? For example in a case like this that you look for glasses, ok you find nice glasses but you are going to uninstall it (application) because most likely you aren't going to buy new glasses the next year or in a long time. For me the first thought was it is a nice toy, but is it useful in a long run? Am I going to need the application?*
>
> *P3(M): I had the same that it still seems a bit toyish and unnecessary. If you read a magazine and you still have to hold a smartphone all the time and then start to play a game, I don't think it is going to happen. The Lego thing was quite brilliant, that you can see the whole product and in 3D and in real size. I think in the future they are going to have some promising applications, but now I think they are still toys like P2 said.*
>
> *P4(M): For me if it's used for commercial purposes for me it doesn't add value to my life. But if this AR can make an application that will make my everyday life easier, or make my studying or working easier then I might be interested about it. But for this purpose, for commercial or buying, it is not interesting for me."*

The international group found a bit different concern in the shopping applications. They thought that there was something essential missing in the whole augmented reality experience when doing shopping, namely the lack of feel, touch and smell. They were mentioned as important factors driving your purchasing decision. It was interesting to see that none of the Finnish participants paid attention to all of these concerns.

"P5(F): People like buying products without going into those shops ... They can try on products now but all... But I think there is a problems that when you try the glasses you can just see the difference but you can't feel if it's right for you...

P4(M): That's very important

P6(M): This is also what I have wanted to say that it's vivid way one of the effect when people use when they are making discussions and purchasing decisions that you really want to feel. You know... Aa... The touch is not there... Those are really key effects on like if someone is trying wine or something... Like smelling also it's not there. There is no feel, no touch, no smell. It's just not there.. You can just see it"

The Finnish group felt pessimistic about applying Augmented Reality through smartphones since they would have to wait for the application to load and it would not feel smart. If they needed to buy a specific device for the Augmented Reality then they would use it more. The applications designed for Google Glass were offered as a solution to make Augmented Reality feel more practical.

"*Moderator: Would you be interested in using AR applications? Why? Why not?*

P2(M): Really depends if it useful for me. I feel that I am kind of a pragmatic person in a way that I like to if I do something I want it to be useful some way. Let's say when it comes to a smartphone, it is only a small window that I see that it feels so limited and it doesn't naturally come here (in front of your eyesight) if I want to see something. So, in that sense I find it really unnatural because AR is supposed to be, the way I would imagine it, the way people have explained it that you get to see extra digital stuff in the real world. In this way the Google Glass is the first one that really interests me. Because your hands are free and you just see stuff there.

P3(M): I am also with P2, if you go around if you want find a restaurant I like to search the map. But if you try to look at the screen and everywhere it is really not useful.

P1(M): Same thing here."

The demand of the Finnish group was that Augmented Reality has to feel practical, natural and voluntary. They would feel frustrated if the Augmented Reality application did not work properly on the first try.

5 Conclusions

The purpose of the research was to find out what sort of augmented reality applications could be potential and what are the concerns regarding them. It became obvious that the applications designed to support augmented reality have to be useful, practical, fast, and the user would have to get some value from the applications. Applications that lack the feeling of getting value or applications designed just for fun did not get rather positive feedback or no feedback at all.

Applications designed for commercial purposes such as shopping applications might face problems regarding the lifespan of the application. It was notable that the participants did not see a long-term potential in applications that were only designed to entertain or to sell something. For example, the sparkling wine example where the user had to complete a challenge to hold the virtual sparkling wine bottle standing in the top of a magazine for 15 seconds in order to get a discount from the product did not raise any discussion during the focus group sessions. Could the lack of discussion be the sign that these sorts of fun applications are not interesting since the value yielded by them is insignificant for the user?

The participants were vigilant towards augmented reality when purchasing products. Perhaps the level of knowledge and trust towards augmented reality is relatively low since they would rather go to a physical store to buy the actual product after they had tried it on at home via help of augmented reality. Therefore, even if the value gained was enough for a user to try the application but for some participants the level of trust towards this technology is too low for the actual purchase decision to take place by just using an augmented reality application. Mohr et al [2005, 7] argued that post purchase reassurance and reinforcement can help tackle doubts of consumers that are related to fear, uncertainty and doubt. Perhaps a purchasing decision made with the help of an augmented reality application could be made easier by offering a free return of the product if the product is not suitable. This return guarantee was mentioned by an individual during the interviews. He thought that it would help him make a purchasing

decision. The authors think that offering incentives, such as small discounts together with a return guarantee, might lower the threshold for a user to at least take the trouble to download and try out the application since there is additional value when using the application.

It was notable that the participants who had experience of online shopping found shopping applications designed for augmented reality more useful with more positive image than those who are used to going to the physical stores to make the purchases there. Nevertheless, the participants would only buy inexpensive products through augmented reality applications possibly resulting from the lack of trust. If the fashion and clothing companies increasingly start to implement these kinds of applications with a proper functionality, they could, perhaps, be applied on more expensive products as well as the trust towards augmented reality increases when people have a chance to get familiar with the technology. It is important that the users of the augmented reality applications get positive and valuable experiences when using them. That is why the productization phase must be carried out carefully to ensure the functionality and to make sure that the user finds the application to be of value.

In order to increase the lifespan and the level of interest towards the applications, they must be carefully designed that they feel practical, fast and useful. According to the focus groups, they should be minimalistic and as easy to use as possible, something that allows people to save time and helps them do their tasks faster. These seemed to be the values that the participants of the focus groups wanted from successful augmented reality applications.

The participants found the applications designed for working or studying to be practical. It seems that the values that the participants appreciate in successful augmented reality applications are present in applications designed for working or studying. Perhaps they believe that in future these applications could make studying, working and even being as customer easier, faster and more practical for people within the augmented reality environment. The applications that allow the user to see and experience more content from the printed media were a popular subject of discussion. Perhaps the participants

found out applications designed for printed media useful in the similar way as applications designed to support working or studying. The applications could make their magazine reading easier, faster and more practical in a way that you can receive the additional information straight via your smartphone, tablet or augmented reality device, without going to the publisher's website to find out the desirable information. Furthermore, the printed media can increase the value received through the content since there is a straight access from the physical magazine to the digital content such as videos or more detailed weather information.

Google Glass was often mentioned by the participants, and their opinions about that device were positive. The participants preferred a device designed to experience augmented reality rather than applications designed for smart phones or tablets. They regarded Google Glass as a practical way to experience augmented reality because it is the way they imagined it to be. When these kinds of augmented reality devices become mainstream and available for wider audiences, the future of augmented reality applications could be in the applications specifically designed for the devices. Athana [1995, 7] argued that it is easier for users to adopt new products if they look like earlier products, and if the usability is quite similar. Therefore, a device that resembles a normal pair of glasses might be easier for the users to adopt compared to a device that does not resemble anything that the user has seen before. However, it must be kept in mind that the intended use of the Google Glass is drastically different compared to normal glasses.

5.1 Qualitative Approach for Judging the Soundness of the Research

Authors decided to replace validity, reliability and objectivity which are more commonly used with quantitative research, with credibility, transferability, dependability and confirmability. Authors found it difficult to use the traditional, quantitative oriented way of judging the soundness of the research, so authors decided to use the alternative criteria which suits better for qualitative research.

"Guba and Lincoln proposed four criteria for judging the soundness of qualitative research and explicitly offered these as an alternative to more traditional quantitatively-oriented criteria. They felt that their four criteria better reflected the underlying assumptions involved in much qualitative research. Their proposed criteria and the "analogous" quantitative criteria are listed in the table." [Trochim 2006.]

Traditional Criteria for Judging Quantitative Research	Alternative Criteria for Judging Qualitative Research
internal validity	credibility
external validity	transferability
reliability	dependability
objectivity	confirmability

Figure 10: Guba and Lincoln proposed four criterias for judging the soundness of qualitative research as an alternative to more traditional quantitatively-oriented criteria. [Trochim 2006].

Kananen [2013, 189] also indicates this same issue in his book: "The reliability and validity concepts of quantitative research cannot, as such, be applied in qualitative research"

Accordingly, the authors decided to use Guba´s and Lincoln´s proposed way for judging the soundness of our qualitative research since we used qualitative research methods throughout the research.

5.1.1 Dependability

Dependability means: “the need for the researcher to account for the ever-changing context within which research occurs.” Furthermore, the research is responsible for describing the possible changes that would occur in the setting and how the possible changes affected the way the research approached the study [Trochim 2006]. Luckily when authors conducted the focus group sessions no major changes such as a participant leaving in the middle of the focus group interview happened during the interviews which could have affected the setting.

The participants for the focus groups were selected randomly and separated that there were two Finnish and two international groups. The participants of the groups were students of the Jyväskylä University of Applied Sciences and they were all studying the High-Tech management course including topics such as High-Tech industry dynamics, marketing of High-Tech products, strategy models of High-tech companies and managing change and innovation in High-Tech companies. The participants who attended the lectures had some knowledge about augmented reality since there was a presentation held on that subject. They were also familiar with each other which could have helped them to feel more comfortable to provide insights about augmented reality. If the research would have been conducted to people belonging to a same age group but without any knowledge about augmented reality, or without being a student who studies business the results could have been different.

VTT wanted separate groups for Finnish students and students from aboard. Since there were two authors conducting the research, more attention was paid to the observation. While one of authors was concentrating on being the moderator who communicates with the participants, the other could concentrate on ensuring that the recording devices were working well and how the group and individuals were behaving.

The authors could have increased the dependability of the research by having a dependability audit. Dependability audit means: “To provide for a check on dependability, the researcher must make it possible for an external check to be conducted on process by which the study was conducted”. [Erlandson, Harris, Skipper &

Allen 1993, 34]. Unfortunately, we did not have a budget regarding our research and external check by professional was not possible.

5.1.2 Credibility and Transferability

Credibility in qualitative research means: “The credibility criteria involves establishing that the results of qualitative research are credible or believable from the perspective of the participant in the research” [Trochim 2006].

The participants and the moderators took the focus group interviews seriously. We set up rules for the focus group sessions in order to create an atmosphere where everybody would contribute their answers and opinions without other participants interrupting them. People had also a chance to have a break whenever they wanted. Possibly due to the aforementioned and the fact that they were not strangers with each other, made it possible that the atmosphere in the sessions was open and relaxed. It became obvious that all the participants contributed at least some of their beliefs and attitudes towards augmented reality to the research and the authors were able to capture and analyze them. To increase the credibility we could have asked participants to fill out forms where they could rate how credible or believable the focus group interview was.

Transferability in qualitative research means: “Transferability refers to the degree to which the results of qualitative research can be generalized or transferred to other contexts or settings” [Trochim 2006].

In the future, the results should not be generalized to other types of groups since the way they perceive augmented reality might be drastically different than the one studied in this thesis. Furthermore, this research is tied to a specific time, and while augmented reality becomes more known, developed and possibly widely used in the future the results are probably different.

5.1.3 Confirmability

Confirmability means: “Confirmability refers to the degree to which the results could be confirmed or corroborated by others. There are a number of strategies for enhancing confirmability. The researcher can document the procedures for checking and rechecking the data throughout the study” [Trochim 2006].

The authors held four different focus group sessions and the authors were able to get similar results from them even if the participants were from different countries. The focus group sessions were recorded using a digital audio recorder and a video camera. The recordings were transcribed word by word in order to make it easier to find broad themes and subjects that were extensively mentioned.

Since there were two authors capturing and analyzing the results the authors were able to confirm the results with each other. Aino Mensonen from VTT who gave us the research task to find out what sort of attitudes, beliefs and knowledge does the students of Jyväskylä University of Applied Sciences have towards augmented reality and its applications confirmed that authors findings are similar to those resulting from other researches that was conducted as part of the nICE project in autumn 2012 in Scandinavia.

5.2 Further research

Focus group studies provide good insight into a certain topic and authors see it as a valuable tool to understand how consumers perceive augmented reality. The focus group discussions for this thesis were conducted with groups that had 20-30 year old students of JAMK in them. In the future discussions could be held with different age groups such as the younger or older generations than the current students. The insight they provide might differ a lot from the insight that the focus groups in this thesis provided.

It would be interesting to understand what older generations think about augmented reality as this technology might enable development of devices or applications that enhance people's performance in certain tasks, which is after all one of the key motivations why augmented reality has been developed. Having augmented reality assist (elderly) people in their daily tasks could be valuable in the rapidly aging societies of the so-called first world countries. The younger generations will most likely be the ones who adopt the augmented reality as their own on bigger scale if the technology reaches the plateau of productivity in the future as they have lived all their lives surrounded by touch interfaces and seem to fearlessly try out new technologies. Therefore, authors think that they might be able to provide valuable information about the future direction that they would like the augmented reality to take.

Professional use of augmented reality (e.g. surgeons, architects) was seen as one of the potential directions that augmented reality might take. The use of augmented reality during a surgery for example has already been studied and concepts for that have been developed (Philips, 2013.) Understanding the specific needs, concerns and such of different professionals regarding this technology could be seen as a viable option for research.

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Appendices

Appendix 1: Guide for the focus group – Mensonen, VTT

Guide for the focus group

1. Introduction
    - some words about the project
    - definition of augmented reality (AR)
        i. Augmented reality (AR) is a technology that combines real and digital data in real time. Typically, virtual 3D models are superimposed over camera images.
        ii. other versions need to be considered. Should we use words “mixed reality” when discussing with consumers?
    - questions: Has anyone of you ever tried an AR application? Free comments on AR applications.
2. Questionaire
    - see the document “questionnaire”.
3. Videos on AR
    - The following videos could for example be shown to the attendees, other videos will be considered as well.
        i. http://www.youtube.com/watch?v=agwFbTwg9HA
        ii. http://www.youtube.com/watch?v=PGu0N3eL2D0
        iii. http://www.youtube.com/watch?v=AjDjsmr0G14
4. First impressions
    - attendees write first impressions on AR, no discussion at this point
    - attendees should be encouraged to write all they think, there are no right /wrong answers

5. Discussion

- based on first impressions
    i. What are your first impressions on the applications of AR (like, dislike, funny, not funny, beautiful, not beautiful, useful, useless…)
    ii. AR is a way to communicate with consumer. Does AR add value for the consumer, how?
    iii. Would you be interested in using AR applications? Why? Why not?
    iv. Who would be interested in using AR applications?
- The mix of virtual and real images
    i. What do you think about the mix of virtual and real images?
    ii. What is interesting/ what is disturbing
- Practicality
    i. Would AR applications be practical to you?
    ii. Would you take the time to use AR? Why? Does it bring something to you? what? Amuses? Would you like to test a product by using AR? When buying a product?
- Other application areas
    i. In which fields you would expect to see AR applications in the future?
    ii. Who would be the potential user of these applications?

Appendix 2: Preliminary questionnaire

Appendix 2 : Preliminary questionnaire

AUGMENTED REALITY

Age : _____ Sex : □ F □ M

1. Cell phone

o What is the brand/model of your cell phone ?

_____

_____

_____

_____

o Can you download applications on your cell phone ? □ yes □ no

If your answer is no, you can go straight to point n°2.

If your answer is yes, how many applications have you currently got on your cell phone ?

□ Less than 5
□ Between 5 and 10
□ Between 10 and 15
□ More than 15

What kind of applications do you download (more than one answer allowed) ?

□ Games
□ Social networks
□ Newspapers/magazines
□ Dictionaries
□ "Fun" applications
□ Photo applications
□ Applications using geolocation
□ Touristic maps and information

What kind of applications are you ready to pay for (more than one answer allowed) ?

□ Games
□ Social Networks
□ Newspapers/magazines
□ Dictionaries
□ "Fun" applications
□ Photo applications
□ Applications using geolocation
□ Touristic maps and information

How often do you use the applications on your mobile ?

□ Every day
□ Several times a week
□ Occasionally
□ Never

What kind of applications do you use most often (games, social networks …) ?

_____

_____

_____

_____

If there are any applications you don't use, what are the reasons (more than one answer allowed) ?

□ I forgot that I've downloaded them
□ I was disappointed the first time I tried them
□ I don't know how they work
□ I don't have time
□ I have no use for them
□ I don't know

2. Computer

○ Have you got a computer/laptop ? □ yes □ no

If your answer is yes, of what brand ?

_____

What do you use your computer/laptop for (more than one answer allowed) ?

□ Programming
□ Word processing
□ Playing video games
□ Downloading (music, movies…)
□ Emails
□ Internet research
□ Online shopping
□ Writing blogs
□ Chatting
□ Social Networks

○ Do you have a webcam ? □ yes □ no

○ Do you have a digital tablet ? □ yes □ no

○ Do you have an e-reader ? □ yes □ no

3. Social networks

○ In which social networks are you present and since when (approximately) ?

□ Facebook since _____
□ Twitter since _____
□ 4Square since _____
□ LinkedIn since _____
□ Myspace since _____
□ Youtube since _____
□ Flickr since _____
□ msn since _____
□ Viadeo since _____

□ Blogs since _____
□ Autres : _____ since _____

o What do you do on those social networks ? (more than one answer allowed) ?

□ Stay in touch with my friends and family (sending messages, posting comments ...)
□ Meet new people
□ Share photos, videos, music and articles online
□ Follow the posts of my friends
□ Follow the news
□ Create myself a professional network
□ Follow companies
□ Follow brands

4. Les marques

o Do you follow brands **on social networks** ? □ yes □ no

If your answer is yes, which ones ?

_____

_____

_____

How do you follow those brands on social networks (more than one answer allowed) ?

□ I read the posts of the brand
□ I look at the profile pages of those brands in order to follow their news
□ I comment on the news of the brands
□ I participate in online contests
□ I want to benefit from special offers
□ I look at the videos of the brand (ads, documentaries, presentation of new products...)
□ I look at the opinions of other people on the brand and its products
□ I interact with other people

○ Do you look at the **websites** of certain brands ? □ yes □ no

If your answer is yes, which ones ?

_____

_____

_____

_____

What do you look at those websites for ?
□ To follow the news of a brand
□ To discover new products of the brand
□ To watch the videos posted by the brand
□ To see the opinions of other people on the brand
□ To leave comments on the website
□ To send emails (questions, complaints, asking for information ...) to the brand
□ To buy products of the brand on the website
□ Other :

_____

_____

5. 3D

○ Have you ever seen a 3D movie ? □ yes □ no

If your answer is yes, why (more than one answer allowed) ?
□ I was interested in the movie itself
□ I wanted to watch a ***3D*** movie

○ Would you be willing to see another 3D movie? □ yes □ no

If your answer is no, why (more than one answer allowed) ?
□ I am not interested in the movie
□ I don't have the opportunity
□ I am not ready to pay extra money in order to watch a 3D movie
□ I don't want to see a 3D movie

Appendix 3: Focus group interview 1

Interview: Moderator, interviewer

P=Interviewee (1-8)

P1: French Male

P2: Spanish Male

P3: Indian Male

P4: Ghanaian Male

P5: Chinese Female

P6: British Male

P7: Vietnamese Male

P8: Russian Woman

Interview: **Now that you have written everything down i would like you ask from you that what's sort of first impression you had from augmented reality. Anybody wants to start? Do you think you liked it disliked it, was it funny or not funny, useful not useful.. What do you think? Feel free to answer anything**

P1: It's useful.. Cos you can have a really good first impression between fun and customer. So useful for me

Interview: **You think companies should use it?**

P1: Use it.. aa.. Me today.. aa. I have never tried that. But aa… Maybe company that seems interesting im interested by this company maybe why not?

P2: One more thing that useful in business like when some company uses this software you can see the product even more what you are buying?

P3: Useful when comparing two products towards.. to other products but for not .. but really good for buying the product.. it's easy to get the comparison between products to customer

P4: I think video shows the customer is willing to try products on. I mean everybody likes to have own comfort zone I mean trying on products so that they can see or like people selling .. you can try products without buying so I mean instead of everybody have a selection of goods can the product ????

P5: People like buying products without going into those shops .. They can try on products now but all.. But I think there is a problems that when you try the glasses you can just see the difference but you can't feel if it's right for you..

P4: That's very important

P6: This is also what I have wanted to say that it's vivid way one of the effect when people use when they are making discussions and purchasing decisions that you really want to feel. you know.. aa.. The touch is not there.. Those are really key effects on like if someone is trying wine or something .. Like smelling also it's not there. There is no feel, no touch, no smell. It's just not there .. You can just see it

P1: Like with the glasses accessories. If I tell I want buy jeans or t-shirt you can't try t-shirt is it a nice aa.. for me but..

P4: I think that should be the question that can you try on a t-shirt?

Interview: I think you are already able to see because like Ikea has this software where you can try if the closet is fitting in your room. So if you wanna buy a sofa or a closet you're able to see via webcam if its suiting in your room. But maybe maybe. Anything else in your mind?

P7: It's interesting and from my perspective I like because there are two things. First is that I like to entertain it satisfies my need to entertain with games or use it or when to eat something. And second reason is to shop online. I usually buy umm some musical

instruments so I would be interested to see how is it suitable for my needs and for the others.

P2: Do you find you can use it for all products or just musical?

P8: Im just curious about umm of which companies are supporting this thing? Only the magazines like with barcodes or what exactly?

Interview: **Yeah I think this survey is about that is it suitable for larger scale that it can be used more since these hard function tablets are becoming more common so that's just one way to apply it on all the preferences it already has so..We will see**

P5: And if you want to use this augmented reality and apps you have to.. have to download some apps before you can use it? Those apps are provided by the manufacturer or the company

Interview: **I think the company itself provides it but im not really sure**

P6: When company tends to serve this kind of application is it free?

Interview: Of course it's free because when customers who would like to buy use these softwares. Augmented reality is a way to communicate with the consumer. As you saw with the glasses example etc.. Does augmented reality add value for the consumer and how do you think it add value for the consumer?

P4: Does it add value to the consumer?

Interview: **Yeah. And how does it add value?**

P4: I don't understand the question.

P5: What do you mean by adding value to the customer?

Interview: **Meaning like aa. Little bit like you talked earlier that you don't have to go to the store or do you think that when you see that company has applications like these do you think that "Okay, this company is a good company because it does this, a quality company because it does this?"**

P8: The customer…

P2: You mean like what extra benefit does the customer get from this?

Interview: **Yeah, yeah..**

P5: Customer can not, or insists on trying products on, customer can be shy to go to shop to try clothes or something cos maybe they want to buy these products so maybe they want to try with this technology. So they can try it without worrying about this product

P2: I have this last thing to say about you can compare the product with another, or with the same from the magazine or something to establish ….??? and you can compare it from home

Interview: **what did you had in mind P8?**

P8: Well I had in mind that the customer can visualize more without… any extra movements or anything.. you don't have to call anywhere and it saves time and energy

P3: And it's more like stress-free . Customers doesn't have to go to store and say "okay let's find this suitable product for me" ???? It saves stress and time

Interview: Does **anybody have anything to say about this anymore?**

P7: The way I use this application it's so that I for example when I go out with my friends and I put out my phone and I try this it makes me a bit astonished .. I don't know how to say it.. Customer value kind of building a good image of yourself.. The feeling is really… good. Maybe it's not so suitable that I can use but the feeling is really good when using it..

Interview: What about yourself.. Would you be interested in using these kind of applications or similar kind of things? Would be interested for example buying clothes by using this software, glasses or there are lots of appliances. Would you be interested in using Augmented Reality applications?

P3: I don't think so. I think I don't want to try this technology because I want to touch it and feel it what I want to try (laugh). More I would like going in to the stores . In retrospect what I need I can find everything in shops so I like more personal shopping.

P8: Well you can combine the both things first you can visualize it home and be like "hmm, now I want to go to the shop" and touching and feeling and everything.

P1: We need the first time for the fun just to try but aa… But later noo I don't think so.

P3: But this technology is also in the case of excitement like if you go in to the store you can get other things that you might also want . "okay I want this thing but I also might want this". You are able to see more options also

Interview**: And they you feel like buying the…**

P3: yeah

P4: I don't think that the main idea is to the company itself, the main idea is to help customers to like do business. So I don't think we should think of the companies. It between them and technology to develop how to benefit but you are talking about the customer. So with customers then the idea is foggy. As a customer and as a window shopper, window shoppers will be very happy about this technology. They can always try something they want. You don't have to walk you can do your window shopping at home.

P3: I like doing actual shopping not window shopping (laugh)

P6: Where the companies would come in this particular case is in terms on supporting this augmented reality with their products. The more we put products viable to the augmented reality we going to have less people coming in to the shop. So they have to remember to pay lots of rent and other costs and if the customers don't walk in they might just close that shop and do business like Amazon

P4: That that was what I was trying to say. You said it right so. The opportunity in this case that customers don't go to the companies but companies go to the customers, the target audience because the customer have no stress of enjoying window shopping or…

P3: Also this technology like goes with everything like accessories, clothing accessories in that sense all the other people in the store help you ??? You can get the other peoples opinion about how good that product looks and see others point.

P2: Yeah so when you're going to buy, there is no sales person

P5: So you have to know what you're buying

P3: Yes, but that is the same dress you want to buy so in online the ….??? Or you see them in common basis when the others are as well looking at the same product

P4:But then again do you really believe that the sales people there are just there to market their product for you. Example is like like… The iPhone and Nokia Lumia. iPhone has gained so much popularity in Finland and lots of people buy it.. Nokia Lumia is better in options and other uses but people still buy iPhone because people are there to market it. They don't care if it's good or not.. So it's up to you to research what stuff do you want. You can read about it if it fits your preferences

P3: Not, not just about the sales people but then you have your friends and then you find something. I don't think you then go for mobile purchase then single. But in physical shopping basically aa.. Physical shopping is more than is different because you may not buy the same product as others. Other people will say that buy this this is a good product or don't buy this this is not a good product.

P2: I think you can't compare augmented shopping, internet shopping and window shopping and physical shopping they both are different.

P3: Yeah im just saying my point of view

P4:If I go to the shop and I want to buy something and you say it's not good it depends on what you are selling. I have my own view and preferences . Maybe it's good for me if I use it you understand. So maybe that's the one that doesn't effect me so much. So that's why I think I mean??

P2: My opinion is that this online shopping can be as typical as window shopping . If we think about the window shopping market the market ok.. it's different than physical.. It's sort of a option that you can go to the market to buy or do it online.

P3: It depends on product what you're buying. Like if you are buying tech products you can't risk so much

P2: yeah, it depends on the product.

P3: So yeah it's good on some products that are not so important on daily purposes. Talking like bags or something. But when it's more important on daily purposes I might have to to physical stores.

P7: I would use this application but I wouldn't take it seriously. I will buy small purchases using this technology but not big purchases.

P4: Do you need to go the website of the manufacturer ?

Interview: **Yeah you might need to the website to download the application. Like on IKEA example you go on their website and try out the application in there via webcam. So it's a small software basically. So we already covered it here that who would be interested in using augmented reality application in this room but what kind of persons would be interested in using this new thing? Is it for older people or younger or what kind of person?**

P6: I think it has to with educated people usefulness of this product. I think the more people understand what they can do with this product the more people will be interested in it. And the usage also. Let the knowledge of people that there is a product like this and how useful it is. Then after that sky is the limit what people can do. At the moment for me even the first impression was that there is not a need for me a product like this right now. I do go shopping when I want to go shopping . I actually like the feel going in shop. So there is not a immediate need . So the more you get to explore this product . Like I was thinking that If this product is viable and I want to rent a car, I would check a rental company which sort of a car I could actually drive. What I mean that you can really explore . Like the sky is the limit you can really do. Like flying with the finnish airways or (laugh) see myself in a going on a holiday in Ibiza I would be able to see the hotel room like "oh, there you go"

P4: Yeah that's really good.

P8: Yeah but there is still a need for development

Interview**: So any other opinions on people who would use this?**

P8: I don't know maybe people who are starting engineering . They could use it as a part..

P5:… of their work

P4: But I think sex-wise women would use it more because they always want to shop. (laugh) because they are window shoppers.

P6: Actually it's a really big relief to guys

(laughing and mumbling)

Interview: **So, then about the mix of virtual and real images. What do you think about the mix of those.. Do you find it interesting or disturbing to you.. Things like this, what do you think? Fascinating, disturbing what are the words that come to your mind?**

P3: We don't know exactly what.. Amazingly we can now have some competition from home

P4: I think this also approves on the notion that in sooner or later in the future it will become people with less workload (laugh). Maybe you can apply the technology in that

Interview: **What about you P1. What do you think about the mix of these virtual and real images like we saw on the videos**

P1: I think today it's more communication like leisure or games or everything. But I think it's not very interesting.. I don't know he said that sky is the limit so later I don't know but at the moment no.

Interview**: Now about practicality. Would AR applications be practical to you ? Like we have talked about shopping and stuff is there anything else practical applications that you would use?**

P5: There is this company called ??? or something like that … How would I say.. And there he wear a glass and tried to repair a pipe or something. He doesn't know how to

do it but when he wears these glasses he can see some sort of instructions to help him to repair this pipe

Interview: **So it could be really practical in workplaces?**

P5: yeah sure.

P1: When you are on the streets and not sure about anything with the address and direction I know the way in reality where to go

P3: One place to apply this is tourism as well. You could go to different cities (thru AR) and see what sort of hotels they have. So in a way they could have augmented tourism (laughing). It's like for people who would want to go Canarias islands you can just stay home and see the experience. There would be like real tourism and virtual tourism

P4: That is interesting

P3: In education this could be applied as well like in engineering or in medical school

Interview: **So what about you in future. Would you take the time to use AR? Like really?**

P8: Depends on the need

P1: If technology improves then yes

Interview**: Well how about now. If everybody would need a pair of glasses would you, and you know that it's just few clicks away . Would you take time really to try on those glasses?**

Many together: yeah! (32:44)

P1: Yeah I could try it but not buy

P3: Im not against any technology, I would try it but not buy

P4: Not related to the question **but could I take a picture of myself when** trying on the glasses

P1, P6: I think you can

Interview: **Well does it bring something to you? Like it brings ofcourse like when you want to try on the glasses it gives you the value that you don't have to walk all the way to the city to try it. But does it bring any other things to you than easy access?**

P1: I wouldn't be so interested in trying on the glasses in home but I would be interested on trying some other things

Interview: **Can you give some examples what you would be interested in trying in?**

P1: For like shoes, for like dress-up that kind of things

Interview: **Like clothing**

P1: yeah like clothing

P4: I think it eases the decision making of the customer would have time to choose whatever you liked compared to the shop where you have pressure of buying

P8: Or the salesman tries to sell you the product that nobody wants

(laughing)

P8 "cmon this is good buy this eventhou it's kind of… shit

P6: I think it also reduces the time used for shopping because if you really have to go and look for something you actually like it takes a lot of time, you have to go from another shop to another. It's just sort of difficult and you spend ages on in the shops, in the changing rooms, this type on suit and then the next one and you just feel that it takes forever

P8: It's good for the business people that who don't really have time you need suit from.. I don't know.. for the special occasion and you simply don't have time and your secretary is busy.. you just can try this out, check the address, what colors it has and everything and it just wastes five minutes of your time..

P4: It's also opportunity for the businesses. Because the …. If you go to the shop and u try on clothes and as much people try on clothes they get dirty.

P5: Think about this if other people have already tried the product before they come to the shop, they have higher possibility to buy the products.

P6: Yea it eases the decision-making. If you are going straight to buy something and you already know what you want

P5: Basically the customer already decided to try that product

P8: Really time saving

Interview: **Atleast some of you would be interested in buying some products through Augmented Reality applications**

P6: Im sure many of us would

P4: It all starts from fun and then it goes to the buying stuff

Interview: **What about other application areas? So in which fields you would expect to see Augmnted reality application in the future**?

All together: Video gaming

P3: Video games, tourism,

P4: I think it wouldn't work on touruism because everybody nobody would go on trip anymore because they can experience it from home

P3: Yeah but you would have to buy to experience the augmented reality tourism. Maybe not that much but a small portion for trying that virtual experience.

P4: But it maybe difficult since every single country have it's own law and jurisdiction and they might not allow this service to happen there.

P1: I think it can't work for all the industries.

P6: Like we talked about this earlier but I think it might work in medical areas . I'm thinking about this from medical point of view that .. doctors.. Like someone is going to have a surgerory and he could see how for example his legs would look after the

surgery. It freighting and dreadful but it something that prepares people to see themselves

P8: It could be also used in the medical things for the students who are in the medical for the in the medicine

Interview: **In medical schools?**

P8: yeaaah visualize the insides of the person or whatever so make it more practical and everything and how it looks like after surgeries or..

Interview: **It was also interesting topic you were talking about P5 That you could use it as part of work when fixing something**

P5: Like if you are having a surgery and it could give you instructions and advises how to do that.

P6: Yea it could be good for medic surgeries

P3: It could be also good for haircuts like how would you look with this haircut

P6: I'm talking about much more than just haircuts or talking like if you would have a severe injury

P3: Yeah but there is already existing systems on how do you look like after a surgery.

P6: but im meaning like severe injuries like burns on the face caused by a fire. Then they could show you how you would look after the surgery. Think yourself outside the box you're limiting yourself. You could see the end-result of your fixed face before you even go to see the doctor.

Interview: **What about you P7?**

P7: For me it's more of entertainment

Interview: **We little bit covered this already but who would be potential users of these other applications and we came to the conclusion that people at work would use this, shoppers, people who are going to plastic surgeon could use this and entertainment.**

Do you find anything else? Anything that else what sort potential users the would be for this?

P8: I think it would fit in the skype thing they want to see more detailed picture of the chat and it could be very useful in that area. Or there could be a connection like if you want to see another person in specific moment and it could be different

Interview: **Anything else in your mind? We covered this pretty well but I think we are quite out of ideas? What do you think?**

P8: Yeah we are pretty much out of ideas

Appendix 4: Focus group interview 2

M = Moderator

M2 = Moderator 2

P = interviewee (1,2.. 8)

P1 = Russian female

P2 = French male

P3 = French male

P4 = Russian male

P5 = Russian male

P6 = Russian female

P7 = Bangladeshi female

M: What are your first impressions on the applications of AR? Did you like it, dislike it, funny or not funny, useful or useless?

P1 (F): In some of them it was useful, for example the one where girl was trying glasses. This kind of stuff I find useful. The one with the Lego stuff, for me it doesn't make any sense. The first video wasn't clear enough, the first impression about that is.

P2 (M): Most of the times appear more like a gadget, like it is funny the first time, not so interesting. For the lego thing, I found it useful. If the new product is in a box you can't open, you can visualize it. But the bottle of the wine example, I really didn't get it.

M: It was in Finnish (the wine bottle example), but it was kind of a competition. If you managed to hold the bottle then you have a chance to win something. It was a bit unclear because it was in finnish. Any other comments?

P3 (M): I guess it's very helpful to understand the product. I guess it is a good tool, but not an advantage for marketing.

P4 (M): I think it can be used to attract the customer's eye for a while. But it can be used mostly for fun purposes.

P5 (M): Also from a customer point of view I think that this is mostly skipping the reality. Meaning that I mostly spend my time with something augmented, unreal, and trying to as it is in the third video trying to imagine how to the product is. Can be used for marketing. For a customer, I will rather go straight to the store and try the glasses there.

P2 (M) With this you can see the product but not touch it. I think it (touching) is important.

P1 (F) IT is not a real look, for example when she was wearing glasses, you could tell that it is not real. You can see it is a fake image so I would as well rather go to the store and try them. But it looks interesting. The first steps, it is attracting interest but after a while you just stop using it (the app)

P6 (F): In shops you can ask which glasses are better.

M: So it is hard to evaluate from this virtual image if the product is actually any good?

P6 (F): Yes.

M: Any other comments? Nobody found the augmented reality annoying or anything?

P4 (M): No it is fun actually, but if you face it everyday it might be annoying.

P6 (F): It is good for those who have an iPhone, I haven't got one.

P5 (M): I also wrote here that you need an expensive device to use this application. I heard about Google Glass, they cost money. You have to pay for it, buy applications, they might break and then you have to fix them. So yes, it takes a lot of money.

M: AR is a way to communicate with consumer. Does AR add value for the consumer, how?

P4 (M): If you want to communicate with a consumer you should do it person to person, not just give person something to see. If I use augmented reality I don't feel like I am communicating with the company, it feels like I am just communicating with the product itself. I get acquainted with the product or the service but not with the company.

P5(M): I think AR could be a good way to present the company. If we have something 3D and from mobile or glasses and there is presentation in 3D form then it might work. But for the product AR is a no.

P7 (F): I think it is good for construction companies. You can show all the parts all the design from each and every part. More visual for the companies.

M: You mean like you can show from different angles?

P7(F): Yes, from different corners. What it is likely to be after the company has finished the construction, you can show that.

M: Would you be interesting in using AR applications? Why? Why not?

P1(F): It would be interesting in the first time. For me most applications that I have downloaded for my iPhone I don't use them anymore. Newspapers applications I use for longer, but for games and stuff like that I maybe use them for a week and then after that not use them anymore.

P4(M): I think it would be interesting for students to try it but not use it every day. But for older people I think they will find it difficult to use. They don't want to face those difficulties.

M: You mean this is so different to what they are used to?

P4(M): Yeah, maybe they don't want to step over that barrier, what they have seen before. I think it won't work with older people.

P2(M): For me there was one app that I could use everyday. It is a Nokia app. You can see stuff around you.

M: Nokia City Lens?

P2(M): Yeah, you can see restaurants and stuff around you. This can be used every day. Then again it is not perfect, sometimes. I think this technology should be improved, I think we can do something better.

P4(M): I remember using one application for a couple of weeks, it was called World Dictionary or something. When you see a text on your iPhone, it automatically translates the text. You see the text on (translated) on your iPhone. It is now in alpha phase, but when in the future it is developed I will use it because it is so easy. You see an unfamiliar word in a book and then you can see the translation.

M: Do you think that the whole AR is in the beginning of its path, but in the future it could be huge?

P4(M): Yes I think it is just starting to develop because all these technologies it is like computers. They will be develop more and more, I think it is just a matter of the rise of this technology. Think we will just have to wait a bit and it might be used in everyday life in the future. For example I could use the dictionary app every day.

P5(M): I think it is also about people. I am a pragmatist so I will never use this augmented reality. In my ordinary life, in routine, because I want to live in the real life, see the people, how they smile and so on. I don't want to see it through a screen all the time. We see a screen almost every day nowadays, for me it is more than enough.

P1(F): Yeah, it is getting more and more unrealistic like if I can say so. All these applications, you are just totally inside computers and phones. I will not use this applications so much.

M: Too much technology?

P (many): Yeah.

M: Who would be interested in using AR Applications?

P4(M): I don't think it is so much about age. It depends on the people's perception of innovativeness. If they are innovative, like for example if there is an innovative business man and an AR application is really useful for him then yes. This is about trying, you have to make the user try this. Conservative people don't even want to try it, if a person tries and finds it useful there is a big chance he will use it.

P6(F): I think it also depends where the person lives. If you live in a big city, you are working every day and you really don't have time to go shopping or to choose some present for your children so it will be useful for those people. It can save your time.

M: So you can do all the testing from home?

P6(F): Yeah

P7(F) These could also be used in saloons. I could see what kind of haircut would suit me. If I use this application and check which haircut suits me I could tell the hairdresser easily how to cut my hair.

P3(M): I think that for the us and for tourists. There is a lot of potential. Take your screen and you can see that here happened a battle in 1905. See how it happened really, huge potential for those interested in history. You cannot live anymore only through videos, books and so on.

P2(M): For kids, they don't have to have an iPhone. They can use it via webcam, I saw this one example with Pokemon cards or something. You just put the cards in front of the webcam and then the pokemon's will become alive and really fight there. Kids games.

M: Do you think there are any differences between men and women?

P1(F): From my point of view it depends on girls. I am not so good with technology stuff, complicated is bad. I don't want to use it anymore, maybe max once a week. I think that the guys understand this stuff more, telephones, applications, computers and so on I think guys are more interested in this. And games, guys are more into games and stuff. I

think it depends on the gender, but of course people are different so there are some girls who like this.

P5(M) I think that men, especially in Finland, put more attention to these kinds of things.

M: How about age, does it matter? A 60 year old man or 15 year old man, any difference?

P4(M): I think young people deal more with technology than old people. Fun, entertainment applications are mostly for young. Older people they just download applications for business, for dictionaries and so on. They don't want to try something that will distract them from everyday routine.

P8(M): Augmented reality market is segmented based on young at heart and the young specially. Old people wouldn't be willing to try, some would but not the majority. They are not interested in the extra of augmented reality.

P3(M): I think that the time augmented reality will be perfect and more closer to reality the current young people will be old and the age won't matter. I know 30-40 old people who use smartphones so it really doesn't matter.

M: The mix of virtual and real images. What do you think about the mix of virtual and real images. What is interesting about it, is it disturbing?

P4(M): I think it is when it augmented you can see it but you cannot feel it. You cannot say if the glasses actually fit you, if they are your size. It is about feeling, people like to feel the product, not just see it. For example when you are in a shop you want to touch the products, the material and so on. You cannot see the quality on the screen.

P1(M): I don't think that this kind of application, for example this glasses stuff, I don't think that yes I chose this one and I will buy this one for sure. If you are planning to buy glasses and before going to the store you can see how the models look. You cannot escape the real life, the application gives you an image, but you cannot really buy it with just help of that. It is really helpful if you don't have that much time to go and try in store. You need to use some time in store as well, you can try the glasses with the help

of AR but it might be that the glasses don't fit. It gives just the image, that's it, nothing more.

P8(M): When it comes to mix of virtual and real images, the trend is nowadays that internet shopping is growing more and more, it is hurting physical stores. Yahoo just said that many physical stores have had to close their doors because of this. You can sit in Finland and shop in China, therefore use of augmented reality can help you try what you want.

P4(M): I think AR should work with places, something that you shouldn't feel. For example tourism, you don't need to feel it, you just have to see it. I think that is the future, not the fitting things like. Of course i see if I can fit these glasses, I will use this application to find the shape of the glasses but not the model. I still do the choice in the store, it will be a bit faster with the help of application.

P2(M): That's why I think Google Glass, because it is based on things you need to see not touch. If you need to see a map, if you want to skype you can do it and so on.

M: Do you find it disturbing that there might be too much virtual stuff in your eyesight. For example in the case of Google Glass?¨

P2(M): Yes, then I think you need to choose what you want to see. If you look at the street and only things you can see are the advertisement, then it is annoying. You need to be able to choose what to see.

P5(M): It shouldn't be too much. It depends on the country and the living conditions. If you are in Finland AR might work. If you are in Moscow where everybody is busy and many things are happening and the living conditions are totally different, then I think you will accidently walk on someone and the story will end. In big countries like China, India, Russia, Brazil, well might work in USA, in the big countries it won't work because there are too many people around you.

M: Question about practicality. Would AR applications be practical to you? Some of you have discussed a bit about this, for certain purposes it should be good. Some of you mentioned shopping, tourism and so on.

p7(F): For business purposes it might be alright.

P3(M): Cooking, I have seen smartphones that can project stuff. You could see how something should look like and then you can cook it.

P4(M): I think it depends on the application if it is good it can be practical if it is not if it is just for fun you cannot use it as a substitute.

M: Would you say if it is fun you would use it for a week but if it really is useful then you might use for longer?

P4(M): Yes, and if it is really useful and if they can implement this technology into something useful then it would work.

P8(M): The tourists. As a tourist you need a tour guide, now you wouldn't need to rely on them. You would have the control on what you want to see. A tour guide will only show you stuff according to his/her previous knowledge, with AR you have a lot of information at your fingertips.

P5(M): I also think that print media would work. As in it was in some video, you look at a newspaper through a screen and there is a video. You need glasses for print media and then you will be able to see more stuff about the magazine. This might work.

P3(M): For movies, if you see a poster in the streets you can see a trailer of the movie through your device. It depends on people, if they accept being a part of life in internet or just reality stuff. Like for example P5 who is pragmatic person, you don't want to rely on technology. It is normal, it depends on people.

P1(F): I see all this stuff more like for fun. Like for example the hairdressers, sunglasses or if you try something before going shopping.. Again it is really not realistic, it gives you a wrong view. Same for cooking, you are not going to cook the thing; everything will not look the same. It just gives a fake view, for me this is just for fun. I could use it, but not for something useful. If I want to cook it won't look the same as in the picture. It is different, like with shopping or hairdressers stuff, you will try how it will look like, but actually it just like you are playing Sims. The same when she was trying the glasses I saw

it as if she was in the game. It will not look the same at the hairdressers, and same with cooking. I don't think it will be useful, at least not for me.

P7(F): Yeah, but at least we can see which hairstyle suits a person.

P1(F) Yeah, but it is still different.

P7(F): It is different, I just mean to say. If hairstyle doesn't suit me then I will have to wait so many days that it will take a lot of time.

P4(M): I think you can see if this or that haircut is good. I think it will work, even if it just approximate, even if it is not that real you can still see the shape.

P2(M) To have an idea.

P8(M): With the help of AR you won't only have the mental image but you will have some kind of augmented picture how it will look like. You can see a picture.

P3(M): I think how quickly it goes with technology, I don't think that graphic or image will be an issue in the future. It is very realistic already, see for example movies and games. I think graphical issues will be solved, just a matter of time. They will be better in a few years.

P2(M): I think so many AR applications are for advertising products. When you want to translate something, see stuff around you. I will use if it allows me to do something faster than the classic way. E.G, if I just need to point at something with my phone and the video appears, it will be fast, yes I will use it everyday. Same with iPad, first I thought it is useless, a computer is enough. Then I got an iPad and I realized that it is so much faster than my computer, looking at internet. If it allows me to do something faster..

M: Would you take time to use AR? Some of you would take time to use if it faster.

P4(M): I think AR should save time, not waste the time. So if it useful and if it doesn't take longer than it would take in real life, I can take time to save my time.

P2(M): Maybe sometimes you can think that you can save time, for example with the sunglasses example. But if you still need to go to the shop you will actually use time.

P1(F): So again, just to see, just for fun. I can try, why not.

P3(M): I don't think it is a matter of time, I think it is about how much information you really want about a product, how much you want to get. If it really fits you (about the glasses), I don't think it is a matter of time (time spent)

P5(M): Think it is also about needs. What you really need.

M: Could you make a purchasing decision based on this. For example the glasses, if you only look at them with the virtual thing. Could you make the decision with only help of that or do you need to go to the store?

P1(F) Yes, I am not so big fan of online shopping. You know just look at stuff in the internet and after you buy something. For me anyway I need to touch it, see it on me, I would not just buy by looking at this virtual thing. I would cry if I would spend money on something that doesn't fit me

P4(M): I think that if a person has to have an opportunity to touch it, it shouldn't influence the decision. For example, if I cannot touch it, if I have to order it from online, and they cannot actually physically touch it. I can use AR to see it and buy that thing. If I need to touch it, then this (AR) won't help me.

P3(M): I personally already bought clothes on the internet, AR can help me buy more things. It can help me decide to buy or not. For example buying a t-shirt is easy, but if it can help then it is good.

P8(M): Personally for me it is a plus. Online shopping before AR has been dead. It will help me make the purchasing decision, I can see if it looks nice. In addition, return guarantee will help me with my purchasing decision.

M: In which fields you would expect to see AR applications in the future? Now there are advertising agencies, do you see potential users? Hairdressers were mentioned, tourism..

P5(M): They should focus on people's needs. What people need the most. They should work in that sector.

P3(M): Teaching maybe? You could show how to do things? For learning something?

P8(F): Maybe online education?

M: So it wouldn't only be for consumer but also for professionals?

P3(M): Yeah and for people who want to learn something.

P2(M): Architecture, visualize the house.

P8(F) Also fashion designers and interior designers and all that. Which thing to place in which part of the room. What would look beautiful.

P4(M): I know an application where you can go inside a house and you can see a distance from a wall to another. It is useful for those who fix a room or something. You can put a camera and you can see the lines, for example four meters, you will get a better understanding of what's happening. of how it works, the measures.

P8(F): Also the directors of 3D movies. We can feel as if we are inside the film, like we are part in the film. Like we would be the actors.

Appendix 5: Focus group interview 3

M = Moderator

M2 = Moderator 2

P1 = interviewee 1, male Finland

P2 = interviewee 2, male Finland

P3 = interviewee 3, male Finland

P4 = interviewee 4, female Finland

M :What are your first impressions on the applications of AR (like, dislike, funny, not funny, beautiful, not beautiful, useful, useless)

P1:At least the last video, where the woman was trying glasses. I didn't know it is possible to make that kind of applications. It was pretty nice, and pretty helpful also. Then you can find a place where to buy those and that's it

P2: The first thought I had is that I have some experience in AR applications from before and still now I have the same thought that they are nice toys and you know they look handy there, but are you going to need them more than once. For example in a case like this that you look for glasses, ok you find nice glasses but you are going to uninstall it (application) because most likely you aren't going to buy new glasses the next year or in a long time. For me the first thought was it is a nice toy, but is it useful in a long run? Am I going to need the application?

P3: I had the same that it still seems a bit toyish and unnecessary. If you read a magazine and you still have to hold a smartphone all the time and then start to play a game, I don't think it is going to happen. The Lego thing was quite brilliant, that you can see the

whole product and in 3D and in real size. I think in the future they are going to have some promising applications, but now I think they are still toys like P2 said.

P4: For me if it's used for commercial purposes for me it doesn't add value to my life. But if this AR can make an application that will make my everyday life easier, or make my studying or working easier then I might be interested about it. But for this purpose, for commercial or buying, it is not interesting for me.

P1: I think in the future it might be the same thing as with the touch screens, it was just a gadget in the first place but now everybody is using it.

P2: It really depends on the developers that are they going to come up with something useful. Of course if something is fun, if a game is fun enough sure it will work. And there already are these kinds of games that are using the mapping system. Android has a game where users are meant to conquer places, it kind of makes you go out and do stuff but still it is a toy. In that sense it is not that useful. Maybe I think too much AR just with the smartphones and tablets, because there was lego thing and as P3 said I also found it really. If all that it requires is a printed barcode on the actual box and then the technology on the screen then I see it as a good bonus, if it is not too expensive for let's say lego stores. Why not?

M: AR is a way to communicate with consumer. Does AR add value for the consumer, how?

P2: Not really at this point.

P3: Yeah if it looks like that, but at this point I don't think so

P2. It is a nice bonus. You find an advertisement in a magazine and get that coupon, how many people are actually going to do that? (the sparkling wine commercial?) Who are going to realize it is actually there. Of course if things like this become more common, people would try out. I have seen so many of these QR codes and these kinds of posters and you are going to get a message if you look at it. Why should I look at it? I have no idea what it is. I am not interested enough to find out what it is. I might have the same thing with AR that this kind of potential is there but I never use it.

P4: I think there has to be certain purpose for the use of that. Because already there is information overflow on the internet, even if you are websites. There is already information overflow, then I don't see any particular reason why it should add value for the customer.

P1: I think the only value are the discounts and points. Nothing else. And it is fun.

M: Would you be interested in using AR applications? Why? Why not?

P2: really depends if it useful for me. I feel that I am kind of a pragmatic person in a way that I like to if I do something I want it to be useful some way. Let's say when it comes to a smartphone, it is only a small window that I see that it feels so limited and it doesn't naturally come here (in front of your eyesight) if I want to see something. So, in that sense I find it really unnatural because AR is supposed to be, the way I would imagine it, the way ppl have explained it that you get to see extra digital stuff in the real world. In this way the Google Glass is the first one that really interests me. Because your hands are free and you just see stuff there.

P3: I am also with P2, if you go around if you want find a restaurant I like to search the map. But if you try to look at the screen and everywhere it is really not useful.

P1: Same thing here.

M: Who would be interested in using AR applications? What kind of people, young, old?

P1: I think a little bit younger than we are.

P2: and these kind of high tech people who are, for whom high tech is a way of life. They are really are interested in trying things out and kind of even forcing this new stuff on them because it is new and it is cool. I know these kind of people, that they might not find it practical but because it is new and you know this is something they want to do, they do it.

P1: In my point of view these applications are in the point of chasm right now. At least I think so.

M: So you mean that there are early adaptors using it? But not the early majority?

P2: Sometimes it feels like because this early majority, or early adaptors are so highly enforcing this. That this is cool and you should do it, when I start to think about it still feels so useless, but the more they try to advertise it the more I think it is useless, sometimes. It is not doing any good for me at least.

P3: Same for me.

P4: I see big potential in teenagers. And in people who like to go shopping a lot. I can see that one of the application, I am sure young teenager would be really excited about it. They could compare clothes and that kind of things.

M: So you can do it from a distance? You don't have to go to a store to test it.

P4: Yeah

P2: People in general who grow up with technology. I mean people older than us they don't need the internet for anything, they simply don't. They come up just fine, they find the information they need. Where as we are pretty helpless without web or computers. I think it is the same thing with this kind of AR, if you really grow into it, you learn how to use it and it will come naturally to you.

M2: You still see a big difference between your generation and the generation after you in this respect?

P2: Yeah, there are so many novel ideas. We are already using computer really effectively, we are not only using one way, for emails or for paying the bill, but for everything. but still we kind of find it that these new really radical ideas, we are questioning if they are useful or not.

M: The mix of virtual and real images. What do you think about the mix of virtual and real images? Does it disturb you?

P3: I think in the advertisements it looks really nice because it is like in a movie. You can see the big screen, but in a phone I think it is disturbing your view when it should really help you.

P1: in the last video it is really helpful, it is not real but it is helpful. In that way it is pretty okay.

P2: For me as an idea, I have nothing against it I think it is great if I would see here (in front of me) an information screen or something. Or just from a phone if it would be easy enough. I think it is really great. I think the applications themselves, I think the practicality is the problem right now.

P4: For me it depends on what kind of information it is. If it is useful for me, it is good but if not, no.

P2: No advertisements

P3: You would get spam messages in these.

P2: There were news that they are not allowing any advertisement in Google Glass. Going to be pretty nice.

M: Would AR applications be practical to you?

P2: That is kind of a hard question. We really don't know what we need, what is practical what is not. I would say something that is as minimalistic as possible, but when I want the information then I would get it. That would be practical for me. In that sense different people have different opinions on what is practical but I'd say practical is something that I could use every day. Not these kinds of applications that I might need every now and then. For example I have an old phone I am not going to store tens of different applications for different purposes. I started thinking here that is it practical to have many supporting applications do I need for my phone in my every day life. One that I can use for everything, 2,3 ,4 ,5 ,6 so that I can this fancy 3D picture of this magazine. For me that would be stupid.

P3: I think in the future there will be something practical but I still don't know what it could.

P4: I think it depends on the device. If it is really small it should be something like pictures. It totally depends on the device, how the information fits.

M: So there is a big difference if there is smartphone or a tablet?

P4: Yes, exactly. If it is a small device and I need to find a lot of information I will choose to go to internet and choose the big screen.

P2: Problem for me and tablet is that it has a bigger screen but then I just feel stupid holding the tablet (in front of me).

P3: One interesting thing that could be practical, but you can also do it on a computer. If you design a room and you want to put furniture in it and then you can look through how it would look like. Not practical for me but for someone yes.

P2: This gave me an idea, professional applications. Really developed applications for professionals, lets say interior designers and stuff. That's a whole different market, not just commercial ones. They might keep it for a long time in their device because they are going to use it. If I get that kind of application, sure it is cool to try the application a few times but when I actually buy the furniture do I need the application anymore?

P1: Where do you need professionals anymore if you have that kind of applications? Those applications do everything for the professionals.

P2: You know they still have the design eye. It doesn't magically turn me into a professional interior designer to have an application like that.

P3: The app doesn't understand everything. For example, shapes, colors and stuff like that it cannot understand.

P1: Maybe it can some day.

M: Would you take time to use AR? Potential for long term use?`

P4: If it is on an iPhone, or some mobile (device) I don't think I would use the application because I have internet. But if I have to purchase device of AR then I would use a lot of time to learn how to use it.

P2: Because if it is worth buying then you know it is worth using. In this situation it always boils down to google glass, it is the first one that actually seems to be the AR that

we thought it would be. To have this kind of thing in your field of vision, that's the way I would see I'd be using AR more. If it wouldn't affect my everyday life that much. Now I have to take my phone, wait for the application to load. The thing I might take two seconds to do I have to spend double the time to do it with my smartphone, that doesn't feel really smart.

P3: There was a question why do you get disappointed in some applications. That on the first try it doesn't feel right, doesn't work right. I think with this application it might happen because it is so new. I will get frustrated really soon if it doesn't work in the beginning.

P2: We have expectations, we watch some trailers of how easy it is. But now you have to create an account, you know it doesn't give you that feeling. It has to feel practical and really natural.

M: Would you like to test a product by using AR? What kind of stuff would you try, anything specific? What kinds of products?

P1-P4: yes

P1: It is always fun to try new gadgets.

P4: IF they would provide some kind of gadget for sports. E.G. sometimes when I go jogging or if I am going to spinning it is a little bit boring. There is just music or something. If there would be somekind of extra stimulation, I would actually be really interested in stuff like that.

P2: There is actually a few application for your running track. It works really well in google mapped cities. You put where you are going to run it kind of has this, it is pretending that there are zombies running after you on that route. You have to run fast enough for them not to catch you, you get points and in the end you can share it with your friends. But of course it doesn't work here. You never know what kind of stuff you can come up with

M2: What kind of product purchase situations there might be where you might look for support with your decision with a help of AR? Is it events, or some product category? E.g. the glasses, there are so many options and so on. Clothing?

P2: I think clothing is kind of challenging to try on because it has to be really accurate to see if it fits or not. Not just have a picture of the clothing on you. But lots of different kind of technology, phones, computers you could have a 3D model to see how it looks like in general. Lots of different kind of products to see how it looks on you, hats maybe?

P1: With the same principle, for example shoes. It is basically 2D you can see how it looks and then you could buy it from an online store. It is pretty handy

P2: I don't know how the tech works, maybe clothing could work, shirts and stuff. I'd say clothing is a really big thing. Accessories, watches.

P1: It would be really handy if you could take a picture of your foot and then send a picture. It would automatically analyze how big your foot is and it would send it to the online store, then you would get the right shoe.

M: Do you think there is any kind of price limit for this? Does it have to be a cheap product or can it be expensive?

P3: You would have to test products in the store as well

P2: It really depends on the product. Glasses and stuff that you actually physically have on it is also about comfortability, it might look nice but does it fit. Same with hats and watches. But when it comes to computers or any other product that you just kind of look around to see dimensions and what it looks and feels like. I'd say that is where you might make the choice, by looking at it online.

M2: Glass example seems to be the one that raises most discussion. Would you buy the product only by using the application, an online purchase?

P1: Based on that application I could buy the glasses based on that. Because you can basically see it in real life.

P2: Maybe.

P3: I would go to a store, the decision would be faster. I could see what kind of glasses and maybe the brand but I would still go to a store and find it out.

P2: In the video, when she pressed purchase it showed the store where she would had to go to buy them. But it really helps you make the initial choice, screening. Then you can go to a store and then" I want these ones, can I try them. They look nice I'll take them. " The time spent in the store goes down. You go in for five mins and then you go out.

P4: I would go to a store. AR only gives you something that you see, but you cannot see how they feel. What kind of strengths are the glasses. It doesn't give you the full knowledge.

M2: So in the same time it is helping but you adding risk if you buy it only by help of AR

M: In which fields would you expect to see AR applications in the future?

P4: Games

P2: Games and surprisingly, when I first heard about AR I didn't really expect it, but fashion for example. And clothing. It seems really natural there nowadays, because trying something on is the biggest thing, especially in online stores. Because something is so cheap there, but the biggest problems is if you are willing to take the risk and order it and find out it doesn't fit. If you can get a bit closer to knowing whether it looks nice or fits nicely, then I think it is a big bonus.

P3: We talked about it, professional designing.

P4: Architects. Buying House.

P2: You can basically go on the site and see how it looks. Of course architects can see the 3D model on their computer but then when you actually go there you can try it with the noise and atmosphere, does it fit there. These are big things for them I guess.

M: Who would be the potential user of these applications? Certain kind of professionals? Some other groups of professionals, consumers?

P2: Any professional. Any person that has the gotten used to computers and smart devices. Somewhere in the future it also depends on the attitude as well. There are older people that are totally fine with smart products and smartphones and applications.

P1: Those kids who are now 8 and they have iPhone 5 and they are using those iPhones better than their parents. They are going to be the users of these kinds of applications in the future I would say.

P2: And even for them it really boils down to which is the most practical and functional application. Even them they are not going to use it just because, if it works and it is useful for them then maybe. Most likely.

Appendix 6: Focus group interview 4

Interview: Moderator, interviewer

Interview2: Moderator

P1: Finnish Male

P2: Finnish Male

P3: Finnish Male

Interview: **What are your first impressions on the application of Augmented Reality. Did you liked, disliked it, found it funny not funny, beautiful not beautiful, useful, useless?**

P1: it was entraining, fun, and seems that it can be applied to various usages

P2: it can add more value to the product cycle and it can put on additional info and different look to the product and then those competition. it's quite interesting

P3:yeah I don't know about what future will bring but at least at the moment and based on the videos that using this kind of things that you can still do like going to the store and fit on the glasses but basically but it kind a bring value if you check it from home for exampåle that fit it overthere. but like like that like I said that basically that for it it looked fun, and it was kind fun usage and you can like check on that magazines and things like that

Interview: **Mm, so there its supposed a bit useful and at the same time it's fun there is a fun factor**

P2: yes yes and also that finding the glasses fit the phone.. I don't know.. that's like on the other scale how useful it is but then I think that most fun is those additional things that comes to magazines. that you can scan from paper and then you look different stuff on it

P1 yea it kind of brings interactive dimension on advertisement

Interview: **Was there anything you disliked?**

P3: I don't have so much experience on that so basically that kind of videos bring the good sides of that but I don't know what the bad sides are.

Interview: **So basically we talked about it already augmented reality is a way to communicate with consumer so does augmented reality add value to the consumer and how does it do it?**

P3: Well, yes like aa…. For instance you can see the lego package before you even build it and decide which one to buy for your children for birthday present in that sence yes. but like and also if the for example the pictures in the magazines can be played as videos it's great so. I think it atleast brings more, more fun into reading magazines. (laughing) Not in the traditional way

Interview: **Yea, anything else?**

P2: Yea atleast that brings additional value to the magazine that you scan the picture of some article and then it opens up some new background to the what could be can also like those games everything.. ofcourse it bring new ideas to the lego that you can whatch the lego package there but it also bring out the that you sort of do the lego already in the store.

P3: It's kind of a aa.. QR-code point to AR.. atleast those "fewtick shits?" looked aa pretty much like QR-code but barcode brings you to the website and they just show you there that you don't have to go different website so it's looked like a better version of QR-code.

Interview: **Anything else?**

P1: everything's said at this point

Interview: **Would you guys be interested in using AR-applications and of course why and why not?**

P1: Yea I would it seems pretty fun. But I really need to try it somewhere.

P3: Yes. (laughing)

Interview: **You would be ready to try anything that just there is augmented reality. And you would be like Hey I can try this or:**

P3: Yes I Would… Like a said that this already referred to barcode and I ve also tried like other "Adobe Item?" even "Carol Opera?".. There might be some subject that can really but when I see that code I might check that "this is kinda cool" and then then so I wouldn't I think that I would do the same thing as augmented reality also

Interview**: So would you say that it's kind a integrating?**

P3: Yea it's kind of because new technologies and things like this. You have to a little bit ready to try a little bit ready to try a little bit. Its kind always like "Yea let's try this out?" If it isn't fun I'll then I won't do it again But at least for the first time

Interview: **Does it have to be useful? So you know it's fun it's that enough. Or does it also have to have some kind of use for it?**

P3: More value if it's useful and. if its useful people usually do it more often and do it all over again. if it's just fun maybe just few times. But if its very useful on daily basis on frequent basis then.. Then it could bring value from that site

P2: If it's only in the advertisements so that perhaps might not be that ok I will always use this kind of things because I can see adverts in different light. Then if it's included to the if it's sorta like normal magaszine and there is basically in every page something extra weather it is article or advert then also the adverts can be looked more truly. Because if you see that this is so useful that I get these videos and these from the article maybe I can get some more value from these adverts also

Interview: **Anything else for this? So the next question is that who would be interested in using the augmented reality applications? For example is the young, old people, tecchies anything?**

P2: Like "Ville"?

P1: that would be young people?

Interview2: **Young means younger than you or your generation?**

P1: Both. People who are using smartphones, I mean things like that. And using all the, all the things doing with that.

P3: Yea it's aa. I would also say that biggest group would be young people that.. It depends on the gadgets and things you can do with it.. aa.. I would see that some older people would use it fine sense with glasses kind of thing that you can find out that which look better. Or similar kind of thing that you can check that what something look like without this or without that

Interview2: **Is it the technology factor that helps. that people who would use this shopping application. is it for people who are pretty much for shopping or technology itself that makes it applying to use it:**

P3: I think those ones who are into shopping they still go and do because they get the kicks out of the actual shopping. so I think those ones who wants to use the technology for some sort of shopping and the ones who buy everything from the internet so its… a bit more going from the technology perspective rather than shopping perspective

P2: Yeah. Especially bring some value to the internet shopping because you could see somehow how some t-shirt or the glasses fit to you. if you buy it and it can also be seeing like it's some color what you were thinking. but then yeah… I think that this active smartphone are more the ones because and it's more for the younger people because quite many smartphone users they just have the smartphone and take a picture and use the email but that's it. But maybe they are not so much into the using the apps and augmented reality. That if they use this augmented reality in the shop then it might bring also the a bit older people to use it. You can see the legos ok this one this one is not so huge one I can buy it. or this one is huge so I can buy this one for my kid.

Interview: **Do you think there a difference between men and women when it comes to the use of augmented reality?**

P3: iiiii don't knooowww.. Well aaa… I think in….. If you said that umm… When you related to the magazines I would say that aaa… I can see that already this barcodes are already full in female magazines. So I knife?? If for women they can it's actually pretty scary to check in and buy it straight it from the magazine just by with checking with your phone.. But yea but I still see a lot of value in that sense. also …. men can look it from anywhere

P2: Now when you say it's pretty scary that you see that fashion magazine and lady goes like"How does this bag look like?" "Ok I buy it" But then yeah, probably it doesn't make number of usage too much different from men to women but the way the use it might be different.

Interview: **Well women use it for shopping. What will the men use it for?**

P2: Well.. If you have article of sports then it would bring you for example last nights hockey highlights and they you check the code and see the goals from the game. And you don't have to go and search them from online.

P3: Articles, archieves, simply the best goals start playing. It should be simply the best.

Interview: **so basically it's both women and men who would use it. and there is no major difference? Then next about the mix of virtual and real images. So what do you think about it ? so there is the virtual and the real image and they are basically together. What do you think about that?**

P1: Like in the glasses thing?

Interview: **yes for example**

P1: it was pretty cool cos I bought aa two sunglasses from the internet and they didn't fit me at all. And I didn't bothered to sent them back so it got quite expensive so it would be nice you know to get a little picture how would they look because I buy everything from the internet so I cant go to optics. Well I can but I wont.

Interview2: **They didn't fit you physically or ?**

P1: No they were just stupid looking or just too small. Or something like that..

P3: Well that's true because im a glasses a user (laugh) myself. So in that sense if you are planning to buy new glasses and aa aa…. Before you go to a optics for example if you don't want to buy from internet for example there is a lot of this kind of discounts in the optics when you go to check your eyesight and you can get cheap the glasses from there. It's good to know already when you go that are they.. Or what kind of glasses you want to buy.. Because usually basically for me it's like every two years or three years and then I want to change the style a bit that they are really good to look from the internet. And it would be having that kind of a thing because they actually they do have it on some website that you can check on how would they look on your face but not that kind of motion.

Interview: **So you can see it from many angles how does it look?**

P3: Yeah you can see how in that.. How does it look. So I can see that it would be a good thing in that sense. And also with other products sometimes workshops there aren't enough pictures of the products of sides it could be that you can look it every angle you want to.

Interview: **Anything else? What is interesting about this. Or is there something disturbing in mix of virtual and real.**

Interview**: Nothing negative about it?**

P2: It is sort of thing you don't have to use so.. that's not too much disturbing.

Interview: **So it has to be voluntary?**

P2 and P3: Yes!

P2. Of course if it's the magazines adverts are only codes of the bottle you go everywhere just with the phone than it's quite disturbing. That you don't get anything without the smartphone. You could just see the codes somewhere. Or I mean everywhere..

P3: Then, then again it's not voluntary anymore. Then if you want to see more then you need to have smartphone.

P2: yeah yeah

Interview: **In order to read this magazine you'll need the smartphone**

P3: could it be then then.. I would have a big usage for new pictures after that

Interview: **Okay.. Anything else? So then would augmented reality applications be practical to you? We kinda went thorugh this when we were talking about the glasses so in that sense .. So would kind a hope you would make purchaching decision?**

P3: Yeah atleast guide me to the ……. direction that which I want to go.. in that sense that which would fit me the best

Interview: **okay.. do you think its more like guidance or would you be able to make the actual decision that I want these glasses**

P3: Yeah I could.. I don't know because I haven't actually checked that if you would like to buy optics and everything how would it go from the internet but… but aa atleast to this point could this kind of find the glasses from the optics and in that sense it's realiable. aaa but well yeah I could see myself buying from the internet.. I bought my contact glasses, lenese from the internet so.. I don't see that why couldn't buy my glasses from the internet.

P2: Yeah probably it could bring some additional value and practicalty to some issues.

Interview: **then magazine reading..**

P2: yeeeaah.. Somewhere it would bring more.. I don't know.. how but quite often it's fine to find to out the practicality after the use. like using barcodes you think this is nothing but then you find out that when you start to use them it's much more quick to go the websites of the competition or anything than to tie bit.

P3: yeah it..s

P2: Or I don't have to type if see that webpage it says.. forget goes to forgetten place and if have to barcode I might check at that point

P3: yeah in that sense makes things aa.. easier and quicker but like aa.. ok I oculd go to computer and then type everything there but for example you would see advert and you could see staright revirews or peer reviews or hmmm… Other kind of stuff that there is in price comparision for example in places where you can find the product cheapest at the moment if you would look straight to the phone.. Because I do it anyways if I decide if I think a product I want to buy I will go and see different kind of reviews from that.. Of course it depends on a product if it's something techhie and or not you probably know that you have checked quite a few review of yourself from the phone.. Not mentioning names.

Interview**: Anything else? Any other comments? Ok.. aa. So you guys would you take time to use augmented reality asor it's been clear quite clear that you would use it for shopping and stuff and.. Magazine reading and and also for you (P1) shopping.**

P3: As I said earlier this is something new that I haven't tried before so I would be aa… very interested in trying it at least for first time. if I'm not satisfied then I want for something new improvements or things like that so.. but I would at least want to try it.

Interview**: Just for the amusement part of it?**

P3: Yeah

P2: Yeah pretty much the same I would also ready to try it for the shopping just to try it and then if it doesn't fit me after I have tried it I wouldn't probably do it straight after again but. . Technology improves all the time so.. You will never know

Interview: **Is there certain price limit for this? Like if you get to test the glasses they cost 500 euros and you tried them with the applications can you make purchasing decision just with the help of the app**

P1: I already did it with the sunglasses (laughing)

Interview**: So it could be done both for expensive and inexpensive**

P1: Yeah.. Precise

Interview2: **So it's limiting the risk-factor in traditional e-commerce with the application options. Is there additional risk, a new risk factor that there might be ?**

P1: Too many sunglasses (laughing)

P2: that's one but you might be too much tempted to buy something. because it looks cool. It looked cool in my mobile phone

P1: Yeah. Too augmented (laugh)

P3: I have too much stuff in my hands and I think… (laugh)

Interview: **So this is a new perspective. So it makes buying too easy. Ok this piece of clothing too good so I have to buy it. So aa.. Okay Is there certain type of product that you would buy with the help of this.. Is it the sunglasses that you buy.. You were talking about the for example something you can't see enough about the product. The augmented reality would help with that but.. So can you buy technology products like computers does it add any value or is it more like sunglasses or accessories ?**

P3: Well if you look at today's people they use computers as accessories pretty much carrying them using ipads to take pictures but… aa.. So they can look how does it fit to my hand.. But I don't usually and probably still despite this augmented reality for example computers or phones I still would check what would it consist of, what would be the components.. How does it perform? And then I probably would see some reviews.. I would see this brining more value that you would check how would that look on you.. Basically the users can computers and phones it matters what's inside of course it has to look good but you don't have to check how it does on you. You can see from pictures how does it look.

Interview: **Anything else? Ok. So in which fields you would expect to see AR Applications in the future?**

P1: In decoration

Interview: **You mean like home decoration?**

P1: Yeah yeah.. Enter to the room and you wanna try something and just take pictures and couches all that..

Interview**: Okay..**

P3: Yeah it would be you don't have the desire.. You could do it yourself real easy. I think they have some kind of a computer based things.. But if you could take pictures and decorate it yourself

P2: Maybe in some sports events like instead of getting the match program on paper it can for example in your ticket the code and you will get the to see how other players look like and see their statistics.

P3: Other players would have the codes on their back and just scan then and see the stats and goals and everything (laugh)

P2: In ice-hockey match that would be really easy thing to do…. Middle of the breakaway you scan the player and then you see "Ok this has been on breakaway for fifteen times and made one goal"

Interview: **Is there anything else?**

P3: Probably those were the major ones. The ones that you can check out how does it look on you, or in your apartment or like this.

P1: I don't how disturbing that would be in a plastic surgery (laugh)..

Interview: **Like which face looks the better or ?**

P1: Or try out new noses you know..

Interview; **yeah yeah..**

P2: How much too tight face.

P1: Or haircuts or things like..

Interview**: You think that like hairdressers and surgeon would benefit from this**

P1: Maybe there's a some ethical issue in the surgeon thing but maybe in the future

P2: I think they already have those computer things where you can see the outcome

Interview: **Okay. So the next question who would be the potential user of these applications. But now you mentioned doctors and hairdressers for example.**

Interview2**: So how would have the applications? The customer when he walks in to the barbershop he should have the application or would the barber have the application? And the it goes to barbershop or both have it? I don't know?**

P1: Or maybe also architechts. They have a empty landscape and drawings and the model you could just.. I don't know..

P2: They can maybe.. Maybe architect can see the house fits the empty landscape but maybe the customer might not see how it would fit there. So you could fill in the new house to the landscape. Ok this looks cool. And it's not too much.. Then.

P3: They have to try or they have to ofcourse designing programs in comptures. but if there would be some kind of that you can just scan it or take a picture of from your phone and it would kind of a atleast perfect dimension what would be good in that sense. But I don't know.

Interview2:**What about this architecture? Or have been chaging any need for the consumers to have that same kind of a application that they could they… have seen that land that they could settle in. Is the land big enough or only business like only professionals**

P2: Usually the people are the ones who buy the place to build the house. If you buy 20 times 20 place for your house.. Basically then you would just see okay I can fit here one bedroom and kitchen and a toilet and that's it..

P3:Atleast in the .. I don't know.. Next five years or so and probably more computer based designing would be used. it might be so that like its discussed and if the customers would kind a quickly get some for example aa… There would be some kind of a operator or some site that would give previous designs which could fit in there.. To get ideas from that but I think professional ones are still due gone by computers and you

can change everything from there using house would be pretty much be more convenient.

P1: At the beginning when I said the architecture I meant that.. You know just model and you say it looks cool and then you start doing the architecture things.

Interview: **Any other potential users?**

P2: Well there are those fashion enthusiast who watch those cute bags in augmented reality from the magazines. See how it is looking from each side…

Interview: **Okay any other comments? I think that's it!**