Multisensory Experiences: The Role of Augmented Reality in Customer Experience Creation

MASTER'S THESIS
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ABSTRACT

Augmented Reality (AR) is an emerging technology that facilitates the blend between the real physical world and virtual environments and can stimulate the senses by adding digital inputs. In this view, this paper defines AR as a technology that can enable the stimulation of all five human senses through sight, hearing, touch, smell and taste in both a biological and cultural understanding of these. Also, this paper defines AR within the context of mixed reality technologies and in relation to the importance of how an interface such as AR is designed to facilitate interaction.

The aim of this paper is to explore how AR can influence customer experience creation through stimulation of the senses, with an outset in the Conceptual Model of Customer Experience Creation (CEC Model) laid out in this paper as a natural progression from more general customer experience theory. To fulfill this paper's aim, then a clear focus has been put into determining which AR specific functions that can allow for such sense stimulation. Determining this was done through the method of thematic synthesis to arrive at these functions, by looking at concrete AR use cases within the academic literature, and by coding and creating descriptive themes based on these.

After generating those AR functions, then these were applied and tested within each of the seven determinants making up the Conceptual Model of Customer Experience Creation. The results stemming from this analysis and the subsequent holistic analysis indicate several implications. First, the results show that each of the CEC Model determinants can be influenced both positively and negatively when it comes to two or more senses stimulated through AR. Second, it has been possible to conclude that these influences can allow for a multisensory experience both within each of the determinants, but also across them. Third, the results show that AR can influence the CEC by allowing for various synergies to exist across the CEC model's determinants made possible through these sense stimulations, and lastly, that AR can influence the CEC by changing not only the nature of some of the model's determinants, but also the nature of the model in its entirety.

Lastly, this paper conducted a discussion around the technological, social and ethical barriers for the integration of AR within customer experiences.

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CHAPTER 1: INTRODUCTION

AUGMENTED REALITY AS AN INTERFACE

In today's digital age, a noticeable trend in relation to technology is the decrease of the size of devices simultaneously with an increase of the contained functions. This integration of more functions means that the internal complexity of the devices is constantly increasing, in relation to the amount of functions (Janlert & Stolterman, 2017). However, as the size of the devices tend to decrease or stay the same, the surface of the device will reach a limit of space for functions and displays. Thus, the external complexity of the device's interface becomes limited. Here, the external complexity refers to the range and amount of functions that the interface contains, which eventually will not be able to keep up with the internal complexity given the limits of human perception. This is a trend that Janlert and Stolterman (2017) refer to as an interface bottleneck.

One approach to solve this challenge could be a transfer of external complexity to interaction complexity, defined by Janlert and Stolterman (2017) as: *"The complexity of the pattern of interrelated actions and moves played out in time; the complexity of what unfolds given that the user can do and be affected by and what the artifact or system can do and be affected by" (Janlert & Stolterman, 2017 p. 87).* One way to accommodate this transfer is to detach the interface from the surface. Janlert and Stolterman (2017) argue that new technologies are steering us toward interaction where the surface of the interface has been removed all together, a phenomenon they refer to as faceless interaction. In this form, interaction changes from being about giving commands to digital artifacts, to instead having digital artifacts designed to respond to a user's expressions.

Related to digital devices, then all user actions can be considered as user expressions, while all actions of a digital artifact can be considered as artifact expressions. These expressions contribute to creating impressions to be picked up by the counterpart. In this thought style named expressive-impressive, the digital device will not just register and accept the user's commands, but will react to the expressions to

make an appropriate response. However, the expressions of an interface in this thought style are not limited to visual expressions. It also considers sounds, smells, movements and other expressive actions (Janlert & Stolterman, 2017)

This thought style of how to perceive an interface is gaining ground. Mainly by advances in technology, the use of social media and a growing interest in design and appearance (Janlert & Stolterman, 2017). In relation to AR, the technology can be seen as a mean to detach the interface from the surface, which is one way to consider a solution for this interface bottleneck described earlier in this section. Through advances in technology the conditions for what makes an interface is changing, and as shown later in this paper, AR technology can instigate visual, audiological, touch and other sensory based interactions.

AUGMENTED REALITY AS AN EMERGING TECHNOLOGY

Augmented Reality (AR) is an emerging technology that facilitates the blend between the real physical world and virtual environments, and can stimulate the senses by adding digital inputs using various devices (Kipper & Rampolla, 2013). AR is not a completely new technology, but has lately gained traction in the general public with the emergence mobile applications such as Snapchat and Pokémon Go that utilize AR functions. Also, AR has previously been offered to the general public without further success. This was for instance seen when Google launched the Google Glass to the general public in 2014, but here it never gained foothold in the market (Naughton, 2017). However, experts now believe that the technology has matured and will be ready for the general consumer within the next five to ten years (Ritzau Fokus, 2017).

This development seems plausible considering investments from several of the biggest and most influential technology companies in the world, such as Microsoft, Facebook, Google and Apple (Kildebogaard, 2017). According to a report, then the AR market is forecasted to reach USD 161.1 billion by 2022 due to increase in adoption of smartphones and tablets all over the world, while the interest of large technology corporations is also seen as one of the reasons (Research and Markets, 2016). Also, a report made by Grand View Research (2016) states that more than USD 1 billion has been invested over the course of just two months within the AR industry. Also, according to another report made by Global Market Insights (2017) the AR market size exceeded USD 1 billion in 2016. This correlates well with AR's position on Gartner Inc.'s Hype Cycle of Emerging Technologies of 2017 (See figure 1). The Hype Cycle is a graphical presentation of the American IT research and advisory company's analysis of the maturity of emerging technologies. Here, Gartner places AR in the phase of *"Trough of Disillusionment"*, which refers to a phase where investments are made to test the potential of the technology. There is also an element of competition between producers in this phase, as it is here some will succeed in their investments and

others will fail. This phase follows a phase of peaked inflated expectations, such as the Google Glass case. Gartner estimates a timeframe of five to ten years before the technology reaches a plateau of productivity (Gartner Inc., 2018).
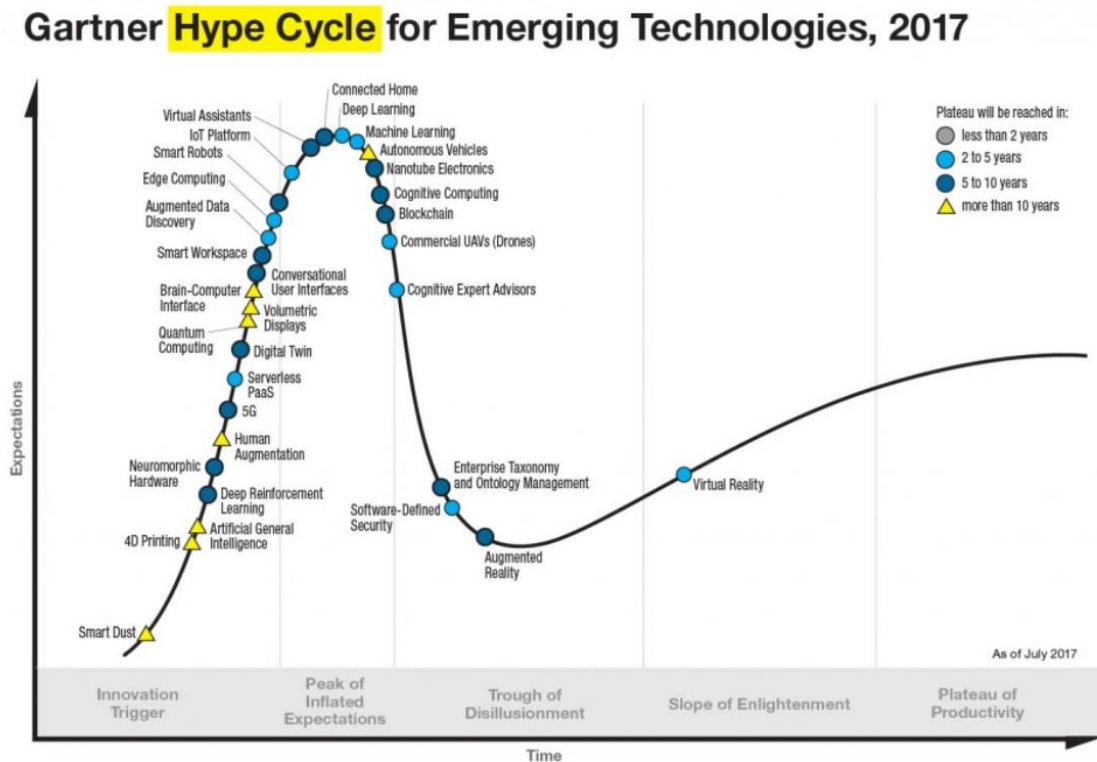
Figure 1. Gartner Hype Cycle for Emerging Technologies, 2017. Reprinted from Top Trends in the Gartner Hype Cycle for Emerging Technologies, 2017 by Panetta, 2017.

AUGMENTED REALITY AND CUSTOMER EXPERIENCE CREATION

Interaction is naturally an important part of the process of a customer experience, as a customer experience is the product of an interaction between a company and a customer over the duration of the customer journey (Lemon & Verhoef, 2016). Thus, fundamental changes to how interfaces are designed and how they facilitate interaction is a factor to consider in relation to customer experience. AR, and the consequences its development can result in, are therefore a phenomenon that is relevant for companies to consider.

Furthermore, customer experience is related to the customer's cognitive, emotional, behavioral, sensorial, and social responses to a company's offerings during the customer journey (Lemon & Verhoef, 2016). The senses can be argued to be an important factor in the creation of a customer experience. As stated by Pine & Gilmore (1998, p. 104): *"The more senses an experience engages, the more effective and*

memorable it can be". In relation to this, then it was mentioned earlier that AR has an aspect of being multisensorial, as it can potentially mitigate interaction through inputs of various sensorial kinds. This suggests that AR has the ability of stimulating and alternating the interaction with important factors for how customers respond to the interaction with a company, which strengthens the relevance of looking into the connection between this emerging technology and the creation of customer experiences. Therefore, this paper has the research question of: How can the use of Augmented Reality influence customer experience creation through stimulation of the senses?

For this purpose, it is necessary to gain an overview of the topic of AR. This includes an investigation of which functions AR can facilitate in the context of a service exchange. Furthermore, to analyse how AR can influence customer experience creation (from now on referred to as CEC), it is necessary to gain an understanding of the concept and how the experience is created, including which factors that are decisive in the process.

STRUCTURE OF THE PAPER

This paper will begin with a discussion of Augmented Reality in chapter 2. This will include a section of defining AR, and a section to define the boundaries in relation to similar technologies. This section will also present an overview of the advancements of the technology until today. Following the discussion of AR, the phenomenon of senses will be introduced in chapter 3. This chapter will focus on the definition of senses in relation to a cultural and a biological understanding of the matter. This chapter will be concluded with a discussion of the two perspectives and arrive at how this paper perceives the phenomenon of senses.

Chapter 4 will present the theoretical framework of this paper. This will start out with an explanation of the concept of customer journey, which will be related to the concept of customer experience, which is one of the main concepts in this paper. The concept will be framed around the Conceptual Model of Customer Experience Creation (from now on referred to as the CEC Model), which will later be subject for analysis. Chapter 5 will present the methodological approach in this paper. This includes an explanation of this paper's method of reasoning and epistemological and ontological stance in relation to theory of science. Furthermore, the methodology of thematic synthesis will be presented and discussed as this paper's method for collecting qualitative data. Also, the methodology of the CEC model and the method of analysis will be discussed in this chapter. Chapter 6 will concern the analysis of the CEC model. The analysis will be structured around the seven determinants of the model, which will each be analysed in relation to the applied data. The analysis will be concluded with a holistic analysis looking into the analysis

of each of the determinants. Chapter 7 will present a discussion to the barriers of implementing AR in the context of CEC. This discussion will focus on the technological, social and ethical barriers to the implementation and success of AR. Finally, chapter 8 will present the concluding remarks of this paper, while chapter 9 will discuss future research relevant to these.

DELIMITATIONS

As the focus of this paper is on how AR can influence the creation of customer experience, then the analysis is focused on AR's effects towards the customer, rather than on the internal processes behind the CEC seen from the companies' internal perspective. AR could possibly also influence various internal optimization processes concerning the company, which could affect the outcome of the customer experience. However, this is not within the scope of this paper and will therefore not be examined.

What is also important to note is that this paper is not focusing on each distinct stage of the customer journey behind a customer experience, nor on specific touchpoints, but is instead considering the various stages altogether in a more holistic perspective.

Furthermore, this paper is not primarily focused on the technical details of AR and how it works in this sense. It rather focuses on the functions that AR can provide, especially in the context of CEC. However, a brief outline of the current types of AR technologies are provided in chapter 2 and a discussion of technological barriers of the implementation of AR in a consumer context will briefly be discussed in the seventh chapter of this paper.

A last but important point in relation to this paper's research question, is the fact that when investigating Customer Experience Creation, then this paper limits itself to only focus on this notion within the context of Verhoef et al.'s (2009) Conceptual Model of Customer Experience Creation. That is, since this model is argued to fairly and comprehensively cover the notion of customer experience creation.

CHAPTER 2: AUGMENTED REALITY

DEFINITION OF AUGMENTED REALITY

The existing literature on the topic of AR introduce several different definitions of what it means. Some of this could be contributed to the fact that AR is not something entirely new, but has existed as a term for at least the past 20 years, with for instance Milgram et al.'s (1994) paper on '*Augmented Reality: A*

class of displays on the reality-virtuality continuum'. The term has therefore had a chance to evolve alongside its use cases, constantly expanding its outreach.

In order to arrive at this paper's definition of AR, it therefores comes natural to discuss how the existing literature on the topic have coined this term over the past years, before discussing the term within the realm of mixed reality. This is necessary to define the boundaries of AR in relation to other types of similar technologies, such as virtual reality.

In its simplest form 'augment' or 'to augment' means: *"to increase the size or value of something by adding something to it"* (Cambridge University Press, 2018a), or in other words to 'enhance' something, or to add an 'extension' to something that is already existing in some form.

In its totality, Oxford Dictionaries defines AR as: *"A technology that superimposes a computer-generated image on a user's view of the real world, thus providing a composite view"* (Oxford University Press, 2018a), while the Cambridge Dictionary defines the term as: *"Images produced by a computer and used together with a view of the real world"* (Cambridge University Press, 2018b).

What is particularly interesting about these two definitions of AR in relation to the pure form of the word 'to augment' is the fact that Oxford Dictionaries and Cambridge Dictionary only equals AR to computer-generated images, while 'to augment' (Cambridge University Press, 2018a) in its very essence can apply to anything that either increases the size or value of something by adding something else to it, no matter what that 'something' is. Hence, leading from the purest meaning of the notion 'augmented' as laid out in the Cambridge Dictionary, it can be derived that there are essentially no limits to what can be augmented on top of reality, and that it is either only ones own fantasy, the scientific- or the technological boundaries that set the limit for what augmented technology can allow for.

According to the existing literature on the topic of AR, various definitions exist. Jon Peddie (2017) gives two slightly different definitions. First, he states that: *"Augmented reality, not to be confused with virtual reality, superimposes digital content (text, images, animations, etc.) on a user's view of the real world"* (Peddie, 2017, p. 20), but then a few lines later go on to define AR in broader terms as: *"Augmented reality is a real-time view of information overlaid on a view of the real world. The information is generated by a local processor and data source, as well as a remote data source/database, and is augmented by sensory input such as sound, video, or positional, and location data"* (Peddie, 2017, p. 20). Interestingly, Peddie uses the general notion of: *"information overlaid on a view of the real world",* hence in this arguing that anything regarded as information can be combined with AR technology. According to Oxford Dictionaries, information is: *"facts provided or learned about something or someone"* and: *"what is*

conveyed or represented by a particular arrangement or sequence of things" (Oxford University Press, 2018b).

In addition, Kipper & Rampolla (2013, p. 1) are particularly clear about the inclusion of the senses within the concept of AR, when they in their book titled 'Augmented Reality - An Emerging Technologies Guide to AR', define AR as: "*...Augmented Reality is taking digital or computer-generated information, whether it be images, audio, video, and touch or haptic sensations and overlaying them over in a real-time environment. Augmented Reality technically can be used to enhance all five senses, but its most common present-day use is visual".*

This definition is supported by, Dadwal & Hassan's (2015, p. 78) in their chapter about augmented reality marketing in relation to tourism, where they define AR as: *"The computer assisted augmenting of perception by means of additional interactive information levels in real time is known as augmented reality. Augmented reality marketing is a constructed worldview on a device with blend of reality and added or augmented themes interacting with five sense organs and experiences".*

Lastly, Castellanos and Pérez (2017, p. 275) also define AR as a mean to stimulate all five senses by saying: "The result is an enriched or Augmented Reality which is obtained by overlaying digital information onto the physical reality perceived through our five senses: in other words, it is a new lens through which we can see a more complete picture of the world".

Looking at the various definitions and particularly at their differences, the main differentiating factor seems to be what is included in the reality that is augmentable. The definitions in the dictionaries and Peddie (2017) are ranging from abstract takes on AR to more precise definitions as something that only allows for visual images, hence stimulating the sight sense only. On the other hand, Kipper & Rampolla (2013), Dadwal & Hassan's (2015) and Castellanos and Pérez (2017) define AR as something capable of enhancing or stimulating all five human senses.

One reason for this difference in definitions, could relate to the fact that AR for many years has mainly been centred around a visual layer (Kipper & Rampolla, 2013), and that it has only been recently that researchers have started to investigate what other of the human senses could be enhanced using AR, which is something that will become evident from the later thematic synthesis in this paper.

However, and despite of the differences, it will still be argued here that there exists some degree of consensus around AR as being capable of enhancing and stimulating all five human senses. Due to this, the definition used in this paper will therefore be to regard AR as a technology that can be used to enhance all

five human senses through computer generated information. What are then constituting those five senses in this paper, is something which will be elaborated upon later. Also, a last but important point in relation to how AR is defined in this paper, is to acknowledge the fact that AR can only be said to enhance the senses if it is clearly separate and distinct from traditional and everyday sense stimulations. This means that AR sense stimulations are only what has been artificially or digitally created, no matter the type of sense. This relates to the definitions given in both dictionaries, in terms of something which must be computer-generated, and relates to Kipper & Rampolla (2013) when they talk about digital or computer-generated information.

DEFINING THE BOUNDARIES OF AUGMENTED REALITY

Having now provided a clear definition of this paper's view on AR, a turn will now be made towards setting up clear boundaries around AR, to establish some context for the later analysis and discussion. This context will first entail a section about the difference between augmentation and simulation, and calm technology in relation to AR. The last section will move towards defining AR in the context of mixed reality technologies, and how AR resides within the Reality-Virtuality Continuum created by Milgram et al. (1994).

AUGMENTATION, CALM TECHNOLOGY AND SIMULATIONS

An interesting link can be drawn between AR and calm technology (Weiser & Brown, 1997), where calm technology is characterized by not only engaging the centre of our attention span, but also by trying to equally engage the periphery of our attention and can move back and forth between the two. This periphery of our attention constitutes everything that our brains are aware of without attending to it explicitly, hence anything that in the current moment is found unimportant to attend to, but which could become instantly important in the next and allow us to feel empowered, aware and capable of acting. One of the most famous examples of this calm technology is the Dangling String created by the artist named Natalie Jeremijenko. In short, the Dangling String can show the network traffic flowing through wires, by translating these into different levels of sounds and motions depending on the business of the network traffic, without being attached to a confined surface (Weiser & Brown, 1997). Hence, constituting a perfect example of a technology existing in the periphery of our attention span, as a sort of background noise amongst everything else that is going on.

When it comes to the larger research focus on *augmentation* rather than on *simulation* this basically entails according to Viseu (2003), that instead of keeping the digital and physical environments to some extent independent and separate from each other (simulation) we are now seeing a move towards

using the digital world to enhance or improve the physical world (augmentation) more explicitly, and with humans connected to the technology itself. Furthermore, this happens without necessarily having this blending exist within the centre of our attention, but can rather exist in our periphery as with calm technology. The move towards *augmentation* stands in direct correlation with the developments within the domain of augmented reality and draws connections to recent developments with wearable computer designs.

REALITY-VIRTUALITY CONTINUUM

Further to the context around AR, and after having defined what AR means and how it can enhance all five senses, it comes natural to further develop the context in which AR resides in relation to other mixed reality technologies (Milgram et al., 1994), such as virtual reality. That is, to be able to clearly distinguish AR from other similar types of mixed reality technologies, and to assist in providing an established notion of AR for the remainder of this paper.

Milgram et al. (1994) were the first to coin the term 'Reality-Virtuality Continuum' (see figure 2) and to define the boundaries of it. It was developed to classify different factors that are important in order to categorise different mixed reality technologies, ranging from purely virtual environments to purely real environments. The main differences between those two extremes are that the pure virtual environments do not have to be governed by the laws of physics, but can in its virtuality allow for any type of fictional circumstance and virtual object. On the other hand, the pure real environments must be governed by the laws of physics and by real world scenes and objects. Every type of technology developed and defined within those two extremes, can all be referred to as mixed reality technologies to some extent, as these types of technologies would then include both real world objects and virtual objects, hence therefore also comprising AR (Milgram et al., 1994).
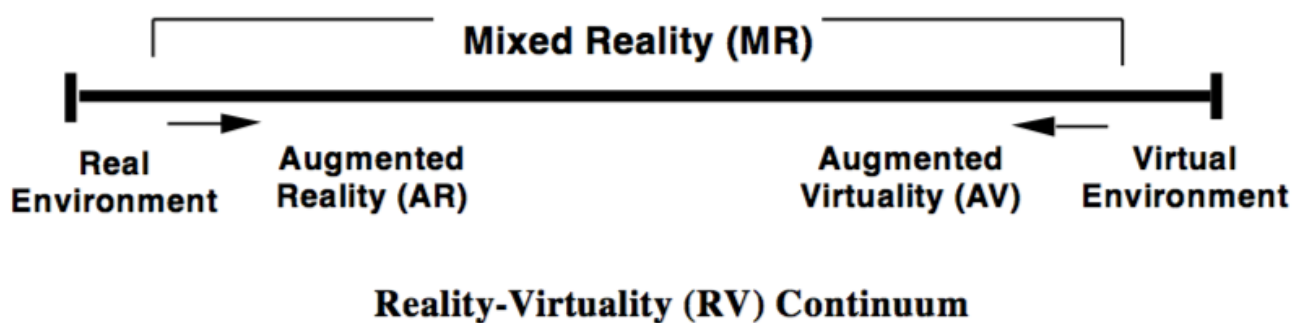
Reality-Virtuality (RV) Continuum

What is furthermore evident in the definition of mixed reality technologies, is the extent to which they are governed by three factors which are: reality, immersion and directness. The reality factor is about how real or virtual an environment can be seen to be, while the immersion factor is about the degree to which the user needs to be immersed within the real or virtual environment. Lastly, the directness factor is related to whether world objects are viewed through an electronic mean, or viewed directly. Those three factors naturally also govern AR, as this technology was previously said to exist within the mixed reality scope. However, those three factors of mixed reality also extend to what is called augmented virtuality, hence a clear definition of what distinguishes augmented *reality* from augmented *virtuality* needs to be outlined here.

When looking at the Reality-Virtuality Continuum, augmented virtuality lies to the right of AR, meaning that augmented virtuality is more related to the pure virtual environment than AR. Instead, AR is more related to the pure real environment than augmented virtuality is, however, they both reside within the mixed reality environment as they are in between the two extremes.

Looking at the particular characteristics governing augmented virtuality to help distinguish it from AR, then it can be said to entail a virtual surrounding environment, but then at the same time being augmented through the use of real imaging data. More specifically, the main difference between this and AR is that augmented virtuality adds a real world component on top of the virtual view of world, whereas AR is defined as doing the exact opposite. For instance, Augmented Virtuality could entail a particular users hand being modelled into the virtual world in order to manipulate something (Milgram et al., 1994).

Following the explanation in the above section, it should now be clear that AR resides within the mixed reality domain, but with a stronger association with the real environment, whereas augmented virtuality and virtual reality lies to the other end of the continuum, meaning a stronger association with the virtual environment. However, it should still remain clear that AR holds various virtual components to it as well, and therefore to some degree has an association with the virtual environment.

ADVANCEMENTS IN AUGMENTED REALITY TECHNOLOGY

The technological advancements within AR naturally entail looking at this in light of the different types of devices that are needed to make possible the enhancements of all five senses, since this is the

definition of AR used in this paper. In the following section a brief outline will be made of what types of technologies are needed for this, but without providing an exhaustive and thorough dive into the technological aspects. The reason for this being that this is not within the scope of this paper, as it was put forward in the introduction part. Therefore, the following should only be considered as examples of ways in which the AR technology makes it possible to enhance all five senses.

First of all, when it comes to augmenting the sight sense using visuals, then various devices exist to allow for this. In short, some of these are either a stationary or mobile computer, some sort of display screen, a camera, tracking and sensing system and a marker that tells the AR device where to place digital objects in the real world (Kipper & Rampolla, 2013). The two biggest platforms for augmenting the reality are desktop computers and smartphones/tablets. In order for AR to work with desktop computers it has to be equipped with a webcam that is used to identify the marker on which the digital content should be displayed. Once identified, it can display various things in front of the webcam. In terms of smartphones/tablets, these are naturally the most popular platforms today due to the build in camera, making it easy to transport around and augment various things in the environment. In addition, these also come with GPS trackers to enable augmentations at specific locations fairly accurately using a set of coordinates, instead of a marker as was the case with desktop computers. Using the GPS trackers will enable information to be attached to certain coordinates, and will then display this information in real time ones users either point their device towards these coordinates, or if standing directly on top of them (Kipper & Rampolla, 2013).

Both of the AR platforms described above are related to what is called non-wearable platforms, but several wearable AR devices are also interesting to take into account, which today include headsets (also referred to as smart-glasses) and helmets. First of all when looking at helmets, then these are being defined as covering the head, ears and some parts of the users face. When it comes to the smart-glasses, then these are normally devices that users wear, and which have the possibility of having microphones, camera, GPS tracking and other sorts of components integrated directly into them, hence allowing for various possibilities (Peddie, 2017).

When it comes to stimulation of hearing and touch senses, then it will be interesting to look into that of surfaces, which for instance could be walls, tables and floors. AR in relation to this, allows for these surfaces to augment objects or real-time information simply by someone touching them, hence allowing for a deeper touch experience that also includes the use of sounds to allow for more senses to be activated at the same time. With this AR surface, it becomes possible to move around digital objects simply by touching and dragging them from the floor to the wall. Another possibility with this type of AR technology is to

transfer the digital object or information from the table and into the hand of the user (Kipper & Rampolla, 2013).

An additional example of AR devices enabling touch sensations, can be seen in the study developed by Nurminen (2015). Nurminen (2015) actually developed an entire mobile platform to augment both the sense of touch, the sight sense, the sense of hearing, and all of them in combination to constitute what is called a multisensory experience. Going into more detail about how the sense of touch was augmented, then Nurminen (2015) developed two pieces of tactile interfaces, which are both wearables made in soft material to enable users to easily move around. The two pieces of tactile wearables included a vest and a glove. The glove consists of three sensors, which when triggered by the user's touch on a virtual surface and general hand gestures, sends signals to the computer device and allows for artificial sensory augmentations. The way the glove works in practice, is that it allows the user to browse, select and move augmented visual objects, and actually allows the user to feel/sense those objects by allowing for vibrations to reach the fingers via three vibrotactile actuators. One example is that the user can have presented additional information about an object just by moving the fingers while wearing the glove.

Lastly, two other device technologies have also been developed to stimulate the touch sense, this time in a study by Pradana et al. (2015). One of these is the RingU, which is a wearable device to be put onto the finger, and the other one is the Kissenger, which is a sensor type of plug-in for mobile devices to be laid on top of the display, and to then be interacted with by the user. For instance, through the activated vibrations in the RingU a sense of augmented touch is feeled by the user, as the vibrated touch was initially sent by a user in another part of the world (Pradana et al., 2015).

Third, research into the technological possibilities of stimulating the chemical senses, comprising smell and taste, have also be done already. One example of this is Spence et al. (2017) who researched how mixed reality solutions, such as AR can be used to digitize and hence enhance the chemical senses, such as taste, smell and the trigeminal sense. The trigeminal sense is related to humans' ability to sense heat and cold through the skin.

It is important to note here that there exist two ways of stimulating the chemical senses digitally. The first type of stimulation happens with the release of a chemical substance, triggered by a digital component such as AR. In short, the best way such chemical stimulation could turn into practice, should according to Spence et al. (2017), be done by digitally enhancing the real food flavors, and doing so by stimulating the taste buds directly by an electrical component. The other type of stimulation can happen electrically without any chemical substances being released, and again also triggered digitally by AR.

In relation to these methods, then Hariri et al. (2016) developed a device which made it possible using weak electrical pulses to digitally stimulate the sense of smell. This was done by applying two sets of electrodes attached to the test subjects, and then have these controlled by a device which was used to program stimulations. The same class of device has also been used to stimulate the taste sense by using electrical currents that have been found to help stimulate receptors on the tongue. In practice, this was performed by ensuring an electrical contact between a straw put into a cup, and then the test subject's mouth, in order for the subject to perceive electric taste (Nakamura and Miyashita, 2011).

However, it is also important to note here that several limitations currently comes along the current solutions for this. For instance, when it comes to taste then some taste senses are easier to target than others, and also some people are more sensitive than others, therefore making it difficult to make a universal AR taste stimulation (Spence et al., 2017).

FUTURE AR TRENDS AND MARKET DATA

Having now looked into the more recent advancements within AR, a brief turn will now be made towards the potential capabilities of AR in the future. However, it is important to note here that the following have not been commercialized yet and some challenges still need to be overcome.

When looking at future concepts of AR, then it will be important to describe smart contact lenses or AR contact lenses as wearable-technology, since these are already being researched at universities and large corporations around the world. One research group at the University of Washington has so far been able to build an AR contact lens that can be powered wirelessly, while the group is also trying to turn a contact lens into an integrated system, which will allow for communication, various images and information to be displayed directly in front of the eye. This could then include words and charts as well as other types of content that could be imagined with access to the internet (Kipper & Rampolla, 2013). Also, corporations such as Google, Sony and Samsung have already been granted patents within this field, and are actively working on developing AR contact lenses, and therefore these could become a reality within the not so distant future. If this would be the case, it could allow for AR to be projected directly into the users' eyes, and could for instance allow for users to take pictures with the lens just by blinking with an eye (Peddie, 2017).

It is also worth looking into the general AR market and the AR smart glass market respectively to get an indication of future market potentials for AR. This is only to provide an indication of some market trends, as market data was not possible to find for all specific types of AR devices. The AR market is forecasted to reach USD 161.1 billion by 2022 due to the increasing adoption of smartphones and tablets all over the world, while the interest of large tech corporations is also seen as one of the reasons (Research

and Markets, 2016). The AR smart glass market is according to a report made by Tractica (2017) estimated to reach 23 million units annually by 2022 as compared to 150,000 units shipped in 2016. That equals a total device revenue of USD 19.7 billion in 2022.

CHAPTER 3: THE SENSES

BRIEF INTRODUCTION

Leading from the previous definition of AR as something that could entail the stimulation and enhancement of all five senses, it therefore comes natural to define the five senses in more detail. Also, it comes natural to create such definitions in order for the later analysis on AR and CEC to take place in relation to sensorial effects of AR.

As with many other scientific areas within academia, nothing comes without differing views and standpoints, and the research on human senses are no different in this. Hence, the first part of this section will be devoted to discussing how the cultural understanding, also sometimes referred to as the anthropological understanding of the senses, stand in opposition to the biological understanding of these senses. Alongside this, a more detailed view of the biological understanding will be provided before additional researchers' view on the senses will be incorporated. Based on all this, a brief discussion will then highlight what this paper's standpoint towards the senses is.

CULTURAL UNDERSTANDING

David Howes (2012), (2011), (2010) has laid out the cultural and the anthropological (from now on referred to as the cultural) understanding of the human senses in contrast to the biological understanding of the same. The divide between those two perspectives is most evident in Howes (2011) where he states that: *"The discipline of psychology has, until recently, enjoyed a monopoly over the scientific study of perceptual processes"* (Howes, 2011, p. 94) and when stating that: *"There is a world of difference between the psychophysical account of perception and the cultural account of perception…"* (Howes, 2011, p. 94).

Howes (2011) argues how the cultural understanding of the senses is very much related to both historical and social formations, and can therefore be argued to have had distinct and unique development paths within each social formation throughout the entire world, meaning that according to this definition, each culture could potentially have its own understanding and classification of what constitutes the human

senses. In Howes' (2011) own words it therefore becomes very important to study the local ways of sensing, hence how different cultures are sensing the world in their own ways.

In order to captivate and exemplify the cultural understanding, Howes (2011) uses an example of a religious experience, which was investigated and analysed by Tuzin (1984), in order to argue how such an understanding of the senses is not taken into account in the more modern and prevalent understanding of the senses as biological. In this particular example, certain cultures seem to favor sounds produced by drum beats to evoke the gods, and these particular sounds put these people in a special state of mind, so that they believe they are in direct touch with the spiritual gods. The point here is that these people actually feel the sub auditory, augmented sound waves and human voices, in a way that makes them feel aroused and experience something through a special type of effect on their brains. These sound waves are outside the normal range of human hearing, and therefore cannot be explained by the biological way of hearing according to Howes (2011). The final point here being that humans can experience something called inter-sensory stimuli and that certain sound stimuli can be registered not as sounds, but instead as feelings.

In connection to the above thoughts on the cultural understanding, then Howes (2012) provides some additional insights into this in his article named 'The Cultural Life of the Senses'. In this, it is being argued how the intensity with which people smell others, is strongly linked to how closely related they view these other people to themselves (Howes, 2012). Meaning, that if a person regards someone as being socially distant from him or herself, then this person could have a tendency to find this someone smell worse, than if the same smell came from someone who is socially near this person. Hence in this view, even though the smell is equally bad seen from a biological perspective, some people will automatically perceive smells more negatively depending on the social context it exists within.

A last piece of interesting work to add to the cultural understanding of the senses, is the work done by Howes (2010) in relation to the studying of languages. What is interesting about this work is the fact that cultures differ to a large degree in the intensity to which they regard senses such as smell and taste, and also differ in how they ascribe the significance of these senses in their daily lives. For instance, if taking the sense of smell first, then the Japanese language differentiates between two smell categories, while according to Howes (2010) the English vocabulary has no precise way to categorise smells. However, when taking the ethnic group of Sereer Ndut in Senegal, then their language actually counts five smell categories and the Weyewa language in Indonesia counts three. Secondly, when it comes to taste, then English has four flavor categories while Weyewa has seven, Sereer Ndut counts three and the Japanese language has five different categories ascribed to taste (Howes, 2010).

What is interesting to note about this, is that what constitutes smell and taste is perceived vastly different across different cultures, as is evident from the languages they speak. The reason for drawing the link between languages and cultures, is that languages can often be said to have been shaped in unique ways depending on the type of situation humans find themselves in. Therefore, words are created for things that are needed and important in people's daily lives, and therefore cultures can be said to help shape the languages we speak. So even though the biological understanding of the senses can fairly accurately explain in scientific terms how many tastes the human is capable of perceiving, then various groups of people think otherwise, as apparently, they are able to distinguish between more than a few tastes and smells.

BIOLOGICAL UNDERSTANDING

Having now argued for the existence of a cultural understanding of the human senses, a turn will now be made towards the biological understanding of the senses, in order to gain a different perspective on these. First of all, Howes (2011) gives a definition of this by saying that the senses are stemming from brain activity activated by a complex network of neurons, and these neurons are then related to various specialized receptors, which exist for each sensory system and actually helps classify what kind of sensory system is at hand.

In addition to Howes (2011), then Goldstein (2010) explains the biological and physical characteristics behind the visual (sight), the hearing system, the chemical senses counting smell and taste, and the cutaneous system, related to touch including the feeling of warm, cold and pain through the skin. Pomfrett (2004) however, leaves out the sense of touch in his article and instead focuses on the senses of taste, smell, hearing and vision.

First of all, the sight sense system is characterized by the fact that only light within the electromagnetic spectrum is comprehensible by humans, which is then dependent on a specific range of wavelengths. Also, when speaking of the visual sense it is important to take into account the entire visual system, which also entails the neural signals leaving the retina and entering certain brain regions (Goldstein, 2010). These thoughts are backed up by Pomfrett (2004), who also goes on to mention that the wavelengths can only include the colors of red, blue and green.

As the next important sense, Goldstein (2010) introduces the sense of hearing. When it comes to the physical sound stimulus, then in its basic form it comes down to changes in air pressure reaching the ear, with these air pressures being derived from an object's vibrations and sound waves. A key difference between sound waves in the biological understanding compared to the cultural one, is that in the cultural

one it has to create a special type of feeling associated with the particular sound. This feeling as stated earlier, is culturally bound, and this is not something that is found interesting to look at from a biological point of view. Lastly, as was the case with the visual sense, then changes in air pressure can only reach the human ear within a certain range of frequencies, namely between 20 hz and 20,000 hz.

Now turning to the chemical senses comprised of smell and taste, then the sense of smell actually allows humans to smell 100,000 different ones by activating as many as 350 different types of receptors, enabling humans to detect fairly small smell concentrations. When it comes to taste, then the main difference compared to the smell system is that molecules instead enter and hit receptors located on the tongue. This tongue is comprised of 10,000 total taste buds, with each taste bud having as many as 50-100 taste cells (Goldstein, 2010). An essential thing to note when looking at the taste sense is the fact that humans in most cases taste either sweetness, bitterness or saltiness or a combination of these. Each of these triggers a certain response in the system, which can either be rejection as with bitterness, or an acceptance response as in the case with sweetness. Besides those three, humans can also taste sour according to Pomfrett (2004) while according to Goldstein (2010) humans can also taste something called umami, but this latter one is rarely described within taste experiences.

Lastly, there is the cutaneous sense system (touch), also referred to as the sense of touch through the skin. What happens when something touches your skin is that either of four types of receptors are activated. Two of the receptors are characterized by responding to stimuli from pressures, and are therefore also located at the outer surface of the skin. The other two receptors are located deeper within the skin, and one of these responds to continuous stimulation, for instance if ones skin is being stretched, while the last receptor responds to skin vibrations and when some kind of touch is applied and then later removed again. This receptor is also capable of perceiving textures from different objects divided into spatial cues and temporal cues (Goldstein, 2010).

What is interesting seen from the biological approach to the senses is the fact that the focus is strictly on the mere physical activities explained by scientific facts, and that there are no mentions of how the senses can be the result of anything besides pure brain activity and neural stimulus. This was otherwise argued for in the section on the cultural understanding of the senses.

In relation to the senses characterized in the biological approach, then several other researchers complement the idea of those five senses constituting the main human senses as we know them today.

For instance, Nudds (2004) in his article named 'The Significance of the Senses' argues for the same five senses as Goldstein (2010) being most characteristic for humans. In addition, he also explains the

reason why this view is taken in most research, which according to him is due to the fact that all those senses are related to organs, namely sense organs, and this has constituted the popular definition since Aristotle first came up with the idea in one of his works (Howes, 2012).

DISCUSSION AROUND THE TWO PERSPECTIVES ON THE SENSES

Having now devoted sections to both describe and discuss the two approaches for understanding the human senses, the following part will look into how they compare in trying to work towards this paper's definition of the senses, in order to lay a foundation for the later thematic synthesis and analysis.

Stemming from how the perspectives of the cultural and biological ways of understanding the senses have been laid out so far, it becomes evident that there exists a strong divide between the two, and that by the look of it, combining the two seems to be impossible. However, what is needed is perhaps an acknowledgement of the fact that both of these perspectives can actually exist in tandem, as often with much else, cultures and our shared understandings of the world transcends and complements our biological outset. Building on this, it can be argued that humans, no matter the cultural background, all have the same biological senses, but then each unique culture builds on top of these by adding something extra, which evolves into various cultural ways of sensing the world. This also explains why even though humans only have four taste buds seen from a biological standpoint, then different languages mention either more or fewer taste flavors than these four, which from the outset seems contradicting. It also helps explain why even though according to biology, we should all hear an object's vibrations stemming from the changes in air pressure the same way, then humans still associate different feelings with particular types of sounds, as was the case with the religious experience captured by Tuzin (1984) in Howes (2011). The explanation for this could be the unique experience associated with particular sound waves and their vibrations, as these are naturally closely tied with people's backgrounds, cultural history and in general prior experiences and can therefore be perceived vastly different among people, even within the same culture. Lastly, it also helps explain why despite the fact that humans should all have 350 smell receptors to smell 100,000 different smell types from a biological standpoint, there still seems to be a difference in how two different people may regard the smell of a third person, which is dependent on how closely related those three people are. That is, one perhaps tend to disregard a bad smell as less significant if that other person come from the same culture, or even the same family.

Based on all this, then what is proposed for this paper's understanding of the senses in the subsequent analysis, is that both the cultural and biological understanding should be taking into account, when analysing and arguing for how AR can influence the creation of customer experience through sense

stimulation.

Furthermore, it is also proposed based on the previous mentioning of the most commonly regarded senses, that the senses of sight, hearing, taste, smell and touch will constitute the focus of this paper's use of the senses in the subsequent analysis and discussion. That is, since both Goldstein (2010), Nudds (2004) and (Howes, 2012) all list those humans senses as being the primary ones.

Also, an important point should be made towards how the sense of touch is viewed in this paper in relation to AR, as it comprises more than one meaning. The first meaning of touch is related to the one already laid out in the previous section about the biological understanding. That is, as something related to the feeling of force, pressure and vibrations directly on the skin. However, the second meaning of touch is about being able to realistically manipulate, interact and explore objects in either real, remote or virtual environments. This particular aspect of the touch sense, is often referred to as haptic interactions (Talhan and Jeon, 2018). Both of these two meanings of touch will be integrated into this paper's understanding of the touch sense.

CHAPTER 4: CUSTOMER EXPERIENCE

This chapter will put forward this paper's theoretical foundation, which will start off with a presentation of the concept of customer journey, which is seen as the underlying process of a customer experience. This will be followed by a discussion of the definition of the concept of customer experience, which will include definitions by various researchers on the topic, and also include a brief section on experience economy as this is seen as related. This eventually leads to a discussion of the Conceptual Model of Customer Experience Creation by Verhoef et al. (2009) that consists of seven determinants of CEC, since this model is argued to be situated within the customer experience theory. Each of the seven determinants will then be discussed with an outset in how they have been laid out by Verhoef et al. (2009). In some cases where found appropriate, then the discussion will include the underlying literature that the determinants are based on. That is, since some of the determinants are not explained in great detail directly in the article by Verhoef et al. (2009).

What is important to note there, is that this CEC Model (Verhoef et al., 2009) will constitute the main theoretical framework for this paper, and will therefore naturally constitute the model for which the data will be tested. A more elaborate explanation of this will follow at the end of this chapter, but especially in the methodology chapter of this paper.

In order to understand the concept of customer experience then the underlying process of creating a customer experience must be defined. This process has been coined in many different terms, such as the purchase journey, customer decision making process and path-to-purchase models (Lemon & Verhoef, 2016). All consists of elements that can be related to the Process Model for Customer Journey and Experience, conceptualized by Lemon & Verhoef (2016) (See figure 3). They conceptualize the customer journey as a three-staged model considering the process of interaction between the customer and company from pre-purchase over purchase to post-purchase.

PRE-PURCHASE STAGE

The first stage of the customer journey concerns all the customer's interactions with the company prior to the purchase. The customer's actions in this stage includes actions such as need recognition, searching and consideration. The boundaries of this stage ranges from the need recognition to the satisfaction of that need by a purchase (Lemon & Verhoef, 2016).

PURCHASE STAGE

The second stage of the customer journey concerns the customer's interactions with the company during the act of the purchase. The customer actions in this stage includes actions such as choice, ordering and payment (Lemon & Verhoef, 2016). The interaction in this stage is also related to the environment of the service encounter, conceptualized by Bitner (1992) as the Servicescape, which has an effect on the purchase decision.

POST-PURCHASE STAGE

The third and final stage of the customer journey concerns the customer's interactions with the company after the action of purchase. The customer's actions in this stage includes actions such as usage, requests and post-purchase engagements with the company. The post-purchase stage can then either lead the customer into a loyalty loop that results in a repurchase, or the customer can start the customer journey over from the beginning, where the need is recognized again (Lemon & Verhoef, 2016).

TOUCHPOINTS

During each of these stages the customer encounters multiple touchpoints. Touchpoints are defined by Meyer & Schwager (2007) as: *"Instances of direct contact either with the product or service itself*

or with representations of it by the company or some third party". Lemon & Verhoef (2016) have developed this concept by dividing touchpoints into four categories:

- **Brand-owned touchpoints:** Touchpoints during the customer journey that are designed and controlled by the company. This can include advertising, websites and sales agents.

- **Partner-owned touchpoints:** Touchpoints during the customer journey that are jointly designed and controlled by the company and one or more of its partners. This can include marketing agencies and distribution partners.

- **Customer-owned touchpoints:** Touchpoints during the customer journey that are not designed or controlled by the company or any of its partners. This can include customers' own need and choices. This is most critical in the post-purchase stage of the customer journey.

- **Social/external touchpoints:** Touchpoints during the customer journey that are external to the customer and the company, and which can influence the process. These can include other customers, independent information sources such as review sites, and peers.
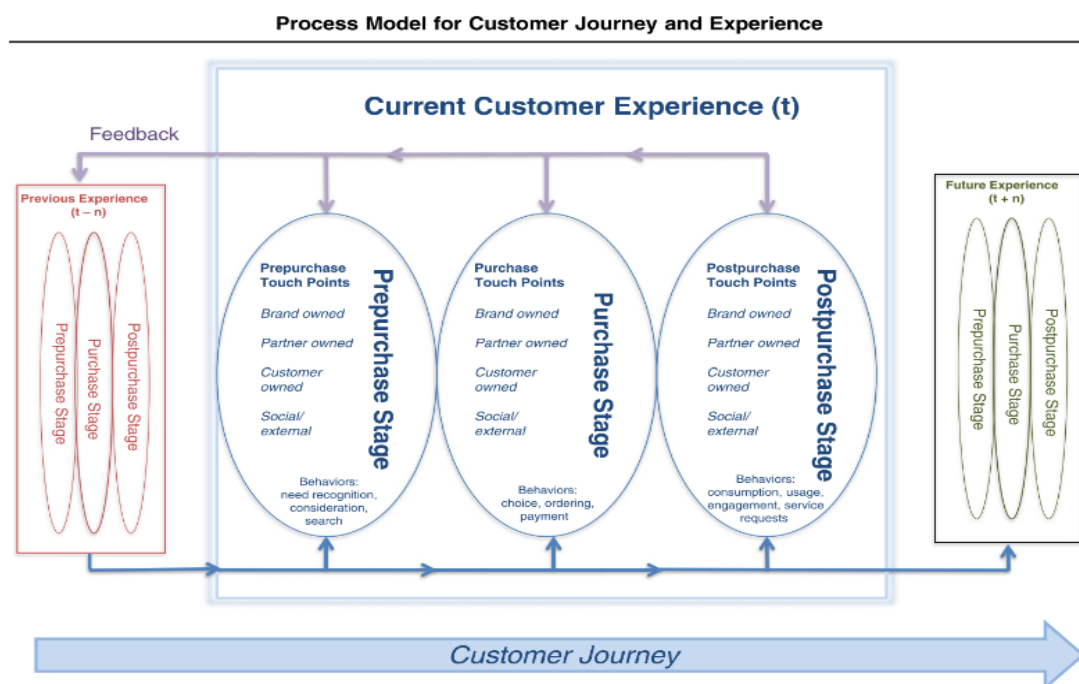
Figure 3. Process Model for Customer Journey and Experiences. Reprinted from Understanding Customer Experience Throughout the Customer Journey (p. 9), by Lemon & Verhoef, 2016.

DEFINITION OF CUSTOMER EXPERIENCE

As shown in the Process Model for Customer Journey and Experiences, there is a dynamic relationship between the customer journey and a customer experience as an outcome. The customer experience is influenced by the past experiences the customer have with the company or similar customer journeys in each of the three stages. Additionally, each stage in the customer journey produces feedback, which the customer will remember in future service encounters. Thus, the dynamics in the model show that the customer journey will influence future experiences, as well as being influenced itself by past experiences (Lemon & Verhoef, 2016).

Following the notion of the model depicted above, then the customer experience is seen as an outcome of the customer journey. Meyer & Schwager (2007) suggest a similar argument in their definition of a customer experience in saying that: *"It is the internal and subjective response customers have to any direct or indirect contact with a company"* (Meyer & Schwager, 2007, p. 2)*.* This suggests that the customer experience is an accumulated direct outcome of all the customer's interactions with the touchpoints through every stage of the customer journey. This holistic approach of the definition of a customer experience can be supported by Berry, Carbone & Heckel's (2002) definition of a customer's total experience. That is, since they use the terminology of "clues" as a similar, but more wide ranging term for touchpoints. Clues entail everything that can be perceived or sensed, and they all carry a message to the customer and define a customer's total experience as a composition of all clues. They are divided and distincted as clues that relate to the functionality of the service, and clues concerning emotions related to the environment of the service offering. To elaborate on this, then clues related to functionality are perceived logically and mainly concern whether the recognised need of the customer has been satisfied. Clues related to emotions are perceived through the five senses, as they include smells, sounds, sights, tastes and textures of the delivered service. These clues can then either be mechanics, emitted by things, or humanics emitted by humans (Berry, Carbone & Heckel, 2002).

Schmitt, Brakus, and Zarantonello (2015) enhance the definition of what a customer experience encompasses. They suggest that every service exchange leads to a customer experience, with no limitations to the nature or design of the exchange. Their perspective of a customer experience considers it as holistic, as it incorporates the customer's cognitive, emotional, sensory, social, and spiritual responses to all interactions with a firm. Thus, they add a dimension to the notion of Meyer & Schwagers' definition of a customer journey, by elaborating on which types of internal and subjective responses a customer

experience consists of. Similar to Berry, Carbone & Heckel (2002), they include senses as an aspect of perceiving the experience.

In addition to the above thoughts, then Verhoef et al. (2009) add a physical aspect to which types of responses an experience consists of with the definition: *"...customer experience construct is holistic in nature and involves the customer's cognitive, affective, emotional, social, and physical responses to the retailer.* (Lemon & Verhoef, 2009, p. 70).

Also, according to De Keyser et al. (2015) in Lemon & Verhoef (2016), they seem to agree with the above mentioned definitions and describe a customer experience as a composition of the cognitive, emotional, physical, sensorial, spiritual and social elements that mark the customer's direct or indirect interactions with a company.

Thus, despite various definitions of a customer experience, there still seems to be a general understanding of a customer's total experience as something being a multidimensional construct of cognitive, emotional, behavioral, sensorial and social components (Lemon & Verhoef, 2016). Furthermore, the literature suggest a distinction between the terms of a customer journey and a customer experience. The customer journey is the process a customer goes through when in a service exchange with a company. The outcome of this process, across all the stages and touchpoints, is the multidimensional construct of a customer experience (Lemon & Verhoef, 2016).

What is important to note in this regard, is that this paper is not focusing on each distinct stage in itself nor on specific touchpoints, but is instead considering all three stages altogether in a more holistic perspective.

EXPERIENCE ECONOMY

Pine & Gilmore (1998) have enhanced the concept of a customer experience and conceptualized it into a distinct economic offering. They have coined the concept as the Experience Economy. In their concept, an experience is not merely the outcome of a service encounter, but is a distinct offering that must be deliberately staged to create a memorable event. It is not related solely to entertainment, but a service offering can also be an experience, if it is deliberately staged to create a memory. The customer can be both a passive or an active participant in the experience and the impact of the customer can be both absorptive or immersive. Pine & Gilmore (1998) argue that the Experience Economy is a further step in the economic progression, preceded by commodities, goods and services.

Similar to the before mentioned concept of the customer journey, Pine & Gilmore (1998) also focus on the importance of harmonizing positive cues and eliminating negative cues. This is evident from them saying: *"It is the cues that make the impressions that create the experience in the customer's mind"* and *"Even the smallest cues can aid the creation of a unique experience"* (Pine & Gilmore, 1998, p. 103). This is similar to Berry, Carbone & Heckel's (2002) thought of the total customer experience as a composition of all clues.

Furthermore, Pine & Gilmore (1998) view the customer's experience as having a relation to the stimulation of senses. They argue that the more of the five senses that an experience can stimulate in the customer, and the more effectively the experience engage the senses, then the more memorable the experience will become. Sensorializing of goods is argued to be a straightforward way of making goods more experiential, by adding elements that enhances the customer's sensorial interaction. This could include adding smells, sounds or other sensory inputs. An example is provided in their book "The Experience Economy" from 2011: *"Smart shoe shine operators augment the smell of polish with crisp snaps of the cloth, scents and sounds that don't make the shoes any shinier but do make the experience more engaging* (Pine & Gilmore, 2011 p. 88). Thus, engagement of the senses is argued to be a central part of enhancing and optimizing the customer experience.

THEORETICAL FRAMEWORK: CUSTOMER EXPERIENCE CREATION

After having explored a definition of the concept of customer experience and explained the underlying process of the customer journey, it is now relevant to look into how companies can create customer experiences.

Verhoef et al. (2009) have developed a Conceptual Model of Customer Experience Creation. The model is based on an extensive literature review of the concept of customer experience and the concept's different aspects. The review included literature that focused on elements within the company's control as well as elements outside of the company's sphere of control. Based on previous research, the model suggests a number of determinants of a customer experience. Also, the model has a similar holistic approach as Berry, Carbone & Heckel (2002), Schmitt, Brakus, and Zarantonello (2015) and Verhoef & Lemon (2016), in seeing the customer experience as the sum of all clues or touchpoints and that the experience is multidimensional related to cognitive, affective, social and physical impressions. It also acknowledges the customer experience as a total experience containing the three stages of pre-, purchase and post-purchase (Verhoef et al., 2009).
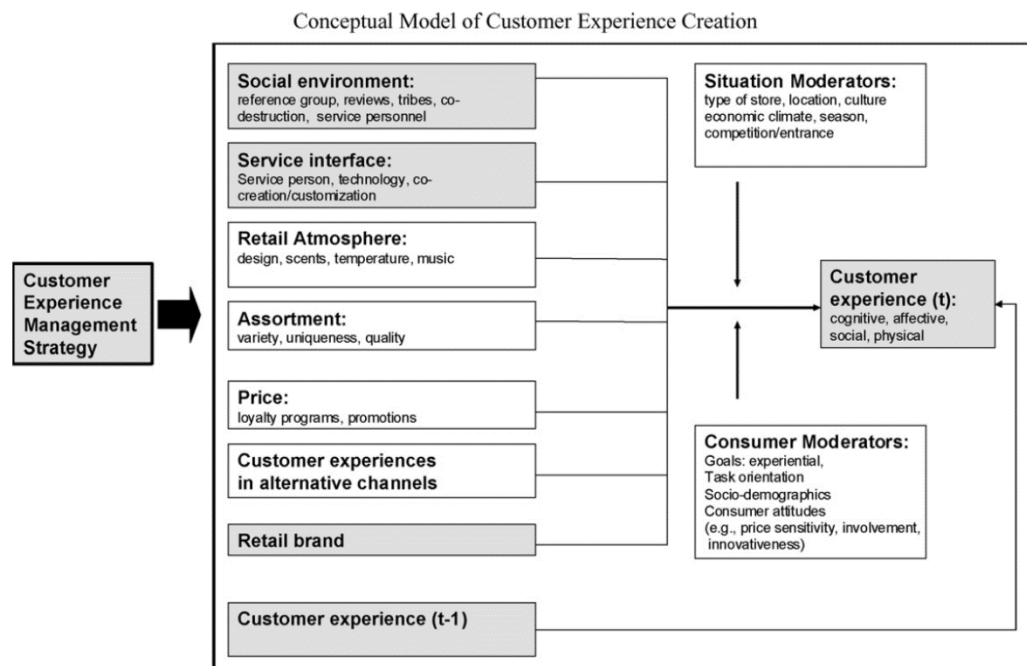
Figure 4. Conceptual Model of Customer Experience Creation. Reprinted from Customer Experience Creation:

Determinants, Dynamics and Management Strategies (p.2), by Verhoef et al., 2009.

The suggested determinants include (Verhoef et al., 2009):

- **Social Environment:** Human-to-human relations that can have impact on the customer's total experience. This can include other customers, service personnel and friends and family.

- **Service Interface**: The interface that the customer interacts with during the customer journey. This can include technology, service personnel and other platforms.

- **Retail Atmosphere**: The atmospherics surrounding the customer during the customer journey. This can include scents, temperature, music and design of the service setting.

- **Assortment**: The range of services provided to the customer in relations to for example variety, uniqueness and quality.

- **Price & Promotion**: The price and promotion activity surrounding the service, including loyalty programs.

- **Channels:** Furthermore, the model acknowledges that the customer experience can be influenced by a multi-channel environment. The customer's experience in one channel may affect and can be affected by the experience in a different channel.

- **Retail Brand:** Interaction with the retailer and the difference in perception between the retail brand and the service brand. For instance an electronics store and telecom company.

Similar to the Process Models for Customer Journey and Experience, this model has a dynamic component of time, which suggests past experiences as cause for customer experience as well. The model also considers situational and consumer moderators. Situational moderators concern factors such as type of store, location, culture and economic climate. Consumer moderators concern factors that are personal to the customer, such as goals, attitude and demographics

The following section will dive deeper into the different determinants and the research behind each of them, and will also try to supplement by adding additional insights from the broader literature. One exception will be made when it comes to the Retail Atmosphere, as this particular determinant will be given a dedicated section for the discussion of the related notion of servicescapes, which is argued to be similar, but at the same time develops the idea even further.

SOCIAL ENVIRONMENT

First of all, the Social Environment according to Verhoef et al. (2009) is as much about customer to customer interactions as it is about customer to employee interactions, and that it is becoming increasingly important to ensure relationship building between customers to help ensure a better customer experience. Furthermore, there is a distinction between directly and indirectly affecting other customers, and customers can even take on different roles in retail settings, such as the helper or the complainer, which will naturally affect other customers' total experience if found annoying or perhaps pleasing. It is argued that distinct value can be added if customers in various ways are encouraged to engage in positive social activities with other customers, which can also be said to include online communities, where posting reviews and engaging in online discussions about products and services can all help in building and strengthening customer loyalty (Verhoef et al., 2009). Regarding customers indirectly affecting each others, then this could be seen if customers are standing too close to each other, which for most will result in annoyance, and perhaps even verbal action. In such cases, companies can try avoiding this by designing the retail environments in such ways so that it allow for more space, and this is highly related to the Retail Atmosphere, which will be elaborated upon later.

These thoughts are also backed up by the other research studies that Verhoef et al. (2009) draw upon in making this determinant. These studies include Baker et al. (2002), Haytko and Baker (2004), Luo (2005) and White and Dahl (2006).

Furthermore, the fact that the Social Environment is important to consider is also mentioned in Gentile, Spiller & Noci (2007) when they discuss the components of what makes up successful and sustainable customer experiences. In this regard, they argue how the relational component encompass the person's social context and relationship with other customers, and how this component is important for the establishment of a culture, community and mutual bond between people engaging in a company's service or product offerings. This sense of belonging and the associated social identity is important for companies to leverage (Gentile, Spiller & Noci, 2007).

SERVICE INTERFACE

The interface that connects the customer with the company during the customer journey is another determinant of the customer's total experience. The interface consists of technology mitigating the service exchange, as well as the service personnel. The importance of implementing suitable technology in a service exchange is supported by Parasuraman & Grewal (2000), who extend Kotler's (1994) Triangle Model of service marketing. The Triangle Model emphasizes the importance of internal marketing and interactive marketing, in addition to external marketing, which refers to more traditional marketing between company and customer. Internal marketing between company and employee concern viewing the employee as an internal customer, which requires training, motivation and support. Interactive marketing between employee and customer, concern the interaction between the human actors in the service exchange. Parasuraman & Grewal (2000) extend this approach in their Pyramid Model, where they add technology as a third-dimension on top of the existing relations in the model. This emphasizes the importance of managing technology in relation to company, employees and customer in order to maximize the marketing activities. This includes to offer the right blend between technologies and employee activity, balanced to the needs of all actors. Furthermore, it is also important to balance the use and blend of technologies to the type of service offered. Especially the customer's activity level and the frequency of service exchanges can be influential in the proper blend of technology. For instance, routine services might allow for more self-service technology (Verhoef et al., 2009).

Another important factor in relation to the Service Interface as a determinant for a customer experience, is the interface's ability to mitigate customization. This is supported by Coelho & Henseler (2012), who found empirical evidence suggesting that customization of services are an important factor in the perceived service quality and customer satisfaction. It shows that customization has a consistent positive influence on the customers' perceived service quality and satisfaction. They further suggest that customization of services are a variable that can be controlled, and can provide the company with a competitive advantage.

ASSORTMENT

Even though Verhoef et al. (2009) mention assortment as a key determinant in CEC and explains the importance of it in relation to service and product variety, uniqueness and quality, they do not elaborate much further on how they regard this. Instead they list a number of research studies from which they developed this determinant, which will then instead be used to shed some light over impacts that assortment can have for the customer experience. These are: Baker et al. (2002), Broniarczyk, Hoyer and McAllister (1998), Huffman and Kahn (1998), Janakiraman, Meyer and Morales (2006).

First of all, Baker et al. (2002) relate assortment to that of both product quality and service quality, and regard those as two distinct offerings but admit that there are certain links, as consumers tend to evaluate both in retail environments. When it comes to that of service quality, then this is specifically linked to how customers regard the quality of interactions with the store employees.

Second, in an interesting study by Broniarczyk, Hoyer and McAllister (1998) they not only looked at product and service quality, but at assortment perceptions in general, which they define in general terms, as they let the test subjects themselves decide on the construct of assortment. In this study, they investigated how the cues of the number of stockkeeping units, favorite product available, and the display space for the category under investigation, defined as item quantity in relation to shelf size, all affected customers' assortment perceptions. For instance, in relation to category space, it was hypothesized that reducing size of display will lower assortment perceptions.

What this study found was that both availability of favorite product, and amount of space for category significantly affected assortment perceptions. But more importantly, what his study also found was that retailers could make substantive reductions in the number of items displayed without having it negatively impact the assortment perceptions and customers' choice of store. However, this were only the case when the reduction was related to low-preference items.

A third study which can contribute to explaining the Assortment determinant, is a study that was not initially included by Verhoef et al. (2009) in the development of this determinant, but one that still provides some interesting insights as it found evidence that was otherwise rejected in other similar studies, such as the previously mentioned one by Broniarczyk, Hoyer and McAllister (1998). The particular study at hand here was done by Borle et al. (2005) and investigated what the effects of assortment changes, specifically a reduction, were experienced by the test subjects. What they found was that a large-scale assortment reduction does in fact reduce overall store sales, and that a negative effect was also seen when it came to shopping frequency and number of purchased items. All of these negative effects could be

argued to relate to that of overall customer experience, and hence interesting to take into account in this paper.

Perhaps one explanation for this contradiction in the research literature could be ascribed to the fact that this study by Borle et al. (2005) looked into the impact of large-scale assortment reduction, whereas the study by Broniarczyk, Hoyer and McAllister (1998) looked into a somewhat smaller scale reduction of 25% and here found no correlation with negative assortment perceptions. However, a reason could also be ascribed to the particular ways in which they carried out the research when it comes to type of test subjects and generally the method used, but also when it comes to the type of products studied.

PRICE & PROMOTION

Relationship building is becoming increasingly important between company and customers, and here price and promotion schemes are designed towards building long-term relationships with the customers. Relationship marketing goes beyond initiating contact and relations, since it concerns developing and maintaining a close relation, which should be beneficial to both company and customer. In a successful relationship, the company benefits from a more stable revenue stream and a buffer of patience from the customer in case of a bad experience. The customer should benefit financially in terms of price savings and incentives, socially, in terms of being recognized and treated valuable and structural, in terms of getting a more efficient and time saving service encounter (Noble & Phillips, 2004).

Relationship marketing can be seen on three different levels, which all contribute to creating a strong relationship with the customer. The first includes loyalty programs that encourage customers to return by offering discounts or rewards. The second level concerns customization and personalization. Here, the company recognizes the preferences and needs of individual customers and designs the offering around these personal preferences. Lastly, the third level concerns installments or initiatives that add value, but also increase the switching costs for the customer. For example installed terminals for quick communication or accumulated recommendations agents, which add value and improves efficiency (Noble & Phillips, 2004).

A key assumption in relationship marketing is that consumers will engage in the relationship in order to be rewarded by the mentioned benefits. Furthermore, they will also be attracted by the personalized relations build on their preferences. This personal relations generate trust between company and customer, which strengthens the relationship even further (Noble & Phillips, 2004).

CHANNELS

As was the case with Assortments, Verhoef et al. (2009) do not go into more detail about the determinant of Channels, even though they mention this one as being key to successful customer experience creations. Instead, they also here refer to a number of other research studies from which they have developed this particular determinant. Those studies are: Neslin et al. (2006), Patricio, Fisk, and Falcao e Cunha (2008), Sousa and Voss (2006) , Verhoef, Neslin, and Vroomen (2007), and some of these will be utilized in order to describe and discuss the Channel determinant.

First of all, Neslin et al. (2006) distinguish between channels on one hand and multichannels on the other. The key difference according to their definition of the two, is that channels is a medium or contact point through which the customer can interact with the company in two-way communications, while multichannels are characterized as the design, coordination and also integration of various channels to enhance customer values and experiences.

Neslin et al. (2006) propose a framework in which they identify five interrelated key challenges to be aware of when using a multichannel approach to enhance customer management and experiences. Those five key challenges are: data integration, understanding customer behavior, channel evaluation, allocating resources across channels, and coordinating channel strategies.

Going into more detail about some of these challenges, then the one related to understanding customer behavior, was researched from different perspectives by Neslin et al. (2006). First of all, they argue how a multichannel approach can both have negative impacts on customer loyalty and experience by perhaps forcing customers to do more extensive research across many channels, but also positive impacts by allowing for better service in many cases. However, they acknowledge that the existing literature is not fully aligned on this matter. Furthermore, Neslin et al. (2006) provide an interesting insight into what make customers choose certain channels over others, where they mention that enjoyment in the search process is important, that integrated channels promote desirable customer behavior, that situational factors such as the physical and social setting are important, and lastly that social influence from the customers' peers influenced their channel selection. Interestingly, this last part about social influence can be related to what was argued for when Verhoef et al.'s (2009) Social Environment determinant was described earlier in this paper.

Furthermore in terms of the key challenges, then another one is about coordinating channel strategies. Here Neslin et al. (2006) argue for two different ways this could take form, which is either by looking at a single touchpoint and then coordinate the different channels here, or one could coordinate across stages and channels all at once. In addition to this, then in choosing one of either coordination

approaches several benefits and costs come with channel coordination and integration, however, the benefits outweigh the costs according to Neslin et al. (2006).

A last but important point made in this research study is that the five identified challenges are all interrelated, and must be addressed within a context that considers a holistic approach to channel management, by thinking in terms of how to combine the different channels and hence strengthen the customer experience through the purchasing journey.

To supplement on the Channel determinant, then Sousa and Voss (2006) also take on a multichannel approach by distinguishing between virtual channels and physical channels when trying to define multichannel services. In their view, the virtual channels comprise everything that is enabling advanced communications in an automated manner without human intervention. This could be through information and multimedia technologies, such as interactive TV's or the internet. On the other hand, physical channels are comprised of some sort of physical infrastructure to enable communication between customers and employees, and this is provided in a more non-automated way than was the case with virtual channels. Building on this, Sousa and Voss (2006) then go on to propose their own framework for multichannel service and service quality. That is, they propose that the component qualities of virtual, physical and integration quality (same customer experience across channels) all make up service quality in a multi channel setting.

Lastly when it comes to Channels, then it will be worth to incorporate additional research on the topic, which was not directly used by Verhoef et al. (2009) to build this Channel determinant, but which can still be used to supplement the ideas put forward. Here, Lemon and Verhoef (2016) also point to the importance of a multichannel perspective, and the fact that online channels and mobile channels are becoming increasingly important to consider. Also, they point to the fact that research has shown that it is normal for a customer to perform the search for products and services in one channel, and then purchase in another, which could point to the fact that certain channels are more important in certain stages of the customer journey. When it comes to mobile channels, Lemon and Verhoef (2016) found that these may help strengthen cross-channel synergies as they are made easy to interact with other channels, for instance by allowing for easy search while inside a store, but also since location-based and personalized advertising are possibilities.

RETAIL BRAND

This determinant of CEC goes into detail about the relationship between CEC on the one hand, and then the Retail Brand or service brand on the other. Specifically, this is about how the interaction between

the company brand and customer experience is related to CEC. Here it is mentioned that there exists a correlation between post purchase evaluations, and hence the customers' experiences, and how customers regard their expectations before they start a service encounter, hence related to the brand perception. Also, it has been found that overall perception of a brand is correlated to the customer experience throughout the journey, and that knowing the brand before the service encounter can actually influence the type of behavior customers show Verhoef et al. (2009).

Verhoef et al. (2009) reference a number of other noteworthy researchers, from which they have based this Retail Brand determinant on. Some of those researchers are Keller and Lehmann (2003) who argue that a company's brand performance is closely related to the perceptions customers have regarding the company, and the value and experiences that can be created for them as customers. Therefore, companies wanting to increase CEC, should look to their brand's performance, and their customers' view of this. According to Keller and Lehmann (2003), then this is first about getting to understand the customers' mindset and then change it accordingly, relating to several aspects. First of all, it is about understanding and then changing their brand awareness. Second, it is about understanding and changing customers' brand associations and next is about the brand attitudes customers hold. Fourth, is about brand attachment, and the last one is about brand activity, relating to how customers engage with their peers about a company brand.

RETAIL ATMOSPHERICS

The setting in which the customer journey takes place carries an important value in facilitating and influencing the experience. The atmospherics of the setting include various types of environmental characteristics such as scents, music and temperature, but also more functional factors such as the design of the settings (Verhoef et al., 2009).

One of the studies that this determinant is based on is an article by Kaltcheva & Weltz (2006), who argue that the role of the atmospherics differs in relation to the consumers' motivation for the encounter with the setting. They argue that environmental characteristics affect the consumers' arousals, which in turn affect the pleasantness of the consumers, which then again affect the consumers' shopping behaviors. The consumers' motivational orientation play a moderating role in the relationship between arousal and pleasantness. Also, when consumers have a recreational motivational orientation, arousals have positive effect on pleasantness. Conversely, when consumers have a task-oriented motivational orientation, arousals have negative effect on pleasantness. They argue that this is due to the need of the encounter in that task-oriented consumers view the encounter primarily as a means for obtaining a needed outcome,

such as a service or information, and wish to complete their encounter as efficiently as possible. Thus, task-oriented consumers find high-arousal environments to be unpleasant. Oppositely, recreational consumers view the encounter as the primary activity itself and therefore find high arousal environments pleasant, as it create a rich experience for them (Kaltcheva & Weltz, 2006).

The argument that the atmospherics of a service exchange carries an important role is supported by Bitner (1992), with her concept of Servicescapes. This concept suggests a categorisation of the different types of environmental characteristics and looks into how these relate to different types of services.

In the above sections it was argued how the CEC Model shows that Retail Atmosphere is an important part of delivering customer experiences. However, the model has a narrow definition of the aspect and does not thoroughly define what Retail Atmosphere encompasses, but describes it as design, scents, temperature and music. Therefore, Bitner's concept of Servicescapes will be included in the theoretical framework of this paper, in order to support the notion of Retail Atmospherics as an important determinant for CEC.

SERVICESCAPES:

Kotler (1973) describes how atmospherics should be seen as an active marketing tool. He argued that customers did not only respond to a product, but to the total product, including the atmospherics of the purchase and consumption. The atmospherics can even be more influential and become the primary product itself. Furthermore, Kotler (1973) also specifies that the atmospherics are perceived through the senses. Mainly through sight, sound, scent and touch senses. However, he argues that the taste sense does not apply to the atmospherics, but are more connected to the product features.

Bitner (1992) has developed the concept of the Servicescape, which elaborates on the atmospherics and physical design of the environment surrounding a service exchange (See figure 5). Similar to the customer experience literature discussed earlier, then Bitner (1992) has a holistic approach to a customer experience. Similar to the notion that it is the composition of touchpoints that generates the customer experience as put forward earlier, then here it is also a total composition of environmental stimuli that influence the customer' response to the service environment (Bitner, 1992).

In addition, Bitner (1992) argues that the surroundings are more important in service exchanges as production and consumption often take place simultaneously and both the customer and employee often experience the facilities. However, she distinguishes between three types of service organisations, which each has different aims with the servicescape. This is due to differences in who is performing the actions

within the servicescape, and the complexity of the servicescape. She describes the different types of service organisations in a typology of service organisations, which can all be either lean or elaborate in the complexity of the servicescape:

- **Self-service:** High level of customer activity and few or no employees in the servicescapes.
- **Interpersonal:** Both customer and employee are present and perform actions in the servicescapes
- **Remote:** Little or no customer involvement in the servicescapes. Employee activity can range from significant to low due to automation.

Another important aspect of Bitner's (1992) theory on servicescapes, is the fact that they can consist of an endless list of possible factors. However, Bitner (1992) distinguishes between three dimensions:

- **Ambient Conditions:** Factors that affect the perception of and response to the environment. It is the background characteristics of the environment, which could include temperature, noise or scents. Ambient conditions can affect all five senses.
- **Spatial layout and functionalities:** Arrangements, shape and size of physical assets in the environment and their ability to facilitate performance and help make the environment purposeful. Spatial layout is related to the design and arrangement of the physical assets, while functionality is related to these physical assets' ability to facilitate performance and accomplish goals.
- **Signs, symbols and artifacts:** Expressing explicit or implicit communication, for instance for directional purposes, behaviour rules or image perception. This dimension both include explicit communication such as signs and labels, as well as artifacts that indirectly communicate, just as the size of a desk in an office setting may communicate a level in a hierarchy.

Bitner (1992) then goes on to argue that the importance of the three different dimensions vary across the type of services. For instance, she suggests that spatial layout and functionality are most important in self-service situations, as the customer needs simple and functional aid to complete the service exchange. Oppositely, she argues that ambient conditions are important in relation to the employees in remote service situations, as they are the only actors in the environment. In the interpersonal service situations, the different dimensions must be balanced to accommodate both customers and employees.
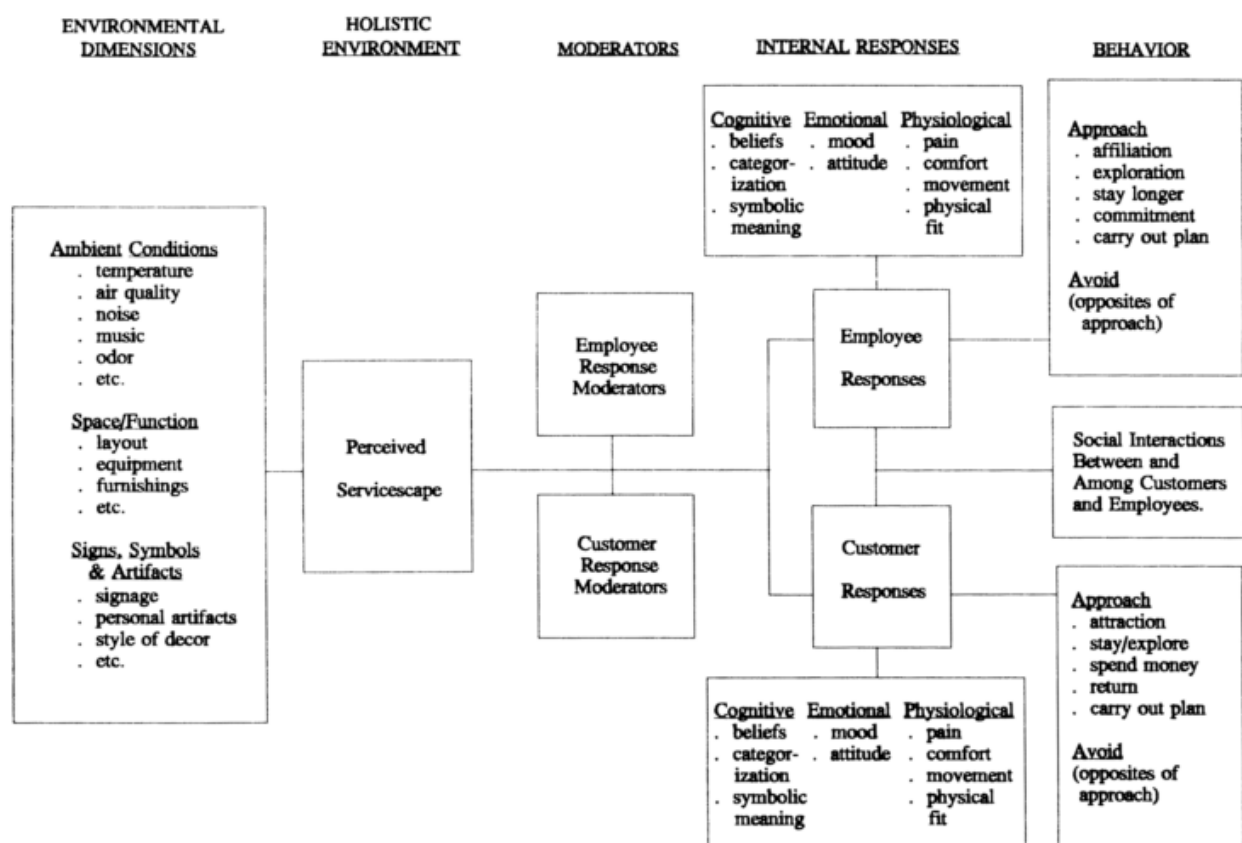
Figure 5. Framework for Understanding Environment-User Relationship in Service Organizations. Reprinted from Servicescapes: The Impact of Physical Surroundings on Customers and Employees (p.4), by Bitner, 1992.

SUMMARY OF THEORETICAL APPROACH

Having now put forward the theoretical background in which this paper is situated, it should now become apparent that the first section on customer journey functions as the underlying theory for which the later section on customer experience was confined within. Also, it should become apparent that both experience economy and the CEC Model are both situated within the larger context of customer experiences, which then ends up concluding the natural progression established in this chapter.

What is important to also note here, is that In order to understand the concept of customer experience then the underlying process of creating a customer experience must be defined. This is why, as argued in the beginning of this chapter, that the CEC Model by Verhoef et al. (2009) and this paper's extension of it to also incorporate servicescapes, will act as the main theoretical framework for the later analysis. In addition, another reason for using this model is because of the nature of this paper's research question, which calls for an investigation into customer experience creations. Lastly, the model has been chosen due to its strong foundation within the literature on customer experiences and service environments, as its determinants have been created based on a large number of prior academic articles on the matter.

It is also important to take note of the relationship between customer experience and the human senses. That is, since several of the researchers referenced in the above sections in this chapter, refer to customer experiences as related to the senses, for instance, Schmitt, Brakus, and Zarantonello (2015) and Berry, Carbone & Heckel's (2002) among others. Therefore, this also constitutes a reason for why this paper has taken on a primary focus of AR's enhancements of the senses.

CHAPTER 5: METHODOLOGY

INTRODUCTION TO METHODOLOGY

This chapter will present the methodological approach in this paper. First, it will explain the method of reasoning throughout the paper. This will be followed by a discussion of the methodology of thematic synthesis as this paper's method for collecting qualitative data and synthesising it. Also, the methodology of the Customer Creation model, and the approach taken in the later analysis will be discussed in this chapter. Finally, a discussion concerning the epistemological and ontological stance in relation to theory of science will be conducted.

METHOD OF REASONING:

The following section will clarify the method of reasoning followed in this paper. It will both clarify the terms of the overall approach and how this varies throughout the paper, as well as specifying the approach in particular parts of the paper.

The method of reasoning will vary throughout this paper and switch between an inductive and deductive approach. However, the paper will in general follow a deductive approach. The research question is related to the CEC Model, but also the existing literature on customer experience, which define the

customer's sensorial responses as an important part of customer experiences. Thus, the data collection and later analysis will be based on a theoretical framework that is already described, but is seeked to be tested with a new approach. However, the process of qualitative data collection through thematic synthesis can be argued to follow a more inductive approach. This synthesis will look into a range of individual observations of use cases of AR and which senses the technology stimulates within the existing literature. Based on these individual observations there will be drawn some more general themes of the functionalities of AR, as well as the stimulated senses. Thus, moving from specific observations to more general findings. This synthesis contributes in turning the studied literature into data, which will constitute as the empirical findings of this paper. These data will be applied in the later analysis of the Customer

Experience Creation model.

A later part of this paper consists of the analysis, which, as mentioned before, will follow a deductive approach. The argumentation in the analysis will be based on a thorough understanding of the CEC Model and its underlying foundation. It seeks to find fits and misfits between the data and the model, as well as suggesting where the data can enhance or alter the model. The argumentation will follow the deductive approach, as it implies that if the findings in the collected data are true and is then seen within the assumptions of the model, then the influences on these assumptions can be argued to be true as well.

It is important to consider the method of reasoning of this paper in relation to the research question, as the reasoning should be consistent with the question. This is especially relevant, since the paper varies in its method of reasoning. Although this paper switches between inductive and deductive approach, the research question suggests a deductive reasoning as it calls for a test of the CEC Model in relation to the phenomenon of AR. As the analysis of how AR fits within the model follows a deductive approach, the paper therefore establishes an alignment between research question and analytical approach.

THEMATIC SYNTHESIS:

INTRODUCTION TO THEMATIC SYNTHESIS

In this paper, the qualitative research method of thematic synthesis was used in the collection of research studies and the synthesis of them, with the purpose of arriving at an understanding of what is already known within the domain of AR and the senses.

This particular approach, is primarily based on Bryman's (2016) and Thomas & Harden's (2008) explanation and utilisation of thematic synthesis as a distinct research method for arriving at a qualitative synthesis of other research studies. First of all, Bryman (2016) argues that thematic synthesis is basically about applying thematic analysis to existing research studies within a particular field. Also, before conducting the actual synthesis of the studies, Bryman (2016) argues for a slightly similar approach as found in systematic review, when it comes to the review and collection of existing studies. That is, especially when it comes to ensuring a specification of a clear review question and that the criteria stated in this are always met before utilising them in the subsequent synthesis. Also, the quality of the studies that meet the first set of criteria should be assessed according to certain guidelines, and if not met, they should be disregarded.

Thomas & Harden's (2008) elaborate on this collection of studies prior to the conduction of the actual synthesis, as they themselves have been using this method on several occasions, and experimenting with it from the outset of systematic review, thematic analysis and meta-ethnography. According to them, the search for relevant studies is related to meta-ethnography in the sense that an exhaustive list of studies is not necessarily needed to conduct this type of qualitative synthesis, as the purpose of it is interpretation of context and concepts. This can be related to this chapters later discussion around the epistemology of hermeneutic-phenomenology.

Next after having established the search criteria and found a list of studies based on these, Thomas & Harden (2008) argue for a quality assessment to avoid to the extent possible to draw unreliable conclusions. In their article, it is not specified exactly what quality assessment criteria that have to be used. However, they themselves have previously utilized 12 different criteria taken from principle of good practice in social research, where some were related to quality of a study's aim, context, methods and findings. A further set of criteria were related to reliability and validity of data collection tools. The last step needed to be performed before moving on to the actual synthesis, is that of data extraction, where Thomas & Harden (2008) mention that the extraction of key concepts, summaries of findings, or text directly labeled as 'results' or 'findings' in the studies could be utilised for this purpose. In addition, they themselves have looked for results in the abstract, which could serve as viable data for further synthesis as well, and Bryman (2016) mentions the conclusion parts specifically.

Once the data relevant for the particular review question has been extracted, the synthesis can begin. According to both Bryman (2016) and Thomas & Harden (2008) this synthesis entails three distinct steps, but with some degree of overlapping. First, the data that has been extracted needs to be coded, in order to label the significance of its meaning and content in relation to the review question and research

question. The purpose of doing this is to slowly start translation of concepts from different texts into one another, and to then add to a 'bank of codes', and when needed, develop new codes. Also, the purpose is to establish representations, topics, index of terms and categories of data before moving on to establishing descriptive themes, which is the next step.

Creating descriptive themes based on the coding according to Bryman (2016), is about organizing those codes into some higher order themes based on how they interrelate and add to each other across the various studies in question. Thomas & Harden (2008) outline the process as looking at similarities and differences between the generated codes, in order to generate themes that are capturing the meanings of the initial code structure. In creating the descriptive themes, then this part of the synthesis process should be viewed as a continuation of the coding, which already entailed the translations of texts into one another.

The very last part of thematic synthesis can be the creation of analytical themes, which is not always needed. However, this stage is about trying to draw out new meanings and understandings that were not initially obvious from looking at the studies, and from the codes and themes they generated to begin with. Hence, in trying to create analytical themes new knowledge is created, as the researchers should try to 'go beyond' the original content.

PURPOSE AND IMPLICATIONS FOR THIS PAPER

The purpose of the thematic synthesis of AR studies was to gain an overview of current functions related to this technology, as well as identifying which senses these functions stimulates. These findings constitute the data used for this paper's analysis. The functions are necessary in order to conduct the analysis on a concrete basis of findings within the literature, rather than based on a more speculative approach of the potential achievements of AR. Since a true and fair view of this would not be obtainable by looking at single studies, this paper conducts a meta-study of the existing literature of AR's use cases and sense stimuli in order to find overall functions.

As mentioned earlier, the thematic synthesis of AR followed an inductive approach. By gathering data from a pool of individual studies, it seeked to arrive at some overall functions of what AR can be used for in relation to sense stimulations and enhancements. It would not have been possible to arrive at these functions by looking at individual cases or by collecting data from individual experts, as this paper seeks to describe a more general phenomenon, rather than a specific case.

Furthermore, this paper is based on a definition of AR as a multi sensorial technology, which further necessitates a broader perspective on the collected data. If the paper was based on a definition of AR as a solely visually augmenting technology, then a case study might have been sufficient to collect relevant data from.

LITERATURE SEARCH

The qualitative research method of thematic synthesis is somewhat related to the discipline of systematic literature review. Therefore, the literature was collected in accordance with a range of search criteria in order to provide transparency into replicability and consistency in the data collection. However, thematic synthesis does not require an exhaustive sample of literature as is usually the case with a strict systematic review. The aim is rather a purposive sample, that ensures conceptual saturation, as the purpose of the review is interpretive explanations. In this, the conceptual synthesis should not change because of the number of studies related to the same concept. Rather, it depends on the range of concepts found in the literature (Thomas & Harden, 2008). Therefore, this paper applied a rather narrow search range, by applying specific search criterias in conducting the literature search.

The search was conducted in LIBSEARCH, the database of the library of Copenhagen Business School, which contains journals and databases of various academic fields relevant to this study, such as marketing, human-computer interaction and service management. The timeframe of the search was limited to articles back to 1994. This limitation was chosen based on the article by Milgram et al. (1994) about the reality-virtuality continuum, where they distinguish AR as something separate from virtual reality, within the realm of mixed reality technologies. To the knowledge of this paper's authors, this particular article serves as the first time where the definition of AR was this clearly defined and distinguished in relation to other similar mixed reality technologies, and therefore argued to serve as an appropriate time limit for the literature search. Furthermore, the literature of the search was limited to articles only, and the language was limited to articles published in English.

In accordance with the described purpose of the thematic synthesis, the search was based on the following review question: *"Which use cases have been developed in relation to augmented reality sense stimulation?"*

Regarding the meaning of the words 'use cases' in this context, then this relates to something that has been developed and tested as a viable technology, either among users or within a laboratory setting. Therefore, in order for a product or technology to be considered as a 'use case' it needs to be a working product at least in the sense of a prototype, and not something that is merely a speculative idea, as this

paper finds it important to have a non-speculative and non-abstract approach to the potential of AR in relation to CECs.

As the focus and purpose of the search was to identify use cases of AR, the term "Augmented Reality" was chosen as a common keyword for all search combinations. The term was combined with each of the five senses individually, and each of these constituted another keyword to be searched for, as AR was previously defined as a technology that can potentially enhance and stimulate all five human senses. Furthermore, since the review question inquired use cases of sense stimulation, then this serves as another reason for why the five senses were also relevant for the search.

Some of the senses can be expressed through various terms, such as the sight sense, which can also be expressed through the term "visual". In such cases, multiple terms were included in the search to describe the same sense in order to better ensure conceptual saturation. Furthermore, the senses of taste and smell are also categorized and often referred to as chemical senses. Therefore, this term was also included in the search.

All keywords were classified as "subject" in every search combination conducted in LIBSEARCH. This was done in order to include studies that did not contain the terms directly in the title, but had the terms listed as keywords in the particular studies.

These criterias therefore resulted in the following search combinations:

- "Augmented Reality" and "Haptic"
- "Augmented Reality" and "Touch"
- "Augmented Reality" and "Visual"
- "Augmented Reality" and "Sight"
- "Augmented Reality" and "Hearing"
- "Augmented Reality" and "Sound"
- "Augmented Reality" and "Audio"
- "Augmented Reality" and "Chemical Senses"
- "Augmented Reality" and "Smell"
- "Augmented Reality" and "Taste"

These different searches resulted in a total of 149 articles across all search combinations. 83 of those were related to the sense of sight, 34 related to sense of touch, 28 related to hearing, two related to

smell and three to taste. In the instance of the search combinations related to the smell and taste senses, the search only resulted in a low number of articles, compared to the other search combinations.

To explore whether this constituted a conceptual saturation for the smell and taste senses, which was regarded as important for this paper, the list of references in the already found articles were reviewed to identify other articles related to the review question. This was conducted without any presumption of finding further results, but only to help ensure conceptual saturation. The review resulted in two additional articles, which were included for the later quality assessment as well. Thus, the total number of searched articles amounted to 151 in total.

ASSESSING THE QUALITY OF THE STUDIES

The articles found by applying the described search criteria and combinations were assessed in order to select the range of appropriate literature to be included in the synthesis. A number of criteria were applied to each article to assess the quality of them in relation to the review question, and each article had to comply with each criteria to be included in the synthesis. The assessment criteria were inspired by suggestions from Bryman (2016) and Mays & Pope (1995), and therefore the quality assessment of the articles ended up being based on the following criteria:

- Is the article relevant to the review question in relation to specific use case and sense stimulation?
- Is there an AR use case and is the development of it described in detail?
- Did the researcher make the theoretical framework and method explicit?
- Is there a clear account of the context in which the research was conducted?

As there are two authors of this paper, the assessment of the first five articles were conducted in collaboration. This was done in order to create common grounds in the approach of the assessment, to limit the bias that could naturally be the case for each individual author otherwise. Following the first five articles, the assessment was conducted individually, but in case of doubt, the assessment was discussed in collaboration to reach common grounds. This assessment resulted in a total of 48 articles to be coded and included in the synthesis.

DATA EXTRACTION AND CODING THE FINDINGS

Once the searched literature had been quality assessed and selected for inclusion in the synthesis, the process of data extraction began. In relation to this, it is important to specify what was being

considered as data in this synthesis and that the data which was extracted from the literature was related to the review question, thus the purpose of this review.

The data to be extracted was located in particular parts of the selected articles. These parts included the abstract, results/findings and the conclusions. As this synthesis is not focused on the method behind each particular article, then this part was not included. In performing the data extraction, a particular focus was put into finding sets of key concepts, which would be related to the review question. The key concepts are considered as being descriptions of the use case of AR and descriptions of which senses the use case stimulates or augments the perception of, hence directly in correlation with the review question put forward. These key concepts were what the later coding process would be based on.

Also, an important point should be made towards the fact that the data extraction focused on key concepts that are relevant to the review question, and not necessarily on what were considered as key concepts by the authors of the articles themselves. However, the reason for looking at those studies in the first place, was due to the fact that they had all listed AR and the particular senses as keywords, hence the authors can be said to have regarded these key concepts as central to their research in any case. In relation to the particular use case, it can also be argued why this could function as a key concept to be extracted, since this paper's authors only included studies that passed the review question in having a concrete use case. And hence, all the studies taken into consideration here, had a distinct use case being central to the papers' findings, as otherwise it would not have passed the quality assessment.

The parts of the articles that concerned the key concepts of practical use cases and AR sense stimulations were further processed by coding. The coding was conducted based on key concepts that were found during the search process in looking for specific use cases, as stated in the review question. These key concepts constituted the data, which was then extracted from the articles and used for the coding. This was done by extracting the descriptions of the key concepts and translating these into codes, which were later used to generate themes within this synthesis. However, it is important to recognise that the process of synthesis started already in the coding process. That is, since a part of the synthesis is a process of translating codes from the key concepts of the different articles into each other. This is done by considering the existing "bank of codes" and only add new codes when the findings in new articles are not related to codes already generated based on previously decoded articles. In total, the coding process resulted in 86 different codes across all five senses.

GENERATING DESCRIPTIVE THEMES

The next part of the synthesis concerned generating descriptive themes of the extracted data, and these themes were specifically generated based on the codes created in the preceding coding process. The codes were here connected by similarities between them. This could have been in relation to the stimulated sense or in relation to central terms across the codes. In relation to this, the translation process during the coding served an important role in finding similarities, as this process had already started to align the codes for similarities, which meant that some codes had already become fairly general before the actual theme generation process began.

The synthesis of the 49 decoded articles and 86 generated codes resulted in a total of 27 descriptive themes describing different overall functions made possible by AR in relation to each of the five senses. Therefore moving from individual use cases in the search process to now looking at these overall functions. Therefore, from now on these descriptive themes can be referred to as functions in this paper.

Nine of the descriptive themes were found related to the sense of sight, seven were related to sense of touch, four were related to the sense of smell, three were related to the sense of taste and four were related to the sense of hearing. Thus, all the descriptive themes had now been categorized based on their relationship to each of the five senses. An overview of the descriptive themes, including a description of each theme, can be found below. Also, an overview of the codes that were created based on the extracted key findings from each article, has been attached as appendix 1.

Descriptive theme		Description:
Sight	Context-driven information layer	Personalising visual content to the context and need of each individual. This can include information based on personal data, location or situational factors.
	Visual scene manipulation	Manipulation of the real scene, such as relocation of objects or color corrections.
	Environmental embedding of digital objects	Integrating digital objects contextually as a layer on the real scene.
	Digital rendering of physcial objects	Recreation of physical objects, as digital object.
	Visual information integration	Blending a layer of information on the real scene
	Visual Navigation	Visual information or images for direction guidance purposes.
	Visual recognition	Recognition of visual objects or symbols
	Real-time visual feedback	The triggering of visual information or other content automatically in real-time, based on location, time or other means.
	Real-time translation	Real-time recognition, translation and display of visual or audiological inputs, such as speech.
Touch	Being able to interact with something not real	Creating the feeling of controlling a physcial object via a digital rendered version, e.g. through hand-touch gestures, rotation and touch-less interaction.
	Simulated physical control	Covers the digital triggering of force, vibrotactile and air vortex feedback stimuli on hands or other body parts
	Different types of touch feedback	Making virtual objects respond with touch stimulation for guidance and other purposes
	Personalized and highly tailormade object responses	The possibility for touching, rotating, controlling, exploring and interacting with virtual objects.
	Virtual object manipulation in either real, virtual or remote environments	The triggering of either force, vibrotactile or air vortex stimuli automatically in real-time, based on location, time or other means.
	Real-time touch feedback	Allowing one to put digital features and tactile textures on top physcial objects, to make the feeling of those objects context dependent and even personalised.
	Designing and personalising the feeling of real objects and products	
Smell	Digitized smell	Digitally triggered smell receoptors
	Enhanced smell experience	Adding additional smell sensations on top of the real ones
	Changing the smell of food and drinks	Chemically or electrically stimulaton of receptors based on digital trigger, to add additional smells to food and drinks based on location, time and other factors
	Allows for increased personaliztion	The change of smell can be personalised, based on people's individual AR device
Taste	Enhanced taste experience	Adding additional taste sensations on top of the real ones
	Changing the taste of food and drinks	Chemically or electrically stimulaton of the tongue based on digital trigger, to add additional taste to food and drinks based on location, time and other factors
	Allows for increased personalization	The change of taste can be personalised, based on people's individual AR device
Hearing	Location-based audio clues	Based on the gps location, certain audios can be triggered
	Real-time translation	Real-time recognition and translation of audiological inputs into speech.
	Context-driven audio clues	Personalising audio content to the context and need of each individual. This can include audio based on personal data, location or situational factors.
	Audio navigation	Through the mapping of various audio clues and the triggering of them based on location, it will be possible to have audio help people navigate around.

Table 1. List of descriptive themes categorized based on the stimulated sense.

A note towards why the majority of themes identified in the literature were related to the stimulation and augmentation of the sense of sight, could be explained by how the concept of AR has been defined throughout its development. As the technological advancements has focused mostly on the visual functions of AR, the definition of the concept has automatically followed. This relates to a previous section in this paper, stating that it could relate to the fact that AR for many years has mainly been centered around a visual layer (Kipper & Rampolla, 2013), and that it has only been recently that researchers have started to look into what other of the human senses could be enhanced using AR.

This could naturally influence the amount of research and experiments conducted within sight stimulation compared to research in the other senses. Furthermore, the definition of AR as only being something visual regarded by many authors, could also influence how augmentation of the senses are classified. That is, literature concerning the augmentation of senses other than the sight, may not have been classified as AR in the subject and keyword sections of some articles, and therefore did not appear in the search for literature that was conducted in this paper.

Furthermore, in relation to the senses of smell and taste, then it was also discovered that some of the research instead concerned how the perception of taste and smell could be influenced indirectly by the stimulation of other senses. For instance, by providing certain audiological stimulation to influence the perception of tastes, and hence only being influenced indirectly. However, these type of studies did not concern direct augmentation or stimulation of smell and taste senses, but rather a cross-sensorial stimulation, which have not been within the limitations of this paper, and therefore these type of studies were not included. This fact could also have influenced the number of studies found related to other senses than sight.

DELIMITATION OF THEMATIC SYNTHESIS

In most cases where found relevant, then the next step after having created the descriptive themes, would be to create higher order analytical themes in order to 'go beyond' the content of the original studies. In theory, this task of generating analytical themes should ideally go on until they are sufficiently abstract (Thomas and Harden, 2008). However, as Thomas and Harden (2008) themselves mention, then this step is often the most controversial one, and the step that is most difficult to describe. Furthermore, they argue that in situations where the content of the primary studies under scrutiny, are closely related to the review question under investigation, then it will often not be necessary or feasible to 'go beyond' the original content and creating the analytical themes (Thomas and Harden, 2008). In relation to these thoughts, Bryman (2016) argues that certain thematic synthesises will stop after having created

the descriptive themes if sufficient answers have been provided according to the review question. That is, the very essence of thematic synthesis, is to fulfill the purpose of the review question.

For the reasons listed above among others, this paper has chosen to stop the thematic synthesis at the stage of generating the descriptive themes, hence not progressing to create analytical themes. First of all the reason being, that the concrete use cases and augmented sense stimuli that were under investigation, and which also functioned as the data to be extracted from the studies, were directly related to the review question. This also relates to the words of Bryman (2016) put forward above, as this paper believes it found sufficient answers to the review question from the descriptive themes alone, and therefore adding analytical themes in this paper were not expected to contribute with new findings relevant for answering the research question. Relating to this, it was estimated that if continuing to work with analytical themes, then this paper would have run the risk of working with too large abstractions to be used for the actual analysis, as concrete AR functions are still important for this paper. That is, the purpose of these analytical themes are often to reach these higher level of abstraction. Also, since this paper's focus has not been on having the findings from the AR studies to be stand-alone-findings, but instead to be tested into the CEC Model to conduct the deductive and actual analysis of this paper, it was not found appropriate to continue to create analytical themes.

METHODOLOGY OF THE CONCEPTUAL MODEL OF CUSTOMER EXPERIENCE CREATION

Since this paper's analysis is primarily based on the Conceptual Model of Customer Experience Creation (CEC Model) developed by Verhoef et al. (2009), it has been found important to briefly discuss the foundation of it in terms of the data it builds upon, while also explaining how this paper has tried to strengthen the model by utilising additional litterature. Lastly, time will be spent on discussing the model's method and its validity and reliability.

First of all, the motivation behind establishing this model according to Verhoef et al. (2009) themselves, is due to the fact that only a limited number of academic articles have so far been focused on creating theoretical frameworks for customer experiences, and therefore they argue that such a framework is needed to construct and structure future research within this area. They also argue that the literature has been more focused on practitioner-oriented papers. Furthermore, their motivation also seem to originate from the fact that most litterature within retailing, have so far been focused on more confined aspects, and not on a holistic perspective and broader understanding of customer experiences, as Verhoef et al. (2009) try to do in their paper.

In creating the CEC Model, Verhoef et al. (2009) looked into a vast number of prior research studies, in order to come up with a number of important determinants for the creation of better customer experiences, particularly in retail and service environments. This resulted in seven determinants, namely: Social Environment, Service Interface, Retail Atmosphere, Assortment, Price & Promotion, Channels and Retail Brand. The Social Environment determinant is based on four prior studies, but then this paper has chosen to supplement with a fifth study by Gentile, Spiller & Noci (2007) in order to further strengthen the foundation of the determinant. The Service Interface determinant is based on seven prior studies, and then this paper has supplemented with studies of Parasuraman & Grewal (2000) and Coelho & Henseler (2012). The Retail Atmosphere determinant was developed based on three prior studies, and then this paper has supplemented with Bitner (1992) and Kotler (1973) to extend the determinant to also incorporate the notion of servicescapes. The reason for extending this determinant to also incorporate the notion of servicescapes, was because it was found to be very much related and to supplement it positively. Also, the reason being that the CEC Model has a narrow definition of the aspect, and does not thoroughly define what Retail Atmosphere encompasses, and therefore Bitner's (1992) concept of servicescapes was included in order to support the notion of Retail Atmospherics, as an important determinant for CEC.

When it comes to the Assortment determinant, then this one is based on four prior studies, while this paper has chosen to supplement with the study by Borle et al. (2005). The Price & Promotion determinant is also based on four studies, and the Channels determinant is based on four studies as well, here supplemented with Lemon and Verhoef (2016). Lastly, the Retail Brand determinant is based on five prior studies.

The question around the validity of Verhoef et al. (2009)'s model needs to be thought of in light of their epistemological stance. However, since they do not state specifically their approach in choosing the studies it is based on, and how they evaluated the findings, the validity can only be speculated upon based on the knowledge that is available. Leading from this, it is here being argued that the model is credible, in the sense that it has been created based on a number of prior research studies written by different authors. Furthermore, the studies on which it is based, all seem to have clear methodologies and valid approaches to the research they conducted, hence those studies are to a large degree viewed as valid academic sources.

However, it is important to note that the model is only credible when seen in light of the subjective and interpretive approach Verhoef et al. (2009) is argued to have been taken, when they considered what prior studies to include, which studies to disregard, and what type of information that should be extracted from the studies. That is, interpretation is argued to have been used to some extend, which then also

relates to the type of epistemological approach they have had. In relation to this, the model's reliability is viewed to be fairly low, as this is naturally the consequence of an interpretive approach, where the reality to an extend is viewed as something constructed by the authors themselves. That is, since others might have chosen another approach using other sources, and therefore also created a different model. In addition to the reliability, then alone based on the fact that the method for choosing the prior studies have not been clearly put forward, should serve as an argument for why the reliability is considered to be low.

The above thoughts around validity and reliability also support this paper's idea of incorporating additional studies, not originally included in the creation of the model. That is, in order to overcome to some extend the possibility of an interpretative and biased approach in the development of the model by Verhoef et al. (2009).

Lastly, a point should be made towards the fact that when creating such a model, it will naturally entail a reduction of the reality in order to make it fit within the boundaries of the model. Therefore, some characteristics of reality around customer experiences that hold true, may not necessarily have been included in this model, since the purpose of such models are to make the reality and subject matter at hand more comprehensible, and easier to understand and work with. However, as pointed out above, the exact methodology going behind the model has not been explained in detail by Verhoef et al. (2009), and therefore the thoughts put forward here, can only amount to some degree of speculation.

METHOD OF ANALYSIS

As it was mentioned at the very beginning of this chapter on methodology, the coming analysis of the data within the context of the CEC Model will follow a deductive approach, in relation to this paper's research question which calls for deductive analytical reasoning. That is, if the data in the form of descriptive themes stemming from the thematic synthesis can be applied to the assumptions of the model, then those influences can be argued to hold true.

In its essence, this paper tries to assess the influence of AR sense stimulations in relation to the CEC Model, and to find out how a holistic approach and alignment between the determinants could be a result of AR as something multisensorial. Secondly, this paper also tries to apply the data in such a way, as to see how the model in its current form should perhaps be adapted to new circumstances in the sense of AR and multisensorial data findings. To the knowledge of this paper's authors', the CEC Model has not previously been tested using data stemming from AR research studies, which is why this paper takes this on as its purpose of testing for patterns and new insights, which either exist or do not exist. Also, it is important to

note that this paper is not simply trying to confirm the model in a non-critical way, but acknowledges the fact that not every aspect of it can necessarily be explained from the data used in this paper alone. Some of the data findings may even seem to contradict the model.

In relation to this, the analysis will be structured around the CEC Model in the sense that each of the seven determinants will have its own section devoted to it, where the descriptive themes will be tested upon. That is, in order to discover how the determinants can be influenced in light of these AR functions, in relation to how sensorial stimulation using AR can ultimately influence customer experiences or not. In doing this, both the particular sense being stimulated will be brought in, but also the particular functions taken the form of descriptive themes, as these constitute cases where it has been proved possible to stimulate the senses. Where found relevant, a descriptive theme may be elaborated upon by drawing on some of the codes that made up this particular theme. Also, it is important to note that structure of the analysis of each determinant will be made in alignment with the conceptualisation of the determinant. This means that in cases where the determinant has distinct concepts, then the analysis will be structured around these. In cases where no such distinct concepts exist, then the analysis will be structured around the senses.

However, in doing this it is also being acknowledged that numerous other descriptive themes could have been tested, had another type of interpretation been conducted during the thematic synthesis as related to the hermeneutic-phenomenological approach taken, which will be elaborated upon later. Also, some of the descriptive themes can most likely be argued to also fit and not fit with the determinants in various other ways than what have been laid out in this paper. What is important to note in this regard, is that the approach taken here has been to test and analyse them where found most relevant instead of trying to apply every one of them for each determinant.

The last part of the analysis will take form of a more holistic analysis, where the results of the analysis of each of the seven determinants will be brought together as a whole, to first of all see how the different determinants can be combined and supplement each other in various new ways with the use of AR. In its essence, the holistic analysis will be conducted in order to see how AR can deliver something entirely new and unique, and why AR is potentially better and worth implementing or not worth implementing, compared to the traditional view of the Experience Creation Model as it was first invented. Adding to this, it will be seen how AR can help deliver a holistic customer experience, by working towards Schmitt, Brakus & Zarantonello's (2015) and others' definition of this as being something that incorporates sensory stimulation among other things, as it was put forward in the chapter on customer experience. Also,

the purpose of this last part of the analysis, will be to find out if and how the different determinants need to be altered to accommodate AR as a potentially multisensorial construct and experience.

Lastly, in regards to the analysis it should be noted that certain limitations exist as to what type of knowledge can be the outcome of this analysis. Even though the data originates from a significant amount of research studies to try to argue for something more general than what could have been the case if only having looked at an individual study, the search was still conducted within clear boundaries when it came to search criteria, review question and quality assessments. This means that the analysis cannot conclude something definitively and completely general when it comes to the research question of how augmented reality can influence customer experience creations through sense stimulations, but is still in its rights to contribute fairly significantly in that regard, within the context and delimitation of the search and review question. Also, the conclusions drawn can only be done so within the context and limitations of the CEC Model, and therefore not generally when it comes to customer experiences as other theory on the matter may contradict this model in some ways, but which is not within the scope of this paper to investigate.

THEORY OF SCIENCE:

INTRODUCTION TO THIS PAPER'S HERMENEUTIC-PHENOMENOLOGICAL STANCE

Throughout this paper, a preference for the epistemology and ontology of hermeneutic-phenomenological is taken with the acknowledgment of its strong position and historical roots within phenomenology as it was first developed by Husserl (Chan, Fung & Chien, 2013). The reason for this epistemological and ontological approach is a direct consequence of the chosen research method of thematic synthesis, which is partly based on the authors' own interpretations and pre-understandings.

In the following section, it will first of all be argued why this particular approach has been taken in this paper in comparison to the pure understanding of phenomenology and its central theme of bracketing. That is, before moving on to all the implications this choice will have for the different aspects of this paper, including the research question, thematic synthesis, and the types of knowledge which can eventually be produced.

The hermeneutic-phenomenological approach taken in this paper is characterized both by the thoughts of Martin Heidegger and Hans-Georg Gadamer as they built their ideas on top of the work initially done by Husserl when it comes to phenomenology, cementing the fact that those two approaches are related. What this means for the epistemological and ontological stance of this paper, is first of all that it is

recognised that creating meaning and achieving an understanding of the subject studied is at the center of this paper. Important in this regard, is the fact that the historically lived experience, background, culture and situation of each individual, is central to the way individuals perceive and live in the world, and this can therefore differ vastly from person to person. This is not only important when looking at the studied subjects, but also important to keep in mind when it comes to the researchers' themselves. Leading from this, then what is perceived as real by individuals, is dependent on the particular pre-understanding each one has, and individuals draw on this pre-understanding when moving into the process of trying to understand the world or reality that they are part of, but without ever leaving this pre-understanding. Hence, a loop-process can said to be created, in which the pre-understanding helps shape new understandings, which then again affects new pre-understandings that individuals will have, before moving into a new phase of understanding of the world, each time leading to more depth in the level of understanding. In this regard, the world and the individual are then constituting and being constituted by one another. However, in order to make continuous sense of the world, each individual must make use of his or her own interpretations and contexts, related to own background, which cannot be eliminated but has to be lived with and utilized in the hermeneutic-circle to make sense of the living world (Laverty, 2003).

A last but important point in relation to the hermeneutic-phenomenological approach is one conceived by Gadamer. According to Gadamer, then through an individual's process of interpreting the subject at hand to achieve an understanding, this individual should see a fusion of horizons at some point, meaning the coming together of expectations and pre-understandings with the meaning of the studied subject. The goal is to achieve new horizons and understandings in this interpretive process, even though a full understanding is likely never possible to be achieved (Laverty, 2003).

The hermeneutic-phenomenological approach depicted here, can be said to be directly linked to the research question in trying to find out the 'how' when it comes to AR's influence on CEC. Finding out the 'how' in this case relates to the understanding and root causes of a possible correlation between AR and CEC. But in finding this, the role of the authors as being interpreters in this, is also acknowledged to be a fact, which will directly impact the type of conclusion that can be drawn from this research question. That is, the method used in this, is viewed as not being completely value free or objective in its application throughout this paper.

In the following section, phenomenology will be outlined in order to help argue why this approach has not been taken, compared to the closely related hermeneutic-phenomenological. When it comes to phenomenology then in its essence, this is about the lived experience of an individual, and about understanding this lived experience and world view as an essential component part of that individual, in

contrast to seeing the world and the reality as something being separated from the individual (Laverty, 2003). Hence, one could argue that in order to understand a person's reality you need to see it from the perspective and inner thoughts of this individual (Laverty, 2003).

Bracketing is an important methodological aspect of phenomenology, and relates to the fact that the researcher should through a systematic and conscious approach try to identify and limit own beliefs, history and pre-understandings of the phenomenon being studied to the largest extent possible, in order to set aside biases which could otherwise influence the validity and reliability of the data collection and analysis (Chan, Fung & Chien, 2013). According to Laverty (2003), then the whole point of this is to suspend the researcher's judgement, to then be able to see the phenomenon being studied more clearly. Therefore, one of the distinct differences between these two approaches is the concept of bracketing, and therefore this is one of the primary reasons for why this paper is primarily situated within hermeneutic-phenomenological, since bracketing is not performed in this paper.

One of the reasons for this, is that one could argue that despite the effort put into eliminating own biases and pre-understandings, then this is never something that can be truly achieved as according to Heidegger (Laverty, 2003) that would not only etail knowing all your own pre-understandings, but also ential effectively removing them (Chan, Fung & Chien, 2013). And in relation to this, one could also ask the question at which point the researcher's own biases have been completely eliminated, as reaching that stage seems to be entirely dependent on the subjective understanding that the researcher has of him or herself. Hence, here arriving exactly at the epicenter of hermeneutic-phenomenology in relation to the idea that the researcher's understanding define the boundaries of what type of findings that can be made, which the method of bracketing in its essence is trying to eliminate. Furthermore, besides having to undertake the task of completely eliminating the researcher's own biases and pre-understandings, one may also have to take into account the pre-understandings of the test subjects, which in this paper's case would relate to the AR research studies, and more precisely a need to eliminate the authors' of these studies' pre-understandings, which from the outset would amount to an almost impossible task. This also constitutes a reason for why the phenomenological bracketing has not been chosen as a method in this paper, but instead the hermeneutic-phenomenological one.

A further issue posed by using bracketing, is the fact that there seems to exist no consistent method for performing bracketing within the literature (Gearing, 2004) nor when it comes to the bracketing method of interpretative phenomenological analysis (Giorgi, 2011), hence posing an issue when it comes to validity and proving by others whether the researcher did in fact eliminate all pre-

understandings. Gearing (2004, p. 1429) even describes bracketing as having been reduced to a: *"formless technique, value stance, or black-box term"*.

Lastly adding to all this, then another reason for not choosing to use bracketing in this paper, is because through the hermeneutic-phenomenological approach it is being acknowledged that the authors' own pre-understandings and the continuously updated understandings are fundamental requirements and reason for the type of knowledge that can be produced in this paper, as in contrast to phenomenology and bracketing.

For these reasons among others, this paper has therefore chosen to be situated within the hermeneutic-phenomenological approach. Having now laid out these prepositions, a turn will be made towards the implications of these for the particular approach taken in this paper.

HOW THE HERMENEUTIC-PHENOMENOLOGICAL APPROACH AFFECTS THIS PAPER'S THEMATIC SYNTHESIS

First of all, the hermeneutic-phenomenological approach taken in this paper impacts the method for searching the literature and the type of knowledge that can be collected. In using thematic synthesis as the method of choice in this paper, a number of choices had to be made, which will naturally be linked to the particular pre-understandings and interpretations of this paper's authors, which are all acknowledged to be an integral part of the paper. That is first of all related to the types of search criteria chosen, as clear choices were made when it came to searching for subject types, articles only, and a certain range of years, while the particular words to be searched for were carefully chosen with a foundation in the review question. Therefore, even though clear search criteria and a clear review question were chosen, then the choice of these have been dependent on this paper's authors situational context, history, motivation and what is already known about the search topic, with the point being that other authors could have made different choices. However, since this paper's research question is to investigate the 'how', it will naturally entail a degree of interpretation. This is not necessarily viewed as a weakness, but rather a strength in this paper in order to make sense of the data findings.

Furthermore, the same thoughts can be said to apply to the choice of quality assessment criteria in performing the thematic synthesis, as the choice of other criteria in this regard, would have yielded the choosing of different research studies to function as this paper's data.

Another interesting point to be made when it comes to the data collection, is the fact that this has been done by two different authors, which can both be viewed negatively and positively. Negatively in the

sense that this could establish inconsistency in the search and the quality assessment parts due to different pre-understandings and motivations of the task at hand, but also different types of interpretations. However, positively in the sense that both authors could at some point enter the same hermeneutic-circle, as through the sharing of best practices in the data collection process, it will be possible to meet in a new common understanding and fusion of horizons in how to conduct the search and quality assessment. The reason for this also being, that according to hermeneutic-phenomenology, then the world and the individuals are constituting and being constituted by one another in new ways all the time.

Lastly, extracting the actual data from the research studies will also entail a degree of interpretation in terms of what constitute the key concepts when looked at in terms of use cases and sense augmentation. That is, since it will be up to the individual researcher's subjective point of view to determine this fact, but again, this is not necessarily viewed as having a negative impact on this paper considering the particular research question, but just has to be kept in mind for the conclusions that can be drawn. However, one could still run the risk of misinterpretations as mentioned by Thomas & Harden (2008).

In an ideal world, to ensure the best possible understanding of the research studies used as data in this paper, then this paper's authors should have engaged in a hermeneutic-circle of understanding with each of the authors of the various studies in a process of co-creation to get to a more precise understanding of what constitute the key concepts and findings from their point of view, in connection to the pre-understandings held by this paper's authors (Laverty, 2003). In doing this, one would also better overcome the motives and biases that constituted the reason for the different authors publishing the studies. However, this has not been possible to completely eliminate in this paper.

On the other hand, this fact is partly overcome by using a significant number of research studies to ensure a less significant impact of individual biases, motives and general understandings on the augmentation of senses. One could argue that the issues outlined above would have been more serious in papers only utilising very few research studies.

Furthermore, what is interesting to note in this regard, is that this paper's authors are instead involved in what could be called a hermeneutic-circle of new understandings with the research studies, instead of the particular authors that wrote them.

In addition to the above, it will also be worth exploring further the relation between the hermeneutic-phenomenological and thematic synthesis when it comes to analysing the various research studies, in particular coding and when setting up descriptive themes.

First of all, through this type of synthesis and interpretations of the research studies, the purpose is to discover new synthesises in the sense of understandings and fusion of horizons, which did not exist in the beginning when looking at the studies individually. In this paper, then this takes its form in the creation of new descriptive themes through the thematic synthesis, in correlation with the hermeneutic-circle as previously outlined. In this view, new and different interpretations and understandings will always be possible, as there exist no clearly defined way for generating such descriptive themes. For instance, it would have been interesting to discover what other themes would have emerged if the search had been widened to include even more studies, or if only one of this paper's authors had conducted the coding and descriptive themes instead of both authors. These are all important questions to ask, as the fairly subjective approach taken in this paper will naturally have implications for the type of analysis that can be conducted, and hence implicate the conclusions which can be drawn from this. Other researchers could have established other codings or completely different descriptive themes.

Further to this, in performing coding and creating descriptive themes, then an attempt is also made to gain access to, and interpret the motives and potential 'common-sense thinking', which the authors behind the research studies could potentially have put into their findings, methods and conclusions. That is, by interpreting and creating new meanings and relationships from their approaches. Because of the interpretivism going into making sense of the research studies and generating the themes, then it is important to note how this also to some extend remove the findings from the context in which they were written originally. As long as this fact is being acknowledged up front before the conclusion is made, then it is not seen as a particular issue for this paper.

A last but interesting point to make when it comes to thematic synthesis, is its relation to the phenomenological research model as characterized by Lukaitis (2011) when it comes to clustering into themes and synthesising. However, according to Lukaitis (2011) this same rigorous method can also be said to exist within the hermeneutic-phenomenological approach with the difference being that the cyclical enquiry of the hermeneutic-circle only exist for this latter approach.

HERMENEUTIC-PHENOMENOLOGICAL APPROACH IN RELATION TO THE ANALYSIS

A last important aspect to touch upon when it comes to this paper's epistemology and ontology will be its consequence for the analysis. According to Bryman (2016), then it is important to acknowledge the fact that after having collected data, then the interpretation of this data is often tested within a theoretical framework, which also constitutes a level of interpretation in itself, as the theoretical framework often has criteria and boundaries limiting how it can be utilized.

What this means for this paper's analysis is that the descriptive themes generated through a level of interpretation, also have to be interpreted once again by the CEC Model and its determinants as they have been established by Verhoef et al. (2009). Therefore, the particular conclusions that are possible to draw from this analysis, will naturally be dependent on Verhoef et al.'s (2009) limitations in terms of epistemology, motivation and their methods validity and reliability.

Lastly, it should not come as a surprise that the conclusions drawn from this analysis, are based on the interpretations and understandings of this paper's authors of the subject matter. Therefore, the analysis and corresponding conclusions are acknowledged to not necessarily hold the single truth on how the descriptive themes can be analysed in relation to the CEC Model.

VALIDITY AND RELIABILITY

The reliability of the thematic synthesis is based on the repeatability of process of the synthesis, as well as the extent to which a repeat of the synthesis would yielded the same descriptive themes.

The search criteria of the literature search have been thoroughly presented, thus a repeat of the search through application of the same search criteria, would be expected to yield the same results. Furthermore, the quality assessment criteria have been presented to give transparency to the process of data extraction, and to minimize bias in choosing which studies to move on with. However, it is still important to keep in mind that this quality assessment can be difficult to replicate in its entirety, since naturally it will entail a degree of interpretation by this paper's authors in choosing which articles to pass. This is something which will be elaborated more upon in the later section about theory of science.

In terms of coding and synthesis of themes, then these processes have also relied on the interpretation of the authors, but have still happened with a clear outset in the content of the articles. Thus, a repeat of the synthesis conducted by others, could yield different themes than the ones generated for this paper.

However, in identifying the concrete use cases in order to code the corresponding key concepts, and then later synthesise these codes into a range of functions as already presented, then a repeat of the data extraction process would be expected to yield much of the same type of key concepts used for the later coding. However, the subsequent process of generating themes could result in different themes had it been conducted by others, since they are to some extent based on interpretation of the researchers. Also

as it was mentioned earlier, then this paper has tried to limit the bias that could exist with having two authors writing the paper, which contributes to a higher reliability.

The validity of what this paper can conclude has been discussed throughout the paper. In terms of external validity it is relevant to notice that this paper conducts a meta-study of concrete AR use-cases, in order to identify the functions of AR in a more general perspective. The findings of the thematic synthesis could be applied in other contexts as well. The ecological validity is limited as the findings has not been tested in real life settings, but merely in relation to the CEC model.

CHAPTER 6: ANALYSIS OF CUSTOMER EXPERIENCE CREATION AND AUGMENTED REALITY

INTRODUCTION

The following analysis will apply the descriptive themes found in the conducted thematic synthesis, to the CEC Model by Verhoef et al. (2009) which was explained earlier in this paper. The analysis will be structured around the model, and each of the seven determinants will be analysed individually, before a final and concluding analysis looking across the determinants will be conducted. Furthermore, the analysis of each determinant can draw on previously mentioned points made during the analysis of another determinants in order to create coherence between the analysis and to ease the understanding for the reader.

All descriptive themes have been considered in the analysis of each determinant. However, due to limitations of space and, again, to ease the process of understanding for the reader, then only the most relevant themes have been included in the analysis. As mentioned earlier, the analysis is based on the descriptive themes identified from concrete use cases in the thematic synthesis. Furthermore, these will also be supported by examples from additional literature and by imaginable examples of how the proposed functions can be applied in a service context. This is done in order to improve the understanding of how these functions can bring value to the service and customer experience contexts of this paper. However, these examples will always be related to and based on the descriptive themes and the functions which they constitute. When the applied descriptive themes are mentioned in the analysis, they will be highlighted in *italics.*

It is important to mention that the following analysis does not suggest that AR can or will completely replace the traditional and present processes in every case. It is rather to be seen as a supplement to the existing tools and methods used in CEC.

IMPLICATIONS OF AUGMENTED REALITY IN RETAIL ATMOSPHERICS

BRIEF INTRODUCTION

This section will look into how AR can influence the determinant of Retail Atmospherics of a customer experience. The analysis of this determinant will focus on the servicescapes, as it was explained earlier how this concept supports the importance of atmospherics in a service setting, and how it categorizes different dimensions of the environmental characteristics. First, the section will look into the potential influence of AR on each of the specific dimensions within this determinant. This will be followed by a broader perspective on how AR can influence different service types and the complexity of the servicescapes.

AMBIENT CONDITIONS

The dimension of ambient conditions of the servicescapes was earlier described as background characteristics surrounding the service environment, and it was further defined to be conditions that could affect all five senses. The conducted synthesis shows that AR also has the ability and potential to affect all five senses of human perception, thus the ambient conditions can be affected in various ways by AR. However, some aspects of these conditions might be more central and therefore more interesting to look into. Here, Bitner (1992) highlights odor, noise and music as central ambient conditions, while Verhoef et al. (2009) similarly highlight scents and music as central conditions in their model of CEC. Thus, factors that affect the smell and hearing senses seem to be important for ambient conditions.

In relation to this, it is interesting to look into the theme of *digitized smell*, since studies in the synthesis showed that AR has the potential of affecting the smell sense. Hariri et al (2016) proposed a technique that could produce smell sensations by stimulating the olfactory receptors in the nose by weak electrical pulses. They argue that the tested prototype has the potential to digitize the sense of smell in the future, purely by electrical stimulation. This could enable a company to stimulate certain smell sensations when appropriate during a customer journey. Similarly, *location-based audio* clues could stimulate hearing during the customer journey. This could both be related to music and noise, which were highlighted as

central factors of the atmospherics. Being able to affect the customer's sense of smell and hearing would give the company more control over these important aspects of the ambient conditions. Also, stimulating these senses on an individual level make the provider able to design the ambient conditions to be aligned with preferences and aims of the customers, which would all contribute to optimize and enhance the surrounding servicescapes.

SPATIAL LAYOUT AND FUNCTIONALITIES

The dimension of the spatial layout and functionalities concerns the physical objects in the environment and how they can facilitate the service performance. In relation to this dimension there are also various functions of AR technology that can alter the servicescapes. *Visual Scene manipulation* can alter the visual presentation of the design and layout of the physical service environment. Supplemented with *digital rendering of physical objects* the service environment can include objects that are not physically visual. This could be facilitated by real-time location based *digital rendering of physical object*s, which can show objects that are present in the environment, but not visible in the real world. This could be objects that might be useful to the customer, but would also constitute an obstacle if present in the visual sphere of the environment, for example supplementary stock of goods in settings with limited capacity.

This feature can be enhanced even further by *simulating physical control* over the digital objects. By making the user able to interact with the digital object, it could potentially replace physical objects present in the setting. Again, this could have positive effects on the spatial layout in service settings with limited capacity, as physical objects could become redundant or be replaced by other useful objects. Furthermore, *environmental embedding of the digital object* where it is most optimal for the user, could improve the spatial layout for the individual. An example could be an information stand that could be replaced by a digital object, which the user could then interact with when and where it felt most appropriate.

Thus the AR technology presents various functions that could redesign and optimize the spatial layout of a service setting and improve the functionality of the layout. Not only in relation to the visual layout, but also in relation to the physical interaction of the functionalities that the layout presents.

SIGNS, SYMBOLS AND ARTIFACTS

The last dimension of signs, symbols and artifacts is related to communication from the company to the customer. An important aspect of this communication is directional guidance, so the customer can stay

orientated in the service setting. The synthesis found several functions of AR that can facilitate directional guidance.

Visual navigation can provide directional guidance as a visual layer, by tracking the customer even in a mapped indoor setting. This could be useful for customers navigating in a large setting, where certain positions are important. This could be customers searching for the right gate in an airport or a certain store in a shopping mall.

Another function that can support the directional guidance, but also serve other purposes, is the *real-time translation* of text. Optical character recognition can facilitate a translation of text, which could be useful in translating messages and signs to the individual customer's language. The *real-time translation* is not limited to text, but AR technology can also facilitate speech to text translation by generating a visual layer of information based on speech recognition. This can enhance the translations from written messages to vocal announcements. Again, the airport setting could be a relevant example, where call-outs are regular means of communication, thus visualizing messages in the preferred language of each individual could be useful. Furthermore, it shows that the technology can facilitate various forms of communication.

Directional guidance could also be based primarily on audiological information. For instance, *Audio navigation* based on *location-based audio clues* is another relevant function to consider in relation to this dimension. These location-based clues have the potential to replace physical and visual signs and directionals. By embedding the directional guidance into the ambient conditions as audio clues, it could be seen as an alteration of the dimensions of servicescapes, where a function is transferred from one dimension to another. In this case, it is the directional guidance that is transferred from signs, symbols and artifacts to the ambient conditions of the environment.

COMPLEXITY AND SERVICE TYPES

Changing the focus from the specific dimensions and to a broader perspective of the complexity of the servicescapes in relation to the different service types, it becomes relevant to look into how AR can influence the setting in more fundamental ways. Bitner (1992) argued that the complexity of the dimensions differ depending on the importance of each dimension in relation to the service type. For instance that an elaborate spatial layout and functionality is important in self-service settings.

Various of the identified functions of AR can influence the composition of servicescapes in the different types of services and change the need for complexity. Here it is interesting to look into the potential influence of *environmental embedding of digital objects* for sight stimulation. This can for instance

enable a retailer to present a product at the consumer's location, rather than in the retail location. This can enable the consumer to evaluate and even try out a product and its features. One example is the Virtual Dressing Room technology that gives the consumer the opportunity to virtually try out clothes in order to determine both the right design and size fit (Yaoyuneyong, Foster & Flynn, 2013). This has various consequences for the atmospherics of the service setting. The atmospherics could say to become rather uncontrollable to the company, as the interaction can now take place nearly everywhere, for instance in the consumer's own home. This leaves the retail environment, especially the servicescape dimension of ambient conditions, to consist of external factors that the company cannot control. For instance, noise that could influence the customer during a decision making process.

Also, it was earlier described how AR can influence the ambient conditions of the Retail Atmospherics. This could potentially be a mean for the company to regain control of the atmospherics, even in self-service situations such as shopping and trying out products at home. By stimulating certain ambient conditions virtually, the company can seek to control or influence the retail environment wherever the customer is present. Thus, AR has the potential to alter the perspective of the typology of service organisations' usage of servicescapes, for instance by moving the complexity of a service provision from lean to elaborate. Furthermore, it might even contribute to changing the typology of services. By creating a virtual environment in which various stimuli and digital objects can be transferred, the interaction between provider and customer can change. For instance, services that are usually performed in an interpersonal setting are now feasible to perform as a remote-service, as shown with the case of the virtual mirror. In this case, the act of visiting an apparel store is now substituted by trying out the products by yourself.

One of the challenges of designing servicescapes is that the optimal design for one individual or group, might not be optimal for another individual or group, as the aim and motivation for participating in the service encounter differ. As shown in several of the identified functions and described examples, then AR can be used to design personal and customized servicescapes for individuals or groups, based on preferences or context. This could be useful in order to overcome the challenge of designing servicescapes to different segments. In relation to this challenge, it is worth considering Kaltcheva & Weltz's (2006) argument that the role of the atmospherics differs in relation to the consumer's motivation for the encounter with the setting. The motivation acts as a moderator for the response to arousal during the customer journey, which differs depending on response of pleasantness in relation to the purpose of the encounter. By facilitating customization of the servicescapes, AR can optimize the atmospherics based on the individual's motivation, which might improve the customers experience.

CRITICAL REFLECTIONS OF AR'S IMPACT ON RETAIL ATMOSPHERICS

The last part of this section will focus on some critical reflections in terms of the influence of AR on Retail Atmospherics. First, it is important to recognise the ethical issues of altering and augmenting the atmospherics of the service setting. As shown earlier, the technology has the potential to augment the atmospherics in various ways, and in some instances on a personalised individual level as well. Being targeted with specific alternated atmospheric inputs might seem invasive for some. Furthermore, the augmentation of atmospherics can seem manipulative. That is, an increase in implementation of AR and increasing augmentation of the atmospherics of the service setting may eventually make it difficult for consumers to distinguish between what is real and what is augmented. This could in the long-term have effect on the relationship between the company and the consumer, as the consumer's trust in the provider might be influenced by the doubt that can be mitigated by increasing augmentation. This issue and its consequences are discussed in more detail later in this paper.

Finally, it is also important to recognise that many of the proposed changes to the Retail Atmospherics are relying on the development of the technology. The basic functionalities of the suggested cases have been tested. However, as of now, many of the suggested functions are still in the early stages of development. Whether the suggested potential of AR in relation to influencing atmospherics is realistic, depends on the technological advancements in the years to come. Furthermore, this development will dictate how the technology will be received by the general public. It is fair to assume that customers would be cautious by letting a company interact and manipulate with their perception of the environment surrounding them. Especially regarding direct stimulation of certain senses, such as the electrical stimulation of the smell sense. These issues, regarding development and barriers, will be elaborated upon later in this paper.

IMPLICATIONS OF AUGMENTED REALITY IN PRICE AND PROMOTION

BRIEF INTRODUCTION

The determinant concerning the Price and Promotion of a customer experience is related to relationship building, which include developing, but also maintaining a close relation to the customers, which should be beneficial to both parties. The relationship marketing was earlier described as containing three levels: encouragement, customization and installment of added value and switching costs. AR shows functions that have the potential to influence especially the second and third level of the relationship marketing.

CUSTOMIZATION OF PROMOTION

The second level concerns customization and personalisation, where the company recognises individual needs and preferences of the customer and designs the offering around this. Regarding customization of promotion, then AR presents functions that could make this offering feasible. A *context driven information layer* can be used to display advertising as a blended layer on the real scene. The context in this case is consumer data, which can be used to target specific adverts to specific customers, similar to online advertising based on browsing cookies. AR could here be used to perform a similar form of advertising, but directly in real settings. This creates an opportunity for companies to focus their advertising on individual advertising, targeted to individual consumers based on consumer data, rather than on more generic advertising designed to target a larger segment. This should, all things equal, make the advertising effort more efficient. In this way, the advertising can potentially take place closer to the physical setting than what online advertising can do today. This could further make way for advertising creating a higher level of serendipity, where the customers find something they were not initially looking for. For instance, through a *context driven information layer* or through *location based audio clues*, the customer could be made aware of offers on the move, which could trigger an unplanned interaction directly inside the retail setting. This form of AR has already been tested in relation to creating serendipity for blind users, who often move about with a specific purpose. This was done in a study by Blum, Bouchard & Cooperstock (2012) who tested a device that could provide *location based audio clues* of nearby points of interest.

The *context driven information layer* displayed could also be related to other relevant topics beside advertising. It could also concern other information relevant to customers during the service exchange. Information like the advertisement could be personalised based on relevant data. By doing this, the provider designs the offering around customization, which was described earlier as having positive effects on the customer's relation and trust towards the company.

ADDED VALUE AND SWITCHING COSTS

The third level of the relationship marketing concerns installments or initiatives that add value for the customer, but also increase the switching costs of choosing another provider. This can help retain the customer in the relationship as the monetary, psychological or time cost of switching provider create an exit barrier.

Regarding added value, then various cases have been and will be presented during this paper, which add value to the service provision. The added value can consist of AR improving the customer experience in various ways. This includes making the process more efficient, offer personalisation and

adding options or channels among other things. This added value can contribute to the second aspect of the third level of relationship marketing, which is related to increasing the switching costs. The more added value AR can contribute with to a customer experience, the higher are the switching costs of choosing another company, which might not offer the same integration of this technology. This could be in relation to psychological and time costs of switching, as the customers have to integrate themselves in another type of process with the new provider.

Furthermore, the customization and personalisation that can be offered through the use of AR as earlier mentioned, contribute to increasing the switching costs. When the consumer accumulates data and purchasing history at one company, the benefits of customization should increase. Thus, the longer the customer interacts with the same company, the higher the switching costs become. In this case the costs are also related to monetary costs, as starting over with a new company, could result in missing out on some of the benefits that a sustained relationship would offer in monetary terms.

CRITICAL REFLECTIONS OF AR'S IMPACT ON PRICE AND PROMOTION

It should be recognised that AR is not seen as having a significant influence on the price aspect of this determinant, as it is difficult to identify a causality between the use of this technology and the price of a service. However, there could be some indirect effects of using AR if it is utilized as a mean for efficiency. If the use of AR can help bring down costs of internal processes it could affect the price determination.

Furthermore, the range of potential impacts of this determinant seem rather limited compared to some of the other determinants analysed in this paper. The impacts are mainly focused around advertising and relationship marketing. However, this limited field of impact might be of significant importance, as the proposed opportunities can bring rather radical changes to this part of the CEC.

Regarding the relationship marketing, it is important to be aware of the changes AR can bring to the way people interact with each other in a service encounter. AR offers a new way to interact compared to traditional face to face contact. Thus, the technology changes the way the relationship is created and maintained, and can pose a threat to losing interpersonal contact between company and customer. However, this paper does not argue that AR can completely replace interpersonal contact, but rather function as a complementary way of interaction. Furthermore, the use of AR could create new opportunities and needs for interpersonal contact in more appropriate situations. This issue of interpersonal relations in response to AR will be elaborated upon later.

IMPLICATIONS OF AUGMENTED REALITY IN ASSORTMENT

BRIEF INTRODUCTION

As put forward in the theory section, the Assortment determinant is primarily about service and product variety, uniqueness and quality. Also, it is about how the reduction of products displayed and range of services offered can both positively and negatively impact customer experiences. In this following section it will be analysed how AR can either positively or negatively influence this determinant, by looking at the different sense stimuli themes that were found during the thematic synthesis.

THE INFLUENCE OF AUGMENTED TASTE AND SMELL

Looking into how AR can first of all influence the assortment uniqueness in terms of services and products offered, the stimulation of smell and taste would be interesting to incorporate into this analysis. The descriptive themes of *changing the smell of food and drinks*, *enhanced smell experience*, *enhanced taste experience,* and *changing the taste of food and drinks*.

Related to taste, it would be possible to stimulate the tongue either chemically or electrically, to provoke certain tastes of food or drinks that would be within range of the customer. In this way, customers could experience a very strong sense of uniqueness as the taste experienced would be digitally triggered, hence controlled to be either time dependent, location dependent or dependant on the customer itself. This could allow for individually tailored experiences when walking around in supermarkets or similar types of stores. Also, it would be possible to get a taste of the menu while browsing the menu in a restaurant, which could help customers in deciding of what food and drinks to order, which would benefit both the customers, but also the restaurant. The same scenario regarding uniqueness could be applied to the sense of smell, as the stimulation of smell receptors could allow for an enhanced smell experience to be put on top of a traditional shopping experience, for instance when walking by certain food in a supermarket. That is, since some type of food do not necessarily express much odour, but with AR smell stimulations, companies could create a strong sense of odour attached to this food and let customers experience something unique compared to a traditional shopping experience without AR and sense stimuli.

Furthermore, if looking specifically at service contexts, it would be possible to digitally control the smell customers would experience ones stepping into a service encounter, for instance a bank or an airport. That is, the smell of plants, coffee or a clean environment could be enhanced to increase the perceived feeling of a better service and hence customer experience, even though they are just added as a layer on top of the real world. Relating this to the notion of Experience Economy as described in the theory section, this would also allow for companies to charge extra for special taste and smell services, in order to create truly unique experiences. Allowing for such experiences, could then also be argued to increase the

perceived quality and uniqueness of the type of service offered in a supermarket or store, related to one of the key aspects of the Assortment determinant.

In addition to all this, the enhancements of smell and taste could not only be said to increase product and service uniqueness, but could also increase the perceived quality of products and services through the examples provided above. It is important to note that natural smells would still be found in these environments, but with AR it will become possible to enhance these smells, and to put larger emphasis on the ones that are most important for the particular service encounter. In addition, it would even be possible for companies to create fully artificial smells that are not linked to any real object.

THE INFLUENCE OF AUGMENTED TOUCH

Further in relation to the Assortment determinant, then the stimulation of the touch sense can in various ways also bring in uniqueness, quality and variety to especially product assortments. First of all, it will be interesting to look at the touch function of *designing and personalising the feeling of real objects and products*. What will be possible for customers in this regard, is to basically feel personalized tactile textures and features that are augmented on top of not only food and drinks, but potentially any type of product found in a store. This would allow for tailormade customer experiences, where different customers could touch unique product textures, and hence experience a perceived higher quality and higher variety of product types, as almost endless possibilities could exist for individually tailored perceived products. A concrete case and example of this was put forward in the study by Bau & Poupyrev (2012), where users could feel highly distinctive tactile features on physical objects, such as coffee cups. Even though the tactile textures are not real, they could still be argued to increase the customer experience, since these customers still get to feel something unique, which would not be possible without this AR touch sense stimuli.

The uniqueness and perceived higher quality of assortments could be further enhanced in combination with *real-time touch feedback* and the theme of *different types of touch feedback*. That is, if each assortment item has a marker located to it, as it was made possible in the study by Hossain et al. (2015). In relation, it would allow for the triggering of either vibrotactile feedback or force feedback when the hand or other body parts are near these items. Whether this would increase the likelihood of customers buying these items is something which could be up for discussion. However, it could still be argued that in any case, such type of touch feedback would increase the perceived uniqueness and quality of the item, which could then again lead to strengthened customer experiences and in this way benefit the company allowing for this. These two functions could also be utilized as attention seekers by employees.

According to this Assortment determinant, then other important factors are the fact that the amount of display space for product categories under consideration affect customer's assortment perceptions, and the fact that a reduction of products on shelves were seen as both having positive and negative implications, depending on which study is referred to. For instance, in the study where it did not have a negative effects, this was only the case for low-preference items (Broniarczyk, Hoyer and McAllister, 1998), whereas the other study by Borle et al. (2005) looked at what they defined as large-scale assortment reductions, and here it had an effect.

In relation to those key points, it is relevant to look into the potential influence that the stimulation of the sight sense can have. That is, before providing some examples for what has been discussed in relation to assortment up until this point.

First of all, the sight theme of *visual scene manipulation* could be argued to have an influence on how the amount of display space affect customer's perceptions. That is, since it would be possible to alter the view customers see, by projecting 3D models of virtual shelves in addition to the real shelves. Also, it would here be possible to render 3D models of virtual objects equivalent of the physical objects, for instance clothes or food to be displayed on those virtual shelves. This way, it could be argued how combining virtual shelves with real shelves, could give the impression of the availability of more products, especially in cases where there is not enough space for all products to be displayed on the real physical shelves. Here, AR can be used as an added on effect to supplement and lower the negative implications of having too few products up for display, and in theory be applied to individual customer needs.

The key point as to why AR could add something extra to assortments over traditional store design options, is by providing the option of individually suiting customers' needs, by either manipulating the visual scene to display more or fewer items and products. Also, since two of the studies examined in relation to this, took the exact opposite views of each other as to what customers prefer, then this should serve as a strong argument to how AR could be utilised in those situations, since it can offer something truly unique and personalised.

AR's stimulation of the sight sense could also allow for something completely different as compared to the traditional view of assortments being displayed on shelves in physical stores. The reason for this is that through the sight theme of *environmental embedding of digital objects* it actually becomes possible to completely move the products from the stores' shelves and into customers' own homes. That is by integrating for instance furnitures, coffee machines and the like as contextual layers in people's living

rooms or kitchens, so that people can see how these would fit in before even making the decision to purchase them. This way, it could be argued how AR could change customer's assortment perceptions in new ways, as it would no longer be relevant to discuss whether a reduction or increase in product displays would have positive or negative effects on customers. Furthermore, the Assortment determinants focus on product uniqueness, variety and quality would also take on completely new meanings. The reason being that the way they have been put forward in the literature so far, is related to having many products and items located within the same physical setting, which would no longer be the case with the *environmental embedding of digital objects*.

An example of how this is already possible will be provided in the subsequent part of this analysis on assortments.

CRITICAL REFLECTIONS ON AUGMENTED REALITY'S IMPLICATIONS FOR ASSORTMENT

Having now analysed some of the more positive influences that AR could have for the Assortment determinant, it is worth looking into some of the potential downsides and negative influences that could come with the introduction of this AR technology.

First of all, when it comes to smell and taste stimulations creating something unique and of high quality, then the chemically or electrically triggered taste and smell stimulations need to be closely related to the reality, as otherwise it could have the exact opposite effect and instead decrease the experience of quality. That is, since customers will have the expectations of smells and tastes to resemble those of the real food and drinks that they are looking for. Also, how customers perceive quality and uniqueness of smell and taste can be argued to be very subjective to each individual. Hence delivering a sense stimuli experience that is supposed to be felt unique and of high quality to the customers, may be a very difficult scenario to achieve from a company's perspective, without risking providing customers with smells and tastes they do not like. If this would happen, assortment perceptions would be negatively affected, and hence customer experiences would be negatively affected.

When it comes to the analysis around touch sense and specifically the theme of *designing and personalising the feeling of real objects and products* the key aspect to consider in this regard is customer experiences. That is, since having tailored textures put on top of real objects could be argued to provide customers with something unique and of higher perceived quality. However, this would only increase the customers' experience as long as customers do not feel cheated by the company, in the sense that they perceive the product to have features, which are only possible through augmentation, but which are not a real part of the product. So for a company utilizing this AR sense stimuli it would become a fine line

between making customers feel unique and high quality assortments, but at the same time making sure that customers are made aware of the fact, that these are only augmented textures and features. Otherwise, the customer relationship could take damage.

IMPLICATIONS OF AUGMENTED REALITY IN CHANNELS

BRIEF INTRODUCTION

In short, the Channels determinant as previously described, is very much related to how the integration of channels can lead into what is called a multichannel approach. Furthermore in relation to this, then the harmonization of touch points and a holistic approach to channel management are key aspects of this, as a coordinated multichannel approach would naturally entail touch points coming together, posing various challenges for companies in successfully doing this.

When it comes to the introduction of AR into this Channel determinant, two interesting aspects could be considered in relation to this. First of all, the introduction of AR could function as just another single channel in relation to other existing single channels, without much coordination and harmonization between them. In this, AR could be argued to benefit with something new to customer's journeys and interactions with companies, as this new single channel could allow for interactions stimulated through several of the senses digitally. On the other hand, AR could be thought of as a channel that can ensure harmonization of touch points and a holistic approach through better multichannel coordination. This could then potentially be facilitated by the introduction of a multisensory experience and stimuli for the integration of existing single channels, as AR allows for features not otherwise possible in a traditional channel context. This latter approach is what will be analysed in this section of the paper, in order to discover how this could potentially take effect.

THE INFLUENCE OF AUGMENTED SIGHT, TOUCH AND HEARING

It was previously found that in order for companies to move towards the integration of channels and a multi-channel approach for better CECs, a number of key challenges would have to be overcome first. Some of these are understanding customer behavior and coordinating across channel strategies. Below, it will be analysed how AR could influence some of these key challenges, in order for companies to move towards a more holistic approach and hence strengthened customer experiences.

First of all, understanding customer behavior is about ensuring customer loyalty, enjoyment in the search process and better situational factors. In this, several AR sight themes could be said to influence

these. That is, *context-driven information layers* and *visual information integration* could positively affect the enjoyment customers experience, by allowing for the personalization of the visual context, specifically fitting into their shopping experience as a layer on top of the real world they see. For instance, customers could be presented with information about when a product that is out of order will be restocked again, even while standing in front of its shelf. Also, if in a museum, certain exhibitions could come to live through reinactions of historical battles played out in front of the customers' field of vision whenever relevant to their situations. In addition, the theme of *environmental embedding of digital objects* could also allow for more enjoyment, as customers could stay at home while trying to fit in digital representations of real objects, before making the actual purchase. This environmental embedding also relates to the ensuring of better situational factors, which is another important part of understanding customer behaviors. The reason for this being that customers would be expected to enjoy their familiar environments over any other environment in most cases, hence this way ensuring stronger situational factors that customers can relate to.

Secondly, when it comes to the key challenge of coordinating across channels, then AR through some of the sight themes could help in the coordination and alignment of channels and touchpoints across the different stages in a customer's journey. For instance, the sight theme of *visual navigation* could help customers navigate across the different channels, and help in merging channels and their touch points together for a more simple and seamless experience, since it will be possible to lay out markers onto the real world, and to provide mappings in the customers' field of vision as guidance for customers in real-time. For instance, this could allow customers to move from interacting physically with various service employees in an airport in order to find directions, to instead use a visual indoor navigation tool to help them navigate these settings. This means the possibility of actually removing numerous physical interaction touch point with the service employees, and instead have a virtual and more integrated touch point. Furthermore, in certain situations, it would allow for customers that are trying to find their way around large shopping malls, to not first having to consult the maps usually displayed around these, and then later having to ask employees for directions to the particular store they are searching for.

Adding to this, then stimulating the hearing sense through AR could help support this *visual navigation*, by combining it with the theme of *audio navigation*. Therefore, different interaction channels and their corresponding touch points could be more seamlessly integrated using sight and hearing stimulations.

In addition to this, then *different types of touch feedback* could also be utilised in this cross channel coordination. That is, since the sense of someone touching you or standing close to you in retail or service

settings, is usually only possible when standing physically close to employees. Having this kind of human contact can be considered a very personalised and unique touchpoint that in some cases are highly sort after for customers. However, this type of physical touchpoint using a direct employee interaction channel, could then be replaced or supplemented to some extent by the *different types of touch feedback* and *real-time touch feedback*, since this would allow for customers and employees to communicate force, vibrotactile and air vortex generated feedback with each other. Furthermore, AR could allow for the combination of several touch points and channels seamlessly, when looking at the previously discussed *visual navigation* sight theme, or the sight theme of *environmental embedding of digital objects* in relation to the *real-time touch feedback* theme as just described. The reason for this is that having touch feedback and the environmental embedding of objects brought together into one single touchpoint and channel using AR, would make it possible for customers to place products such as furnitures into their own homes, while also being able to communicate with employees through touch stimulations, hence making it possible to merge some interaction channels together. However, even though this is possible in theory using AR, it could be argued whether this is actually better than what can be done traditionally, and therefore whether this is really needed besides situations where real physical contact is not an option.

Lastly in relation to the cross channel synergies discussed above, then AR could be argued to also be useful for customers when their motivations are to just get through the customer journey fast, rather than having the experience in itself being the primary motivating factor. Kaltcheva & Weltz (2006) talk about these task and motivation-oriented customers, where obtaining a needed outcome is in focus above anything else, also in terms of high-arousal environments, which is not necessarily the motivation for every type of customer to achieve. This point of view is similar to the one laid out in the section about Retail Atmospherics, where it was argued how AR can optimize the atmospherics based on each individual's motivation, whether that be the experience of high-arousal environments or not. However, for these type of task-oriented customers, some of the earlier points concerning streamlined channel coordination would become useful in this context, especially that of *visual navigation* and *audio navigation*. Also, the sight and hearing themes such as *real-time visual translation* and *real-time audio translation* could become beneficial in achieving this. That is, for instance in scenarios where tourists act as customers in a foreign country without necessarily knowing the language. Here, there would be no need for them to interact with employees in the traditional sense, as for most tasks people could rely on their AR devices to get them through the journey and translating important information for them, hence resulting in larger channel synergies. This somewhat also relates to the analysis of translations that was conducted in the section about retail atmospherics.

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This analysis has now looked into how AR could be used to solve some of the key challenges related to obtaining a multichannel approach for increased customer experiences. Therefore, by overcoming these using AR to stimulate sight, hearing and touch senses, then this could help lead companies and their customers towards the alignment of touchpoints and channel integrations in a positive sense.

THE INFLUENCE OF AUGMENTED SIGHT AND TOUCH ON VIRTUAL AND PHYSICAL CHANNELS

Besides what has already been analysed in relation to the Channels determinant and AR, there are a few other key characteristics of this determinant which would be worth looking into.

First of all, an important thing is to distinguish between virtual channels and pure physical channels when trying to define multichannel services, and how an integration of those can lead to better customer experiences. Stimulating the visual sense using AR, could allow for the blending of the virtual channel on top of the physical one within the same situational setting, as has been argued to be important for channel synergies. The reason for this is that through the sight theme of v*isual information integration* it will be possible to layer customer reviews on top of the real setting, and in this way reduce the need for customers to switch to a pure virtual channel for the purpose of seeing those reviews only. In addition, different digital promotions facilitated by a company, could then also be layered on top of the real world for customers to see when they are inside different retail settings, museums or similar. Especially from a service context perspective, this would mean a stricter alignment of touchpoints and channels.

Also, through *digital rendering of physical objects* it would suddenly become possible to take objects that have traditionally been part of pure physical channels, and then render them digitally to have them blend into the virtual. One could even imagine a future scenario, where it would almost become difficult to completely seperate the two channels, as together they could create completely new offerings that will become the new norm. This blending of channels could be further enhanced by combining it with the touch theme of *virtual object manipulation in either real, virtual or remote environments* and the touch theme of *simulated physical control*, leading toward the scenario where separating them would become increasingly difficult, as one could control the digital rendered object almost to the same degree as with the physical and real version.

A last but important point in relation to the Channel determinant is the fact that it is normal for a customer to perform the search for products and services in one channel, and then proceed to the purchase in a different channel. This then points to the fact that certain types of channels are more important in certain stages of the customer journey. If taking the perspective that AR could function well as a technology to facilitate the integration of channels, it could be argued that the same type of channel

switching would no longer be seen as prefered by customers, as there would be no other relevant channel to switch to, as AR could integrate most of these to some extend.

CRITICAL REFLECTIONS ON AUGMENTED REALITY'S IMPLICATIONS FOR CHANNELS

This paper also acknowledges the fact that having AR facilitating such a comprehensive channel coordination and integration, to the extend that customers no longer will have to switch channels in any case, may be to overextend the possibilities of AR. It could be argued that AR is most relevant only in some stages of a customer journey, or at least relevant for the integration of some existing channels and their related touchpoints. For instance, as it was previously argued, this could be the case when the motivation of the customer is task-oriented, or when certain types of physical channels and touchpoints can be integrated with virtual ones for a more seamless experience.

Some additional critique could be directed towards how *environmental embedding of digital objects* was previously in this section analysed to be able to influence touchpoint integrations across channels. In some situations, allowing for this may not be preferred by the companies, as they could end up losing control of touchpoints when customers can embed products into their own homes or other settings that are placed outside the control of the company. Hence what would happen in these cases, is that control will switch to the customers themselves, and this actually goes against what most companies are argued to prefer. That is, to always be in control of the touchpoints and channels to the extend this is possible. The same issue of losing control was also analysed in the section about Retail Atmospherics, but here in relation to uncontrollable ambient conditions, which suddenly could be placed outside of the companies' control.

Another point of critique can be directed towards the entire analysis related to the harmonization and alignment of touchpoints across channels as well as the multichannel approach. The reason being that merging several channels into one multichannel through the harmonization of touch points, could quickly end up cluttering the space, and make things confusing for especially the customers if not implemented properly. For instance, if several senses were to be activated through one device only, and at the same time within the same situational context, then customers could end up experiencing information overload, which could damage the customer experience. Furthermore, the company also takes on a risk in the sense that if customers have a bad experience through this integrated multichannel or they simply do not like using AR, then they would possibly have no other channel to go to. This crique relates to this paper's introduction about interfaces

IMPLICATIONS OF AUGMENTED REALITY IN RETAIL BRAND

BRIEF INTRODUCTION

In its essence, the Retail Brand determinant is about the relationship between a company's brand and CECs. One of the key components is first of all the relationship between post purchase evaluations and the expectations before stepping into the next service encounter as these expectations could influence customers' future behavior. Secondly, another key component is how understanding customers' perceptions of the company's brand and understanding how to change these, is important for the type of customer experience that should be tried to be created by the company. In this, companies must try to understand and change the customers' mindsets. These key components will be analysed below in relation to AR and sense stimulations.

THE INFLUENCE OF AUGMENTED SMELL, TASTE, SIGHT, HEARING AND TOUCH

Taking the importance of post purchase evaluations first, then this component could be said to be very much related to how customers value the quality and uniqueness of the service or product encounter during the purchasing stage, as that would naturally influence the evaluations given afterwards. Since much of these uniqueness and quality aspects have been analysed already in this paper when it came to assortments, much attention to this will not be given here, but instead references to other relevant sections will be provided. For instance, it will be worth pointing towards the section on the Assortment determinant, as it was here argued how the stimulations of the taste and smell receptors through *changing the smell of food and drinks*, *enhanced smell experience*, *enhanced taste experience*, and *changing the taste of food and drinks* could ultimately help shape the perceived quality, variety and uniqueness in relation to products and services, by offering something different compared to the traditional. Also, the assortment section's focus on touch sense stimulation for increased perceived quality and uniqueness, is worth extending upon here in relation to post purchase evaluations. That is, since also allowing for *personalized and highly tailormade object responses, virtual object manipulation in either real, virtual or remote environments* and *designing and personalising the feeling of real objects and products* during the purchasing encounter could help toward these more positive post evaluations due to the possibility of delivering more variety and uniqueness in the service encounters.

Regarding the second key component of the Retail Brand determinant as referred to in the introduction part of this section, then this one is related to understanding and changing the customers' mindsets. Understanding the customers' mindsets seem to be outside the scope of this paper's analysis,

since none of the generated AR themes seem to be able to influence this in neither positive nor negative ways. However, this still poses the important fact that AR does not influence equally on the different determinants put forward by the CEC model, which is important to take into consideration as well.

Nevertheless, once such an understanding of customers' mindsets and brand perceptions have been achieved by other means than through AR sense stimulations, then AR could be argued to serve as a tool in changing those perceptions for increased brand perceptions. According to the theory section about this determinant, then this entail changing customers' brand associations, brand attachments and brand activities among other things.

Several AR sense stimulations could help companies in achieving this. For example, it could be argued that companies allowing for *visual navigation*, *audio navigation* and *real-time translations* both in relation to hearing and sight senses, would help ease the customer's journeys and the associated touchpoints in various ways, and is therefore having the chance of strengthening the positive associations customers hold toward the company's brand. Lastly, when it comes to changing brand activity, then some of the thoughts put forward in the analysis of the subsequent Social Environment determinant would become important to include. For instance the ideas about how AR through the stimulations of the sight and touch senses can positively influence the establishing of social contexts, identities, community building and cultures among customers and the company employees.

CRITICAL REFLECTIONS ON AUGMENTED REALITY'S IMPLICATIONS FOR RETAIL BRAND

Even though there seem to be some positive influences of AR on this determinant, then it will still be argued here that there are some negative influences as well. Also, in general there does not seem to be a big fit between this determinant and AR when comparing with some of the other determinants, which in most cases had more unique aspects to offer. For instance, analysing this determinant did not seem to bring many new insights compared to the analysis of the other determinants, and generally speaking it was not possible to find many fits between AR sense stimulation and aspects of Retail Brand, which were also seen from the difficulties in testing AR on the understanding of customers' mindsets and perceptions of brand.

Specifically when it comes to the aspect of post purchase evaluations, then it could be argued that it would be difficult for companies to control these using AR, once customers leave the store and enter the post purchase evaluation phase. That is since they would no longer be directly influenced by the stimulation of taste and smell, and therefore AR could be argued to only indirectly influence this aspect during the actual purchase phase, and would not be able to influence it directly.

BRIEF INTRODUCTION

In its essence, the Social Environment determinant is about human-to-human relations in any form, which can impact the customers' total experiences. In this following section, it will be analysed how AR can either positively or negatively influence this particular determinant, by looking at the different sense stimuli themes that were found during the thematic synthesis.

One of the key proponents of this determinant is the establishing of positive social contexts, identities, community buildings and cultures among customers themselves and between them and employees when engaging with a particular product or service offering. At its core, this is very much about belonging somewhere and feeling mutual understandings from the people around you in a purchasing context. Therefore, besides the obvious analysis of this in relation to the senses from a biological standpoint, it will also be important to think of the following sense stimulation analysis, as the senses being constituted by a cultural factor as well. In this paper, space was previously devoted to an elaborate explanation of the senses in a cultural context, as something where the feeling and perception of touch feedback such as vibration and force, are strongly connected to people's backgrounds, cultures and histories. This cultural understanding of the senses is important to keep in mind when reading the following analysis.

THE INFLUENCE OF AUGMENTED SIGHT AND TOUCH

In trying to understand how the implementation of AR could help facilitate this to a larger extend, one could first look at the generated descriptive themes in relation to the sight sense. Here, the theme of *context-driven information layer* can be applied in the sense that it could allow for the sharing of visual information among customers finding themselves within the same purchasing context, for instance the same store. This context related information could then be triggered by a location based marker, GPS tracker or the like, to generate community relevant product or service reviews when a customer is looking at a particular product or when considering which employee to be the most friendly one to ask for advice. Furthermore, this would not only be confined to that of visual information, but could also be extended to incorporate the *digital rendering of physical objects* as 3D layers. That is, allowing for customers to discuss competitive products that have been digitally rendered, in order to assist each others in making the right purchase decisions. This information can then be placed by the customers themselves through a location

based marker. The context could also be broadened out, to encompass the entire store, hence allowing for the sharing of information and digitally rendered products with anyone.

These examples could then be combined with the sight theme of *real-time visual feedback*, as this would basically allow for the customers to instantaneously share live feedback and reviews with each other, but in a subtle and more anonymous way, compared to talking out loud with each other within the retail setting or service setting.

Hence, all this discussed above could help in establishing a stronger sense of community feeling, culture and trust among customers when trying to achieve the same goal of getting the best, most relevant product or service for the lowest amount of money spend.

Now, taking a look at this from the perspective of the employees, then allowing for such a community feeling among their customers is not necessarily a bad thing, but could be argued to ultimately benefit the company and its employees directly, as it has been argued to be the case by Gentile, Spiller & Noci (2007) in creating lasting and better customer experiences.

In addition, according to the Social Environment determinant as put forward in this paper, it is just as much about establishing constructive interactions and relationships between customers and the particular company's employees. In this regard, it could be argued that one way of indirectly achieving this, could be if employees actively participated in ensuring this community type of feeling and shared culture between its customers, which could eventually affect the view customers take toward the employees in a more positive direction. In strong connection to this, then through the Social Environment determinant, it was previously mentioned how ensuring increased in store space can help reduce negative customer interactions and in creating a stronger Social Environment, as you would simply have less chance of customers annoying each other. This is something that could potentially be facilitated by the company's employees, and then indirectly affect the stance customers have toward the employees.

Looking into how AR could help facilitate this, then one could turn towards the sight sense theme of *visual scene manipulation*. At its core, this theme is in fact related to some of the other themes already mentioned, such as the *digital rendering of physical objects* and *real time visual feedback*. However, *visual scene manipulation* constitutes something more, as it relates to any type of visual 3D overlay, interactive visual projection, projection based AR, real-time object registration and model alignment, as they have been found to exist within the literature, to therefore in theory encompass the reshaping of whole environments to either fit individual or group contexts. For instance, when it comes to object registration, model alignment and visual 3D overlay, Swaminathan, Schleicher, Burkard (2013) found that they could

recreate digitally the exact size and shape of furnitures as 3D overlays, and Wen et al. (2013) found that digital content and objects could be projected in real-time on various type of surfaces. Therefore, thinking of all this in combination, then *visual scene manipulation* could entail having employees altering the landscape of the store or any type of service environment, to accommodate the number and type of customers found in the store at the present time, and thus help avoid having customers finding it necessary to stand too close to each other at any given time. Expanding on this, it would become possible for employees to recreate objects digitally in real time, as they are found in one location of the store, and then make a visual projection of them in another part of the store by utilizing location-based AR. Doing this could be in order to help move customers away from certain overly cluttered spaces, as they instead would be able to interact with a rendered version of that object elsewhere in the environment. This particular case would become even more interesting if combined with the stimulation of the sense of touch, in relation to the touch theme of *virtual object manipulation in either real, virtual or remote environments* and *real-time touch feedback*. In combination with these, it would become possible for customers to actually rotate, explore and control those objects and products, while at the same time getting a touch response, for instance vibrotactile, to make the solution stronger.

The above analysis of visual scene manipulation as a way to counter the potential risk of having limited spatial layout negatively influencing customer interactions and behavior toward one another, could have some downsides as well. For instance, if not done properly then having visual 3D overlays and interactive visual projections could clutter the space even more by leaving too many objects in the field of vision. Hence this way increasing the chances of negative customer interactions with each other, as the spatial layout would feel smaller than it actually is, even though it only exists virtually. Therefore, one could argue that there exists a fine line between making *visual scene manipulation* successful in reducing negative customer interactions on the one hand, and on the other hand actually enabling them even more. However, that is only seen to be a potential case if these visual overlays are shared with all customers within the store, and not something individually tailored to each customer.

Further to the negative implications, the end of this section on the Social Environment determinant will have a section devoted to analysing how AR may not help in fostering this stronger Social Environment for various reasons.

THE INFLUENCE OF AUGMENTED TOUCH FOR ONLINE COMMUNITIES

For the Social Environment determinant according to Verhoef et al. (2009), then it is important to note that it is not only about physical locations, but just as much about online community feelings,

especially in a world where a lot of businesses mostly operate online, be it through their website directly, and otherwise through blogs, emails, Skype or other remote conference tools. This also means that the company's customers never really get to meet to discuss and influence each others, and hence it poses a challenge for how companies can actually ensure this type of mutual bond and community feeling between customers engaging with an online company's product and service offerings. So the big question for these type of online business would be how to ensure customer loyalty, which according to the Social Environment determinant, is so dependent on customers actually getting to interact with each other in various ways to perform positive social activities for the generation of increased value. This would not only be for the company itself, but just as much for the customers, since they would get to share important information with each others.

Another layer to this is the importance of also ensuring positive interactions and relationships between employees and customers who through various online text messaging applications provide support and advice to customers. For many reasons, it could be argued that the way online communication works at present, it does not to a large extend allow for a shared social bond and connection between company employees and its customers online.

To help overcome these obstacles in online businesses and online communication one could turn towards AR and sense stimuli, especially that of touch. The sense of touch through AR can be utilized to add an extra layer to the type of possible interactions between customers and between employees and customers for increased community and relationship building in these online worlds, where anything besides visuals and audio are limited. Several descriptive touch themes have emerged from this paper's thematic synthesis, which could be used in this matter.

First of all, the touch theme of *different types of touch feedback* is interesting to incorporate as an example of how touch stimulation can affect the Social Environment determinant. The essence of this, is the possibility of feeling force feedback on your body, but also to feel what is called vibrotactile feedback on either your hands, fingers or other body parts. Having customers or employees using this could effectively add another layer of communication, and allow people to actually 'feel' each other in a sense without being present in the same room. One could even argue that it would be possible for customers and employees to communicate feelings to each other, which could go a long way in creating a sense of closeness with people that are not really there.

Through the utilisation of these types of touch feedback AR technologies, it is being argued that a sense of community feeling and social closeness is more easily achieved within existing online communities and remote services where direct physical contact is not necessarily an option, than what would be the

case without AR. Therefore, AR touch stimulation is said to positively affect the Social Environment determinant compared to a situation without using AR.

Further adding to this, the touch theme of *real-time touch feedback* could also be introduced when it comes to remote services, as in combination with the before mentioned theme of *different types of touch feedback*, it makes an even better use case and possibility of positively influencing the Social Environment, not only between customers, but also between employees and customers. In addition, this type of *real-time touch feedback* could also be combined with the touch theme of *virtual object manipulation in either real, virtual or remote environments*, as it would allow for people not in the same room to interact with the same visual object, rendered from a physical one. This way, allowing for something extra unique when combined with touch feedback to allow for something not traditionally possible in online communities without the use of AR.

In this section it was discovered how the use of AR touch feedback can enhance the Social Environment determinant for increased customer experiences when it comes to remote contact in online businesses and communities. One could argue that such technology would be better suited for remote communication rather than in situations where direct human-to-human contact would be possible instead, as this is naturally more effective in any case. However, if this type of technology would be introduced into a physical environment as well, it is important to note that the purpose of it would not be to completely replace direct human contact, but merely to supplement it to create something more and to add another dimension to customer-to-customer interactions, but also for interactions between employees and customers.

CRITICAL REFLECTIONS ON AUGMENTED REALITY'S IMPLICATIONS FOR SOCIAL ENVIRONMENT

Some of the downsides of introducing AR sense stimulation into a social environment context has already been briefly touched upon earlier in this section, however, below a more detailed look into this will be provided.

First of all, just as much as *context-driven information layer*, *digital rendering of physical objects* as 3D and real-time visual feedback could be utilised in the right ways to strengthen customer cultures and social identities through the enablement of sharing options, reviews and the like, it may just as well be used for the opposite purpose. That is, it could be argued how customers would be confined to their own individually tailored AR device, since highly personalised visual information and objects are also a possibility, as the descriptive sight theme of *environmental embedding of digital objects* shows. This theme is in its essence about tailoring offerings and information to a person's individual context and environment,

meaning that if people are not willing to extend this into a Social Environment by not being willing to share, AR could turn into having a negative influence on the Social Environment determinant.

Hence, downsides exist in terms of individuals possibly gaining their own reality without a shared reality with every other customer and employees in the service context and product offering context, which could make people becoming more distant from each other.

Further adding to this, then the way AR stimulation of the sight sense has been put forward, it could also end up resulting in more limited contact with the company's employees being necessary, thus this way decreasing the personal attachment and social feeling towards the employees, and ultimately decreasing the positive effects AR could have on the Social Environment determinant. That is, the quest of asking employees questions could eventually be replaced by AR visual 3D layers.

Another point of critique of sight stimulation in this customer to employee interaction context, can be explained by the sight theme of *visual navigation*. Utilising AR for easier *visual navigation* around a store, airport or the like or even outside in a service environment could see various benefits. However, it would again also limit the reason for customers to interact with employees, as they would need no additional help to find their way around. Hence, automating the navigation using AR could risk negatively impacting the relationship and community feeling between employees and customers.

The possibility of cluttering the visual space was previously put forward in this section as a point of critique, in potentially resulting in more limited spatial layout. This discussion can be extended to also encompass that of touch stimulation and feedback, in relation to the discussion around the expressive-impressive thought style as laid out in the introduction of this paper. That is, since in this introduction it was put forward how the technology interface can be detached from the device surface, and how AR can be designed to respond to users expressions. Also, it was explained how persons can express themselves using hand gestures and body movements to generate expressive interactions that an AR device responds to, which could ultimately lead to the cluttering of interaction commands in the expressive and detached space. Therefore, having both sight and touch stimulations and interaction commands all laid out in the open among various customers and employees, could then end up having people interfering with each others commands, which could negatively influence the shared sense of culture and social attachment amongst those people. This could be even more negatively enhanced, if customers would take on bad actor roles as explained by the social determinant theory, as something which can happen in retail and service settings.

Ultimately, whether this would constitute an issue or not, could be said to depend on whether the AR sense stimulations take the form of calm technology or not, in relation to the discussion around Weiser & Brown's (1996) definition of this and the dangling string created by artist Natalie Jeremijenko. In this view, the cluttering of the visual and touch spaces would not become an issue as long as the technology could exist only in the periphery of our attention span, as a sort of background noise amongst everything else that is going on.

IMPLICATIONS OF AUGMENTED REALITY IN SERVICE INTERFACE

BRIEF INTRODUCTION

Since AR is a technology, the use of it in a service encounter can be directly linked to the Service Interface. Thus, it can be argued that all effects of the use of AR reside within the analysis of this determinant. However, as this paper seeks to look into AR's influence on the entire CEC, then this section will instead focus on the influence on the Service Interface, by relating the technology to the Pyramid Model of Service Marketing by Parasuraman & Grewal (2000), as this is one of the underlying models of this determinant.

The focus of this paper is mainly on the technology's effect towards the customer rather than on the internal processes behind the CEC. Therefore, the effects on the relation of internal marketing in the Pyramid Model of Service Marketing will not be examined to the same extent as the external and interactive marketing, which include the customer.

It was earlier explained that the determinant of the Service Interface concerns not only the technology mitigating the service exchange, but also the service personnel acting in the exchange. This include offering the right blend between technology and employee activity balanced to the needs of the actors in the exchange, the type of service, the customer's level of activity and the frequency of the service exchange.

The external marketing dimension of the Pyramid Model concerns the interaction between the company and the customer, which can be seen as a traditional understanding of marketing. The interactive marketing dimension concerns the interaction between the actors in the service exchange, meaning the employees and customers.

It was also explained earlier that another important factor in relation to the service interface as a determinant for a customer experiences is the interface's ability to mitigate customization, since empirical evidence suggested that customization was a controllable variable that had a positive impact on the perceived service quality and customer satisfaction.

EXTERNAL MARKETING

The section concerning the analysis of the Price and Promotion determinant already touched upon AR's influence on the external marketing dimension, in relation to how the company could utilize AR in advertising and promotion towards the customer. Therefore, this section will focus on how the blend of technology and personal interaction can be influenced in terms of the Service Interface of external marketing. In this regard it is relevant to look at how technology is already utilized in common external marketing in today's business environment. Without any further analysis of the matter, it should be fair to argue that technology already plays a significant role in communication with customers today. Various communication and marketing channels are based on technology in one way or another. Common channels are television advertisement, social media campaigns, radio advertisements or online advertising, such as banner advertisements or digital content among many other examples.

Thus, the use of technology in external communication is already extensive. It is also fair to assume that this type of communication involving technology, plays a more significant role than personal communication, just by looking at the various opportunities and their roles in today's increasingly digitized society. Thus, the blend of personal interaction and use of technology in external marketing is already significantly biased towards the use of technology. Implementing AR would therefore not necessarily change that blend, but rather substitute some of the existing use of other technologies.

However, one instance where technology might replace more analogue approaches could be in relation to creating individual advertising, as mentioned in the analysis of the promotion determinant. Here it was argued that the use of AR in individually targeted advertisements, could replace more generic marketing targeted to a broader segment. This could replace the more analogue communication channels such as posters, billboards and similar, which do not involve this same level of technology.

INTERACTIVE MARKETING

Regarding the interactive marketing dimension of the Service Interface, it is relevant to look at how the implementation of AR could influence the interaction between service employee and customer. This section will initially focus on some specific functions that could affect this interaction, which will be augmented touch feedback and navigation. Afterwards, the focus will turn to a broader perspective and this part will look at the use of AR in relation to Janlert & Stolterman's (2017) thought styles on interaction and finally the section will also look into how customers behavior in relation to AR can affect the interactive marketing dimension.

Different types of touch feedback can impact the interaction between service employee and customer, by bringing a new dimension to the communication. Online communication using touch feedback has been tested and found to able to convey deeper meanings than words. It was also argued that the communication would create a more personalised and affective experience for the customer (Pradana et al., 2015). Touch feedback could be utilized particularly in remote services, where personal contact is normally not possible. A more personal contact would be possible by enabling the actors in the interaction to send touch feedback to each other as a part of the communication. Thus, in this case the technology can support the interaction between the actors rather than substituting it.

Looking at an opposing case where the technology might substitute the personal interaction, then the functions described as *audio- and visual navigation* could be relevant to mention. These have earlier been mentioned in relation to the servicescapes of the service environment and channels, regarding providing the customer with directional guidance. However, as mentioned in relation to the analysis of the Social Environment, one of the purposes of the service personnel is often to help the customer navigate the service environment. Therefore, this function as usable and valuable as it might be to the customer, can eliminate or limit a reason for the customer to seek contact with the service personnel. This might not be a negative consequence as it could bring a lot of value to the customer, but the personal contact might have long-term benefits to the relationship between company and customer, which could be impacted by limiting the interaction. These consequences could also apply in other situations where information is provided to the customer through the use of AR.

When analyzing the interface and its impact on the interaction between actors in the service exchange, it is relevant to include a perspective on Janlert and Stolterman's (2017) notion on interaction. Earlier, it was argued that AR resides within the expressive-impressive thought style. AR can be seen as a tool to detach the interface from the surface of technological devices, which obviously is a radical change to the use of technological interfaces. Furthermore, the expressive-impressive thought style sees the interface as the relation between the users expression and the impression picked up by the technology.

These expressions can include hand gestures, movements, voice commands and eye tracking, among others. These are all expressions which are controllable by the user. Thus, it can be argued that the user, which in the case of service exchange is the customer, becomes a part of the interface itself. However, this can inflict consequences, as it was earlier argued in the analysis of the Social Environment that all the expressions could interfere with each other and be picked up and impress unintended devices and cause cluttering.

It has already been argued for how navigation can be a factor of limiting the personal interaction between service employee and customer. In relation to how AR can be a limitation to interaction, it is also relevant to look at how the behavior of customers can change when using AR technology.

As argued many times in this paper, AR can provide individuals with their own alternative reality. Both as a consequence of individuals getting different sensory inputs and because the inputs can be personalised based on personal data. This could lead people to focus on their own closed reality, rather than the shared reality surrounding them. Focusing on their own individual reality, could make people reluctant to interact with people outside this reality, which naturally would limit both the volume and depth of the interactions. Furthermore, the personalization of the individual realities limit people's ability to share what they experience, as no one else would have seen, heard, felt, tastet or smelled the same.

CUSTOMIZATION

The final part of this section concerns the service interface's ability to facilitate customization, as this has positive influences on the perceived customer satisfaction and experience. Customization has been mentioned several times in this paper as one of the main features of AR technology. For instance, in relation to advertising it provided information. As the interface can be personalized and tailormade to the individual user, the interface can be seen as becoming an increasingly important determinant in the CEC, when considering the positive influence customization has on customer satisfaction and perceived experience.

HOLISTIC ANALYSIS OF THE IMPLICATIONS OF AUGMENTED REALITY IN CUSTOMER EXPERIENCE CREATION

BRIEF INTRODUCTION

It has so far been analysed how each of the seven determinants making up the CEC Model can be influenced by AR. In this section of the paper, the purpose will be to look beyond each of the determinants

and each of the senses individually, to instead analyse how synergies could be said to exist or not exist between the determinants and AR sense stimulations. This would be in order to perhaps arrive at a more holistic view of CEC in relation to AR, as an holistic approach has been put forward as essential to achieving better customer experiences in the chapter about this. For instance, Schmitt, Brakus, Zarantonello (2015) here defined this holistic approach among other researchers. This is all, before lastly arriving at an analysis of the CEC Model in its entirety, and how it perhaps needs to be altered in order to accomodate a technology such as AR.

However, before trying to look beyond each determinant individually in trying to find synergies, it will be worth to briefly summarize the findings so far.

SUMMARY OF FINDINGS

First of all, for Retail Atmospherics it was argued that both the senses of smell, hearing, touch and sight could be stimulated in order to positively influence this determinant for stronger customer experiences. This was evident from the one smell theme, the two hearing themes, one touch theme and the five sight themes found relevant and therefore applied. Second of all, for Price and Promotion it was seen how the senses of sight and hearing could be relevant to stimulate using AR in order to influence both positively and negatively. Here, one sight theme and one hearing theme were found relevant and applied. Thirdly, for the Assortment determinant, then the senses of smell, taste, touch and sight were found relevant to stimulate in relation to this. This became evident from the two taste themes, two smell themes, three touch themes and two sight themes found to be relevant. Fourth, the Channel determinant was found to be positively and negatively influenced by touch, hearing and sight senses. That is, through the six sight themes, two hearing themes and four touch themes. Fifth, the Retail Brand determinant was found possible to influence by smell, taste, touch, but also sight and hearing to minor degrees in reference to other determinant sections of the analysis. That was through two smell and two taste themes, three touch themes, and two sight and hearing themes. However, it was also argued how the possible sense stimulations only had minor effects on this determinant, and that overall there was not found a great influence and fit. Sixth, the determinant of Social Environment was analysed in relation to the senses of sight and touch. Here, six sight themes and three touch themes were found to either positively and negatively influence this. The cultural understanding of the senses was also found important here. Lastly, the Service Interface determinant was found possible to influence by the AR stimulated senses of touch, hearing and sight. This was done through one touch theme, one hearing theme and one sight theme. Compared to the other determinants, then this one was found especially interesting when relating it to the previously analysed determinants, since Service Interface mostly is about the technology aspect in itself.

Therefore, it was possible to relate it to some of the previous points, however this time seen within another perspective.

AUGMENTED REALITY'S MULTISENSORIAL IMPLICATIONS

In relation to the above summary, it becomes evident that no matter which of the seven determinants are being considered, then they all seem to allow for some degree of multi sensorial stimulation through AR, as more than two senses have been found relevant to stimulate through application of the descriptive themes for each of the determinants. Stemming from this analysis, then the determinants that seem to allow for the highest degree of multi sensorial experience using AR, are Retail Atmospherics, Assortment and Retail Brand as it was found relevant to stimulate four or more senses for each of those.

This also ties in with some other important aspects to consider, which are related to why incorporating AR is necessarily better than the traditional approach without AR, and why AR is even worth implementing in terms of what it can do differently. In relation to this, it can thus be argued that AR sense stimulations may not necessarily be better when looking at each sense stimulation individually within each determinant, but when looking at them in combination instead, it opens up possibilities for having them contribute towards something bigger and better, than what has so far been possible in traditional service and retail environments without the use of AR. That is, being able to digitally trigger several of the customers' senses could allow for an array of simultaneous, context dependent and personalized sense stimulations, which can all ultimately result in multi sensorial experiences as found evident in the analysis of each of the determinants.

Furthermore in relation to the above, then an important point is also related to the fact that AR can not only be used to enhance an existing experience by causing digitally triggered sense stimuli, or by combining several sense stimuli simultaneously. That is, since it can also be used to make what is already possible without AR, possible in other settings and scenarios. For instance, this becomes evident when looking at the descriptive theme of *environmental embedding of digital objects,* which does not necessarily stimulate more senses, but could actually be argued to stimulate fewer senses, since people may not touch the virtual object in the same way as they would do with a physical object. Also, the sight sense is stimulated no matter whether people are looking at the physical object or its virtual counterpart. However, what it does differently, is that it allows for sight stimulation of this digital object in customers' own homes, which therefore serves as another argument as to why AR is worth implementing and take into consideration over traditional approaches. That is, since it can deliver something not otherwise possible.

All of the above thoughts around looking at the senses in combination within this multisensory perspective, can be said to relate to the theory of Experience Economy developed by Pine and Gilmore (1998) as laid out in the theory chapter of this paper. The reason for this is that they mention the importance of stimulating several senses in effective ways in order to create memorable experiences. Therefore, in relation to this notion of Experience Economy, one could argue that allowing for a step towards this multisensory experience, then AR can help companies' work toward using AR sense stimulations as distinct offerings, which can be deliberately staged for successful creations of memories.

What AR can also do differently, and why AR is worth implementing are aspects which will be considered in more detail in the following section, but this time from another perspective.

AUGMENTED REALITY'S SYNERGISTIC EFFECTS ON CUSTOMER EXPERIENCE CREATION DETERMINANTS

Having now summarised some of the key findings stemming from the analysis of each determinant individually, and the multi sensorial aspects of these, a turn will now be made towards how the determinants can perhaps be integrated in various ways using AR stimulations, in order to perhaps arrive at a more holistic approach. This is important for better and more total customer experiences that are more seamlessly integrated, as put forward by De Keyser et al. (2015) in Lemon & Verhoef (2016), Berry, Carbone & Heckel (2002), Verhoef et al. (2009) and Schmitt, Brakus, and Zarantonello (2015). Also, Verhoef et al. (2009) are specifically talking about a holistic approach in terms of the CEC Model, as all seven determinants must be taken into consideration and worked with, in order to create better experiences.

One way to argue towards a stronger holistic approach is by looking at where the same descriptive themes and sense stimuli have been found relevant for more than one determinant, as this could lead towards an argument of a stronger alignment and synergies between those determinants, when incorporating AR sense stimulations. In the following section, examples of such combinations will be given, while at the same time acknowledging that the analysis here is not completely exhaustive in this matter, as more cases could possibly have been discovered.

First of all, there seem to exist synergies and alignment between the channel determinant and the Social Environment determinant in relation to the stimulation of the sight sense, which is evident from the fact that the descriptive theme of *context-driven information layer* was found relevant in both cases. In the Channel determinant, this sight theme was argued to help with enjoyment in customers' search process, while the same theme in the Social Environment determinant was argued to allow for the sharing of visual information with other customers, for instance context relevant product or service reviews. Furthermore

and more interestingly, there seem to exist a relationship between the two determinants when it comes to online communities and virtual channels in relation to touch stimulation. That is, since in the Channel determinant the use of *virtual object manipulation in either real, virtual or remote environments* was found relevant for better channel alignment, while in the Social Environment determinant, the same touch theme was found relevant to allow for online social engagement with virtual objects.

Second, synergies also seem to exist between the determinants of Retail Atmospherics, Assortment and Retail Brand. For instance, it was found how enhancing the smell sense through *digitized smell* was relevant for the Retail Atmospherics determinant by letting a company offer this throughout the customer journey. For the Assortment determinant, it was found relevant how the smell sense could be enhanced through the theme of *smell enhanced experience* and other themes in relation to increased smell experiences in service settings. And lastly, for the Retail Brand determinant, various smell stimulation themes were argued for, in order to influence post purchase evaluation positively.

Third, alignment can also be argued to exist between the Atmospherics and Assortment determinants on the one hand, and then the Social Environment determinant and the Channel determinant on the other. That is, since it was previously argued for the relevance and possibility of *visual scene manipulation* by the stimulation of the sight sense in both atmospherics, assortment and Social Environments, all fairly much related to altering the design and layout of physical service environments and the amount of display space.

Between Atmospherics, Assortment and Channel, alignment of AR functions and sense stimulation seem to exist in terms of *environmental embedding of digital objects* through sight stimulation. Specifically in the case of Assortment and Channels, it here comes down to them all having to somewhat to do with having customers interacting with digital representations of physical objects in their own familiar settings, such as homes. For Atmospherics, then this AR function was instead related to improving the spatial layout for the customers, but in the sense that it could be done where found most appropriate, for instance within people's own homes.

Lastly, alignment between the Service Interface, Social Environment and Channel determinants can also be argued to exist when it comes to touch stimulations, and specifically the AR function of *different types of touch feedback.* This can be said to be the case, since this AR function was previously found relevant for these determinants in the sense that it could allow for another level of interaction between service employees and customers, primarily in online communication settings for a more personalised feeling and emotional experience.

The above mentioned synergies between the determinants when it comes to specific functions of AR sense stimulations, do not serve as an exhaustive list as it was previously stated. However, the examples should still service as an argument for the fact that AR can bring together determinants and this way allow for a more seamless and holistic customer experience. The reason for this being that customers can have fulfilled the importance of better retail atmospherics and assortment through the same AR smell functions. Also, customers can have fulfilled the importance of better channels and Social Environments through the same *context-driven information layer* and *virtual object manipulation in either real, virtual or remote environments.* These are just two of the examples provided in the above section, but should still be able to convey the meaning that AR can contribute with something more than just influencing each determinant individually.

Furthermore, this can also be used as an argument as to why AR's enhancement of the senses in relation to a holistic approach, can lead towards experiences of cognitive, affective, social and physical impressions as coined by (Verhoef et al., 2009). Also, this can help lead towards the total customer experience by incorporating at least the customer's cognitive, emotional, sensory and social responses, listed as some of the important factors in this according to Schmitt, Brakus, and Zarantonello (2015). And lastly, what has been put forward in the above analysis can also be related to De Keyser et al.'s (2015) description in Lemon & Verhoef (2016) of customer experience as a composition of the cognitive, emotional, physical, sensorial, spiritual and social elements that mark the customer's direct or indirect interaction with a company, however, without necessarily a big impact on the spiritual element.

In addition, the multi sensorial aspect across the different determinants should be noted as something important as well. That is, by looking at all seven determinants in this holistic approach, then it becomes evident how this can entail a combination of various sense stimulations across the determinants to result in multi sensory experiences.

AUGMENTED REALITY'S POTENTIAL ALTERATIONS OF THE CONCEPTUAL MODEL OF CUSTOMER EXPERIENCE CREATION

In this section, an argument will be tried to be made towards how the CEC Model in its current form, perhaps needs to be changed in certain ways in order to accommodate the AR sense stimulations, which were argued to positively and negatively influence the different determinants in various ways. Such change could both involve the nature of each individual determinant, but also the model in its entirety. At the same time, it is important to point out that the purpose is not to confirm or reject the model in any way, since it is being acknowledged that AR is not supposed to completely replace all natural aspects

regarding channels, social settings, servicescapes and the other determinants making up CECs. Rather, the purpose is to see the model in light of this new technology, and its influence on CECs.

First of all, in the previous section it was argued how AR can help bring together determinants and in this way allow for a more seamless and holistic customer experience, as also evident from the entire analysis. Building on this argument, it could be argued that when implementing AR and allowing for these same types of sense stimulations across the determinants, then some of those determinants could perhaps be merged together to overall form fewer than seven, and hence this way altering the model in its current form. However, this would of course entail a further development of the technology, and having service environments not being afraid of taken the step into this yet uncharted territory, which would probably be the case for many companies.

In addition, there are a number of important aspects to consider when looking at the determinants individually. For instance, in the analysis of the Assortment determinant it was analysed how AR's stimulation of the sight sense could allow for something completely different as compared to the traditional view of assortments being directly displayed on shelves inside of physical stores. Here it was argued that using *environmental embedding of digital objects* then many products could be directly integrated into customers' own homes to see how they fit in before making a purchase. Therefore, it was argued how this would make it no longer necessary for the Assortment determinant to care about customers' reactions to reductions in product displays. Also, it was argued how uniqueness, variety and quality would no longer be relevant as part of this determinant to the same extend, since it would no longer be necessary to have products located alongside many others. Thus, this would entail an alternation of the determinant in its traditional sense.

Another important aspect also became evident in the analysis of the Retail Atmospherics determinant. That is, since here it was argued how companies' use of AR could potentially alter the perspective of the typology of service organisations' usage of servicescapes, for instance in moving service provision from lean to elaborate, and since the company can regain control of the atmospherics even in self-service situations through stimulating ambient conditions virtually, which is not part of the current version of the determinant. Furthermore, another aspect showed how AR can be used to personalize and customize the servicescapes to cater for individual needs. Therefore, it will no longer be necessary to discuss the difficulty of designing services to different segments as part of the Retail Atmospherics determinant, thus would entail an alteration of the determinant in its traditional sense.

However, looking into some of the negative influences which were put forward during the analysis of each individual determinant, then it were also noticeable how AR can impact the determinants in such negative ways, so that the nature of the determinants need to be completely thought of in new ways, and perhaps be altered to accommodate this new technology, for instance in relation to ethical aspects. This could be thought of as a cause and effect relationship.

For instance, this could be argued to be the case when looking at the critique put forward in the analysis of Atmospherics regarding the AR technology becoming invasive and manipulative, hence creating a need for such aspects to be included in the theory of this determinant, as something that would be needed to be overcome if AR would be implemented this way.

The same need for thinking of determinants in new ways, and having them accommodate entirely new situations could be said to exist for the Assortment determinant, the Channel determinant, and the Social Environment determinant among others in relation to the critical reflections which were put forward in those sections as well.

CHAPTER 7: DISCUSSION

This paper has presented various suggestions for how AR can influence the CEC process. However, it should be recognised that there are various reservations and conditions in relation to the realization of the suggested impacts. These reservations and conditions apply to both the technological advancements, people's adaptation to the technology and ethical issues regarding the use of AR technology.

This chapter will discuss some of the main challenges for the implementation of AR in today's society and for the adoption from consumers. The chapter will also discuss the potential barriers and issues and in some instances also address factors or solutions that could help overcome them, while other questions will be raised without a concrete proposal for a solution.

TECHNOLOGICAL ADVANCEMENTS

One of the primary conditions for the success of implementing AR is the technological advancements achieved within the field of AR. All the functions applied in this paper stem from the literature and have been tested in either real life or lab settings. The data have shown that all five senses have been possible to stimulate in various ways. However, many of the functions are still in their early stages of development. Whether this development continues fast and far enough is naturally an important condition for the success of AR as a technology of the future.

One of the main achievements that the technological advancements should address in order to achieve the usability that is proposed in this paper, is that the technology should become wearable. To alter people's perceptions of the reality and create new layers of reality, the device should not be an obstacle in itself. The blend between the real world and the augmented world should be as seamless as possible, thus the technological components need to blend in as well.

Another essential condition for the implementation of AR, could be the development of an ecosystem of both hard- and software that make the different functions possible. A smartphone in today's society would probably not be much more useful than a simple mobile phone, without the ecosystem of apps that allow the device to exploit the hardware in various ways and to interact with other devices and media. The ecosystem could be important in turning the developed technology into applicable use cases as those suggested in this paper.

This paper suggests that the stimulation of multiple senses is one of the primary impacts that can potentially provide the biggest influence to the creation of customer experience. The ecosystem seems especially important in this relation. To stimulate and augment the perception of multiple senses at the same time, would probably require multiple devices that could link up with each other and function in correlation. Most of the functions found in this paper have been tested in experiments, which often, as of now, have been related to single and simple stimulations. Thus, to achieve multi sensorial stimulation, it seems necessary to combine different functions and make them interact with each other. Thus, the pace and achievements of this development seems essential to the successful implementation of AR in relation to the multi sensory aspect.

Whether this development is possible or not will probably depend on companies' and organisations' willingness to invest the required capital and resources in the research and development of the technology. It was earlier mentioned that many of the biggest actors in the technology industry, such as Microsoft, Facebook, Google and Apple are investing capital and resources in the development of AR. This competitive pressure could be a positive sign for the future of AR, as these investments and a potential competition of becoming leading in this technology could push the development forward.

SOCIAL BARRIERS

Another barrier to the successful implementation of AR is the adoption from consumers. Using wearables such as head-mounted displays could pose a threat to people's social image, which could be a barrier to consumers willingness to adopt the technology. This is argued to be one of the reasons for the failure of the Google Glass, an AR device launched in 2014, which never really gained foothold in the

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market. First of all, people did not find the design and look of the product appealing, which limits the motivation to wear them. Furthermore, other people felt uncomfortable around a person wearing the glasses, as they were unsure of their intentions and what the device was capable of. For instance, people were worried about being recorded without their consent. This obviously put both people wearing the glasses and people around them in an uncomfortable social situation (Naughton, 2017).

To overcome this barrier it could be relevant to look into the same solutions needed in relation to the technological advancement discussed in the previous section. Making the devices wearable and non-obstructive could make them more appealing to wear, which could help overcome challenges of people's lack of motivation. Also the development of the ecosystem will help motivate people to adopt the technology. If the technology and the functions in the ecosystem become smart enough, people could find the technology useful, which might eventually be enough to convince people to use the devices.

Furthermore, for large scale adoption, then innovative first movers are most likely needed first. Once some people start wearing the devices and break some of the social barriers it could spread to other people and eventually become a more normal feature in society.

This could be supported by a push from the market leaders. As mentioned earlier, some of the biggest actors in technology business are investing in the technology. Once they begin to push their products in to the market it might trigger a demand and curiosity for the new technology. Rather than consumers creating a pulling demand for the technology, AR might need to be pushed in to the market to create a demand for something the consumers did not recognise as a need.

ETHICAL ISSUES

In addition to technological and social barriers of the implementation of AR, there is also a need for a discussion of the questions regarding ethical issues that the technology raises.

The essence of AR is that the perceived reality is altered for a specific purpose. Purposes that can stem from various motivations, as shown in this paper. This blend of the real- and the virtual world could eventually become so seamless, which could raise confusion of what is actually real. Thus, there is an ethical issue regarding the boundaries of AR, and whether it can become blurred.

This confusion could be strengthened by the lack of control the user might feel when interacting with AR. The user gives up a lot of control over which sensory inputs they are going to be exposed to. Giving up this control could feel invasive for the users, as they will need to accept being manipulated, especially in relation to senses that the users normally are more or less in full control of. Sensory inputs in

relation to the taste and touch senses are usually rather controllable, as the user to a large extent can control what to taste and what to touch. Thus, giving away the control of these senses might be more invasive than accepting to be manipulated in relation to sight, hearing and smell, since these are normally senses that can be affected by uncontrollable inputs.

In relation to giving up control, then it is relevant to look at who the users will hand over the control to. This should be of relevance to the user, as it concerns who will decide what the user will see, hear, feel, taste and smell, as well as deciding which information is provided. Essentially, as more and more inputs become augmentable, this issue will actually concern the fact that the users give control to others to design their reality. This can again be related back to the ecosystem of AR. The companies behind the software applications would gain control of the consumer data and thus gain the power to design the augmented reality presented to the user.

Another ethical issue regarding the implementation of AR, is how it will affect people's behaviors. As mentioned earlier, then AR has the possibility to design the reality for every individual person based on data and situational context. This raises the question as to whether this will benefit the interaction between people or contribute to people closing around their own individual realities.

While functions in the individual's AR can help people become more efficient, overcome challenges, enhance experiences and make them able to do something that was not possible without AR, there are also potential downsides to the use of the technology.

First of all, some of the functions presented in this paper suggest solutions where the need for interpersonal interactions are replaced by a self-service tool. For instance navigation in indoor settings or supply of relevant information.

A more deeply rooted consequence can be seen in relation to how AR can affect people's attention. AR can potentially act as a limitation of interaction between people, as individuals closes around their own private spheres. There is already an existing tendency in relation to the use of social media. Social media creates new ways for people to interact, even over long distances and over long time spans. However, it has shown to decrease the attention span of people. Especially among teenager. This is related to earlier mentioned issues of control. As people become more reactive, instead of in control, the attention span decreases, as people will focus their attention on the expressions outside of their control that they need to respond to (Sandor, Fuchs, Casinelli et al., 2015). The same issue can arise with the use of AR, as people become reactive to inputs they are exposed to by AR. Furthermore, the individual reality created by designing the input based on data, makes it difficult to share experiences with others. If everything is

experienced individually, it is hard to relate to each other's experiences and feelings. This is an issue that might end up limiting the perceived experience for customers, as the value of it might decrease if it's not shareable.

In relation to the issue regarding people's attention it is also relevant to discuss the role of information. As shown in this paper, AR can potentially provide the user with a wide range of different information in various contexts. This raises the question of whether people will be able to comprehend the vast amount of information and inputs that could be made available to them through the various stimuli. Information overload could enhance the issue of limiting people's attention spans and ability to interact with other people, as they become too focused and busy with comprehending all the information provided by their AR devices.

This makes the management of information an important factor for the success of AR and an important task for the companies and organisations creating and managing the content provided through the AR devices. Just as the customization of provided information was earlier argued to potentially be a limiting factor of interaction, it serves an important role in facilitating the filtering of information. This filtering will probably be a main factor for avoiding the information overload and provide the appropriate information in the right context with the right timing.

The overload of inputs might not only concern information. The multisensory possibilities presented in this paper and the influence this paper argues for also poses a potential issue. Similar to the issue of information overload, there is also an unknown aspect of how people will react to all the potential sensorial stimulations, especially regarding the multisensory aspect. The question of whether the user can comprehend all the inputs or not arises. This poses the risk that the stimulation can be overdone and become discomforting instead of enhancing the experience, which is the aim. Thus, similar to managing the supply of information, then management of the sensorial inputs are a essential requirement for the companies in order to avoid turning the enhanced experience into a discomforting experience.

These challenges can be seen in the same perspective, as they all point towards a risk of creating a sort of digital fatigue. If the technology and its implications become too extensive for people, they might turn away from it and reject it, despite its usability. As earlier mentioned, a tendency is already seen in the modern society that people start to worry about the use of technology. Especially regarding young people spending too much time on social media and in the virtual world, such as gaming, instead of being active and interacting socially with others in the real world. If this tendency gets stronger and more grounded, it could pose a barrier to the implementation and expansion potential for AR.

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These are all some the challenges and issues that the companies and business developing and investing in AR must consider and try to address to in order to successfully implement AR in to the technological society of today. Some of the challenges might be solved naturally in relation to the development of the technology, while other might requeries legal procedures, such as the issue of privacy and safety concerns.

CHAPTER 8: CONCLUSION

This paper has taken an outset in three fairly abstract notions of augmented reality, the senses and CEC in order to first of all define AR and the senses in relation to each other, and then later use this definition to argue for how the use of AR can influence CEC through sense stimulations. Thus, one outcome of the analysis has been concrete clarifications of those notions, in order to be able to conclude legitimately on the research question.

In conducting the analysis, it has become evident that several conclusions can be drawn from this. The first conclusion relates to the influences of AR on each determinant individually. In this, it can be concluded that each of the CEC Model determinants can be influenced both positively and negatively when it comes to two or more senses stimulated through AR, evident from the application of various AR functions. Based on these results, it has furthermore been possible to conclude that these influences can allow for a multisensory experience both within each of the determinants, but also across them in what was referred to as an array of simultaneous sense stimulations.

Furthermore, it can also be concluded that AR can influence the CEC by allowing for various synergies to exist across the CEC model's determinants made possible through these sense stimulations, which can allow for more seamless and holistic customer experiences. A last conclusion which can be drawn from this paper's analysis, is the fact that AR can influence the CEC by changing not only the nature of some of the model's determinants, but also the nature of the model in its entirety through sense stimulations. This was argued to have both positive and negative implications.

CHAPTER 9: FUTURE RESEARCH

As mentioned earlier, the results of the analysis in this paper are based on the authors interpretation of the data's implications for the CEC model. Thus, the conclusions should be seen considering the limitations these possess. The paper has suggested a number of implications that the implementation of AR can have for CEC. In order to address some of the limitations of the study, the suggested implications of the analysis could instead be tested individually to confirm whether the results hold true or not, but this time by trying to limit the interpretative nature, which has otherwise been an integral part of this paper.

This could for instance be done by conducting experimental prototyping of some of the functions that this paper suggests can influence the CEC. This could then test the suggested influence in a real life setting and the actual responses of the test persons could be observed. This could potentially improve the validity of the conclusions of this paper, as the reliance of the author's interpretation could be reduced. Also, the ecological validity would improve by testing the results in the customers real life settings. Observations and interviews of test persons could furthermore contribute to examining the discussed barriers to the implementation of AR.

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APPENDIXES

APPENDIX 1: GENERATED CODES OF THEMATIC SYNTHESIS

Article (Author)	Sense stimulation	Codes:
Abdi & Meddeb (2017)	Sight	Visual information layer, driver safety, Virtual objects,
Aleotti, Micconi & Caselli (2015)	Touch, Sight	Virtual object control, force feedback, virtual objects, visual information layer
Ando et al. (2007)	Touch	Force feedback, vibrotactile feedback, finger vibrations causing undulation perception, Virtual tactile feeling ontop real objects
Bau & Poupyrev (2012)	Touch, Sight	Virtual tactile feeling ontop real objects, Tactile textures, oscillating electrical field, feeling virtual features and objects, enhancing physcial objects
Behringer, Chen, Sundareswaran et al. (1999)	Sight, Hearing	Visual 3D overlay, speech recognition, audio clues
Biocca et al. (2007)	Sight	Visual 3D overlay, visual attention, Virtual attention guidance to real objects,
Blum, Bouchard & Cooperstock (2012)	Hearing	Location-based, audio clues, POI database, hearing aid
Chen, Lee & Lin (2015)	Sight	Visual 3D overlay, therapy
Chintamani et al. (2011)	Sight	Visual information layer, robotic-movements
Chionna et al. (2015)	Sight	Visual information layer, historical buildings, real-time viewing,
Cho, Jung, Lee et al. (2011)	Sight	Visual 3D overlay, real time visual recognition
Deb, Suraksha & Bhattacharya (2017)	Sight	Optical character recognition, text recognition, real-time translation, visual 3D overlay
ElSayed, Thomas, Marriott et al. (2016)	Sight	Visual information layer, filtering, interaction
Fernández-Palacios, Nex, Rizzi & Remondino (2015)	Sight, Touch	Visual 3D overlay, virtual objects, virtual object rotation, virtual object exploration, virtual object control
Frohlich, Adams & Tallyn (2000)	Hearing	Audioprint, audiological overlay
Gee, Webb, Escamilla-Ambrosio et al. (2011)	Sight	Location-based, mapping, visual information layer
Hariri et al. (2016)	Smell	Stimulation of smell receptors, electrical stimulation, digital interface, digitizing smell
Hatala & Wakkary (2005)	Hearing	Location-based, audio clues, personalized
Hossain et al. (2015)	Touch, Sight	Digital rendering of physical objects, Marker-based, vibrotactile feedback, Rehabilitation of patients
Janssen et al. (2017)	Sight	Visual information layer, Visual 3D overlay
Kundu, Mazumder, Dhar et al. (2016)	Sight	Localization, mapping, visual information layer
Lee et al. (2009)	Sight	Environmental embedding, digital rendering of physical objects, virtual embedding of physical objects, visual 3D overlay,
Li et al. (2018)	Sight	Visual 3D overlay, mapping, location based, real-time, digital rendering of physical objects, physical pipelines
Lin, You & Lu (2017)	Sight	Marker-based, visual information layer
Lv et al. (2015)	Touch	Virtual object control, touch-less interaction, wearble AR
Magnusson, Rassmus-Gröhn & Szymczak (2012)	Hearing	Location-based, mapping, audiological feedback
Mahmoud, Grasa, Nicolau et al. (2016)	Sight	Visual 3D overlay, real-time model alignment, surgical visual guidance
Meisner, Pfeiffer, Pfeiffer & Harmen (2017)	Sight	Visual information layer, eyetracking
Mirzaei, Ghorshi & Mortazavi (2013)	Hearing, Sight	Speech recognition, real-time translation, visual information layer
Nakamura & Miyashita (2011)	Taste	Electric stimulation, tongue stimulation, food taste change, sensors
Ni et al. (2017)	Touch, Sight	Force feedback, Haptic feedback as guidance, Digital rendering of physical objects, Visual 3D overlay
Radkowski, Herrema & Oliver (2015)	Sight	Visual 3D overlay, assembly guidance, video representation
Randell, Price, Rogers et al. (2004)	Hearing	Location-based, audio clues
Rasool & Sourin (2012)	Touch, Sight	Virtual object control, virtual objects, medical training
Ruminski (2015)	Hearing	Location-based, audio clues, navigation
Seo & Lee (2013)	Touch	Hand touch detection, Virtual object control, markerless AR
Shen, Terada, Tsukamoto (2013)	Sight	Visual information layer, sound recognition
Sodhi et al. (2013)	Touch	Feeling virtual features and objects, Free air textures, air vortex generated feedback
Spence, Obrist, Velasco et al. (2017)	Taste, Smell	Electric stimulation, thermal stimulation, chemical substance stimulation
Swaminathan, Schleicher, Burkard (2013)	Sight	Visual 3D overlay, Environmental embedding, measuring
Syberfeldt, Danielsson, Holm & Wang (2015)	Sight	Visual information layer, assembling guidance
Uenohara & Kanade (1994)	Sight	Visual information layer, real-time object registration and tracking, medical images,
Webel et al. (2012)	Touch, Sight	Multimodal AR, vibrotactile feedback, location based, visual information overlays, training skill
Wen et al. (2013)	Sight	Visual information layer, surgical visual guidance, projector-based AR, visual feedback of robotic needle
Wrzesien, Botella, Bretón-López et al. (2015)	Sight	Interactive visual projection, therapy, interaction
Yaoyuneyong, Foster & Flynn (2013)	Sight	Visual 3D overlay, Environmental embedding
Yovcheva et al. (2014)	Sight	Location-based, visual information layer, Mobile AR interfaces, tourism information,
Zhao et al. (2017)	Touch, Sight	Digital rendering of physical object, real-time force feedback, tele-robotic, visual information layer