Enhancing conference experiences using mixed reality implementations

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Abstract

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This thesis was made to prepare managers and designers for the future of experiences that may be changed by the innovative opportunities brought in with the development of mixed reality technologies. Author approached this topic through the perspective of conference event management and how mixed reality technologies could be implemented to enhance the attendee experience and felt customer value.

Author has defined mixed reality using the xReality framework, that defines mixed reality as a defining quality of an augmented technology solution that has a local presence for the viewer. Customer value was approached from the perspective of Sheth and Uslay's ten processes to create value for customers. In their research customer value is considered through the three categories of service, performance and affordability value and the ten processes that contribute to creating value for the product. In addition, Pine and Gilmore's theory of Experience Economy's customer journey was used to evaluate the ways customer value is created throughout the customer experience of the event.

Author conducted interviews to a set of specialists in the fields of xReality technology development, event management and experience design. These interviews were analyzed using thematic analysis and the results were further elaborated using a future scenario to illustrate the future potential of mixed reality technology implementations throughout the improved conference event customer journey.

Author was successful in their research objective and has defined potential customer value of implementing mixed reality into the conference event design and has created tools to improve future conference event customer journey. The author presents the new design practices for cohesive mixed reality event experience management and the improved conference customer journey which describes the potential ways to develop the experience using mixed reality implementations.

Keywords
Mixed reality, augmented reality, conference management, event design, customer value, experience design.

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1 Introduction

The world is changing around us faster than ever. In February of 2024 Apple has released its first mixed reality headset Apple's Vision Pro, which is targeted for B2C segment. Although Vision Pro's price-point of roughly 3 500 United States dollars makes Vision Pro still a product for a niche market, mixed reality products are not anymore just for science fiction. (Porter, 2024.) Global augmented and virtual reality market size was valued in 2023 at USD 5.97 billion and it is expected to reach USD 397,20 billion by 2031 (ICT, 2024). As in early 2000s with smartphones we can remember, how quickly people can adapt to new technologies, and now is the time to prepare for what is coming next and be ready for it. Mixed reality could provide the virtual interactivity that is currently common only with Virtual Reality implementations while being grounded into our physical surroundings.

During this thesis I explore the opportunities provided by the future augmented and mixed reality implementations for event experience management. Experiences are intangible and subjective reactions to multiple controllable and uncontrollable interactions. New augmented and mixed reality implementations are likely to provide new opportunities for experience management. In the range of event management experiences this thesis focuses specifically on conference events, as conference experiences focus more on participant interaction and information sharing. These factors are likely to provide more varied perspective on the event experience and interaction opportunities. Furthermore, hybrid and virtual events have a chance to provide great opportunities for conferences as it can provide chances for cost savings and for more global audience attendance (Haider, 2022). As my aim is to focus on future potential I have chosen to focus specifically on mixed reality implementations as they are still less available than other augmented reality implementations due to their higher technological requirements. As I am unable to interview future users currently, I have also chosen to approach the customer experience from the event designer and management perspective.

As I discuss the future state of things, which I cannot completely predict, I have chosen to create my thesis questions to take it into consideration. The overarching question of the thesis is: "How future mixed reality technologies can be expected to be used to create customer value in conference event experience management?". As deliverables I produce a set of best practices, when using mixed reality technologies in creation of conference events and recommendations of how to potentially implement mixed reality as part of the conference customer journey. To answer the thesis research questions, I approach it through two sub-questions Q1 and Q2.

With Q1 I approach the mixed reality technologies as a new form of technology and how they can be used to create value in the conference experience management and is as such:

> “How mixed reality technologies can be expected to be used to create customer value in conference event experience management?”

With Q2 instead I evaluate the future potential of mixed reality technologies and what the future development can be perceived to enhance in the future for the customer value in conference experiences. As such the second research question is:

> “What kind of customer value mixed reality technologies can be expected to provide in the future?”

With the combination of these answers, I discuss how these future technologies can be expected to create value and what kind of customer value they can be perceived to create. Furthermore, through these questions I assess the difficulties in relation to the new technology in the setting of conference events. This master thesis is made as a commission for Digisti Live – The New Age of Events -project, that aims to provide an opportunity to develop virtual and hybrid service solutions for companies.

I will first discuss the theoretical framework of this thesis through its combined three lenses of experience management, event management, and xReality technologies and I will discuss how these three perspectives will intertwine to create the thesis framework. After it I will discuss my chosen research methodology, which is followed by the discussion of my results. Before my conclusion I will first describe a future scenario where a mixed reality has been implemented to enhance conference experience management. The thesis ends into my conclusions and future recommendations for research and development.

2 Conference visitor value proposition in mixed reality

As mentioned, during this chapter I will discuss the overarching theoretical framework of this thesis and how it is implemented throughout the thesis research. This thesis research combines the perspectives of technology management, experience management and event management for its theoretical framework. The thesis research framework is further visualized in the figure 1 below.

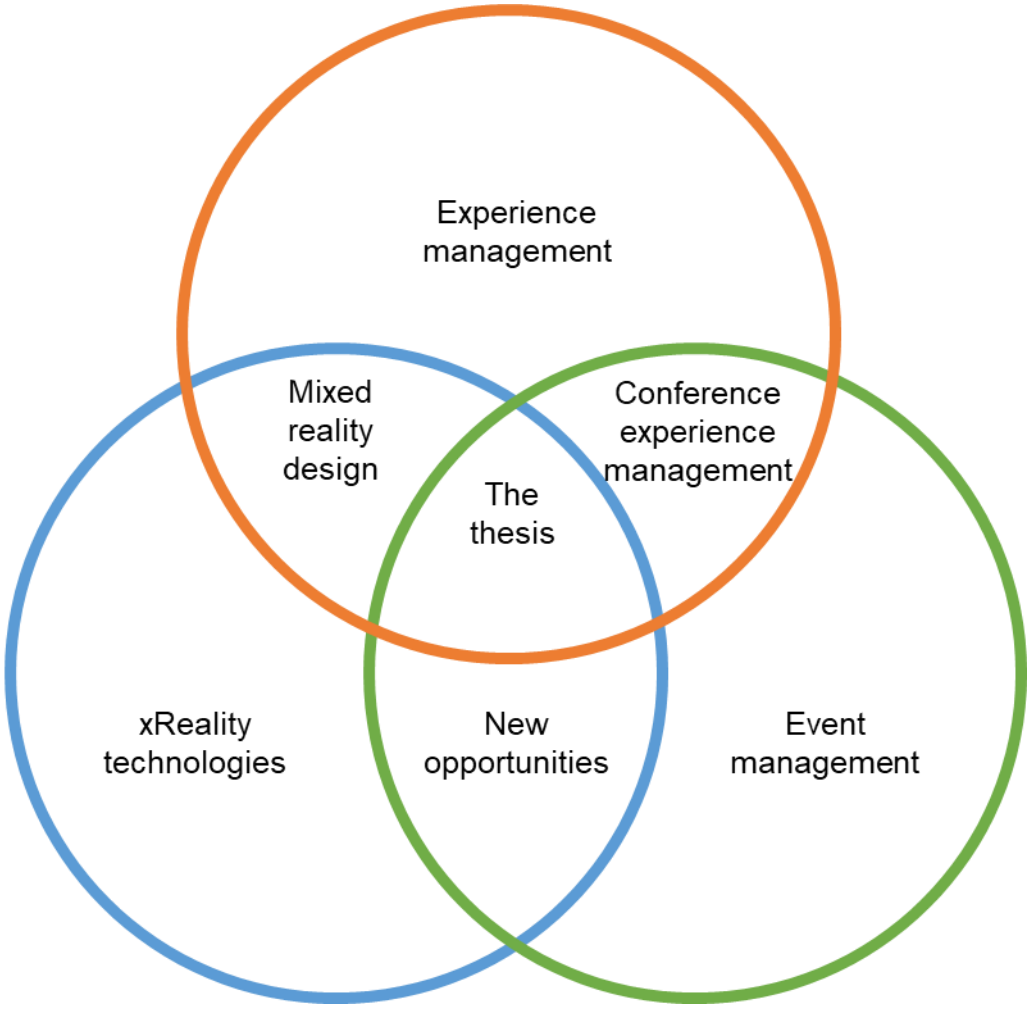

Figure 1 The thesis framework

In technology perspective I describe the xReality virtual and augmented reality framework (Rauschnabel, et al., 2022) and what it entails, and how to design for mixed reality applications. For the second perspective of the theoretical framework, experience management, I discuss the concept of experience and experience management relying on Pine and Gilmore's 1998 original definition in 'The experience economy' (Pine & Gilmore , 2011). I elaborate further on the concept of customer value in relation to business success and how combination of customer experience

and customer value estimation can be used to design better products and services. To accompany the perspective of experience management I also discuss and describe event management theory more specifically to specify the conference experience perspective. I define the specifications of conference events, intents and customer expectations and needs of conference visitors. I discuss these factors with a customer centric perspective and focus on factors creating customer value and thus ignoring logistical or organization management perspectives that do not create direct customer value.

2.1 xReality technology and mixed reality

The concept of augmented and virtual realities has already existed in principle in its first form through science fiction since the 1930s with Stanley Weinbaum's 'Pygmalion's Spectacles' (1935). Weinbaum's main character Dan Burke meets a professor, who offers Dan a chance to wear his invention, goggles that allow him to experience a movie with sight, sound, taste, smell, and touch (Weinbaum, 1935). Pygmalion's Spectacles sound less and less like science fiction as advancements in technology have taken us closer to what the crazed professor managed to accomplish with his magical spectacles.

With recent technological advancements, such as high-speed mobile internet, artificial intelligence, increased computing power and high-resolution displays, many companies have developed devices to partake in the growing business opportunities that augmented and virtual reality devices entail. With the plentitude of new devices, applications, and research there is still not a clearly shared understanding of the specific definitions of the concepts. This research takes the perspective of xReality, a recent framework created by Rauschnabel, Felix, Hinsch, Shahab and Alt in their 2022 research, where they created a new framework for augmented and virtual reality to accommodate the differing views into a shared understanding to enable further research and development. This framework is visualized in figure 2.

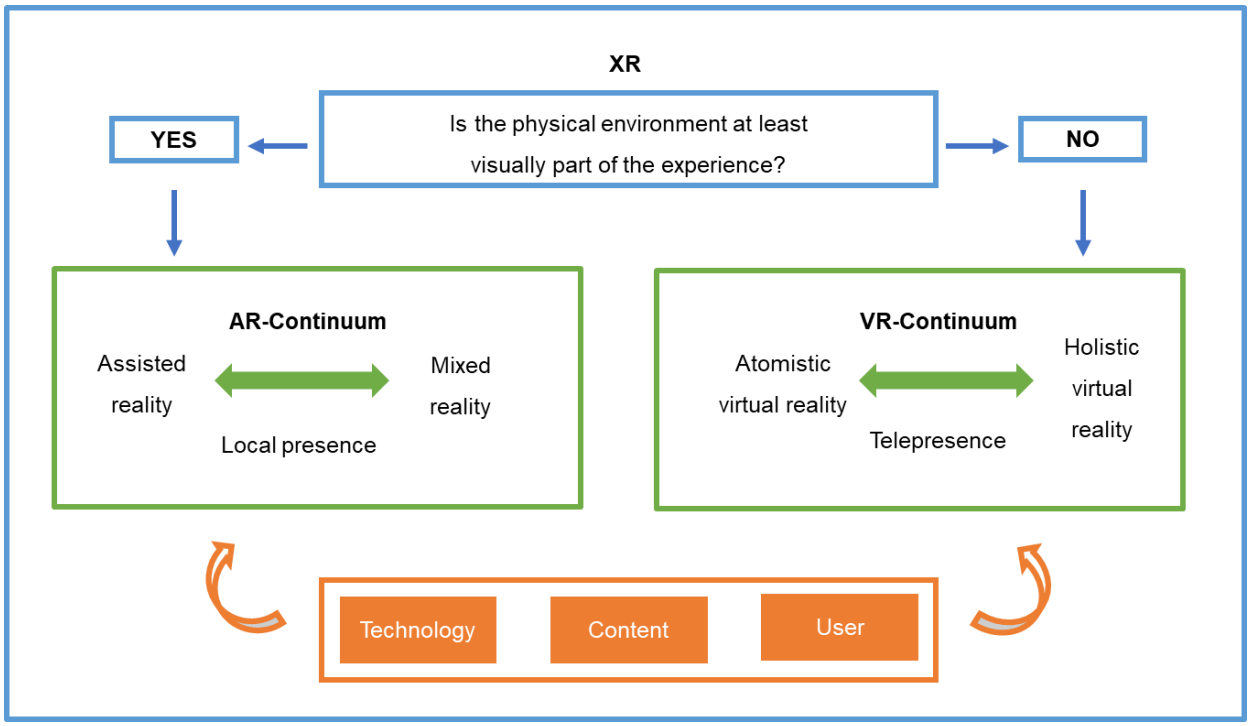

Figure 2 XReality (XR) Framework (Rauscnabel et al., 2022)

In the xReality framework, xReality or XR is defined as the general umbrella term for all forms of new realities under which augmented reality (AR), and virtual reality (VR) lie as separate entities. AR and VR are divided into separate categories as they rely on different functions for the immersive experience. In augmented reality digital entities are overlaid on the surrounding physical reality to enhance or diminish it, whereas in virtual reality the digital environment replaces the user's physical surroundings. (Rauschnabel, et al., 2022.) An example of a simple AR implementation is for instance a QR code on your kitchen table, which can be scanned with phone camera, after which the area of the QR code on the screen is overlaid with a picture of a flower, but you can otherwise see the table and your other surroundings through the screen as it is. VR implementations on the other hand are nowadays already quite common with the use of virtual reality headsets that you wear, and you can experience other spaces that are not linked to your current surroundings.

Immersive AR experience relies on the degree of belief that the user perceives for the entity being there. This degree of perception is defined as local presence, which defines the range of different AR experiences in the AR-continuum, ranging from assisted reality to mixed reality. In assisted reality entities are clearly overlaid on viewers perception to provide for instance information and is distinct from the physical surroundings. Such as in my previous example a stationary picture on a table that you can see through your screen, does not seem real. In mixed reality instead these entities can interact with the user's physical surroundings and seem as if they were real. (Rauschnabel, et al., 2022.) If we consider the example of a flower we could consider that instead of a

stationary picture of a flower, the flower is 3D rendered, and has a 3D rendered bee coming out of it which seems to start to move between your furniture and reacting to the different spaces in your kitchen, avoiding from banging into corners and hiding and appearing behind furniture as you follow it. Although this seems science fiction, there are already very similar applications although they may be currently more used to entertain children or to humor dinner parties.

Immersive virtual reality experiences instead rely on the degree of user's perception of being present in the virtual environment, which is defined as telepresence. Telepresence ranges from the atomistic to holistic virtual reality, with atomistic holding lower levels of telepresence and holistic higher levels of telepresence. Atomistic level ascribes for instance to instructional virtual reality experiences, such as employee training, where providing larger range of information is more important than immersivity, whereas holistic virtual reality experiences aim for escapism and immersivity to enhance emotional impact, such as virtual reality games. (Rauschnabel, et al., 2022.) The range in these experiences are most defined in the range of ways the user can feel as if they are in the virtual space. Are you just looking into a movie theater screen in your headset, or are you able to move in the space, maybe open the curtains, or even move the chairs.

XReality framework provides a basis for the many future forms of different augmented and virtual reality experiences and allows us to assess them based on their function. XReality framework also provides a clearer understanding of the sometimes-conflicting concepts of mixed reality and extended reality and solidifies mixed reality as a type of augmented reality instead of combination of augmented and virtual reality. As mixed reality applications adds more virtual entities into our lives it is important to be able to differentiate and classify what is the difference between the realities. Although the xReality is a new framework, which still needs further development for refinement it provides the required base needed to solve the issue of distinct and dichotomous selection of current definitions in relation to virtual and augmented reality.

To support the xReality framework in my assessment I will further discuss the factors involved specifically in the design of mixed reality design. Kharis O'Connell has discussed in his 2016 report 'Designing for Mixed Reality' the potential of mixed reality and the hurdles of designing experiences for mixed reality. Although the release of the report is prior to the formation of the xReality framework O'Connell's description of mixed reality aligns with the xReality framework's definition of mixed reality. Still O'Connell treats mixed reality as a separate experience in comparison to augmented reality experiences, but his focus on the relation to physical space aligns to the description within xReality framework. (O'Connell, 2016.)

Mixed reality equipment relies on the use of multitudes of sensors to assess the user's environment. Current MR headsets use at least one or more cameras to assess the surroundings.

Depending on the type of camera used there are specific benefits for depth-sensing and the suitability for artificial intelligence empowered computer vision (CV). Furthermore, other sensors such as accelerometers, magnetometers and compasses are used to compute the headsets' position in relation to the visual input. This process is called sensor fusion, necessary to provide accuracy in the depth of vision of the virtual entities. (O'Connell, 2016.)

Senses of touch, sound and sight all provide possibilities for input interaction in mixed reality environment. Touch can be used for instance with various controllers. gamepads or triggers. Camera captured gestures or projected buttons can also be used to signal intent. If the devices are equipped with microphones voice controls can also be used to input control. Lastly sight can be used by monitoring the gaze of the user and assessing a locked gaze to signal intent. (O'Connell, 2016.)

O'Connell specifies to be mindful on the distance of the virtual entities in relation to the user, and he defines the elements within the experience. The immediate area around the user creates the Interaction Plane (IP), which is arm's length from the user. According to O'Connell for the user to feel connected to the task the interactions should be as close as possible to the user within their Field of Vision (FOV). Understanding the Interaction Plane also prevents the sensation of searching triggers for irritation and tiring the user. Outside the Interaction Plane begins the Mid Zone (MZ), where objects and data can be implemented at full resolution. In Mid Zone computer vision tracking is also the most effective. Currently the Mid Zone doesn't go further than a few meters as depth cameras are unable to assess difference, and the accuracy of entity placement drops. Past the Mid Zone continues the Legibility Horizon (LH), where objects can still be noticed, but they are less likely to provide information. Understanding these distances also allows a chance to adjust the rendering quality and distance of objects to enhance computing efficiency. (O'Connell, 2016.) These elements of mixed reality design are visualized in figure 3.

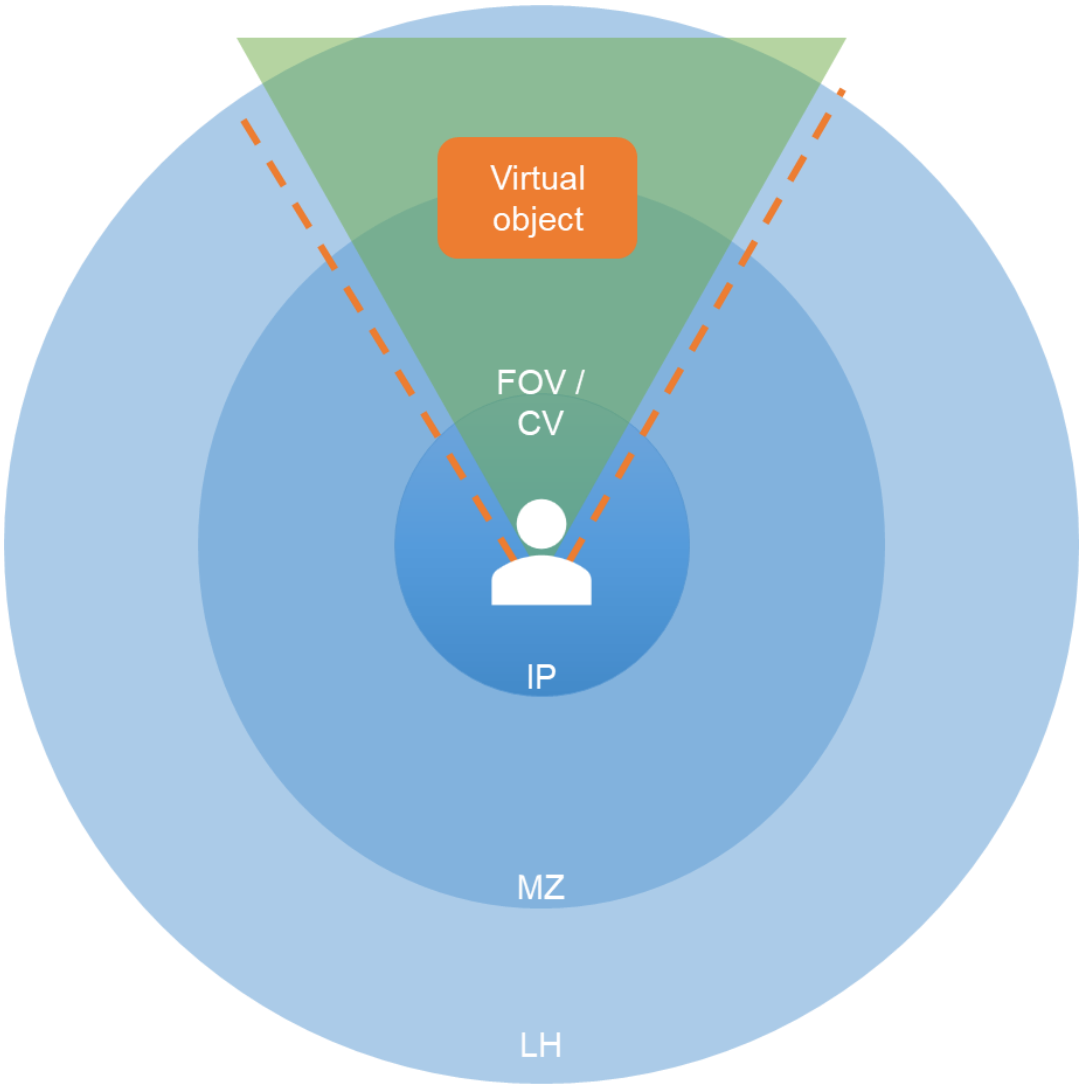

Figure 3 Mixed reality spatial elements (O'Connell,2016)

O’Connell also speculates on his report the future benefits of MR adoption as wearable technology become lighter over the years and the computers as we are used to disappear out of use. The MR adoption provides a chance to gain the right information at the right time and location without using hands. With MR devices it could be possible to visually work in a shared mixed reality environment, sculpting digital entities. Furthermore, MR offers in business and education an opportunity for more tactile kinetic learning and training. (O'Connell,2016.)

As mixed reality applications provide higher chances for future development, the thesis discussion will focus specifically on the possibilities of future mixed reality developments with assumed increase in availability and adaptation of the technology. Furthermore, mixed reality applications provide a higher chance of local interactions which will be highly beneficial in event planning to create memorable experiences throughout the event (Rasoolimanesh, et al., 2021).

2.2 Conference event management

Event market industry in Finland is valued at 2,35 billion euros and it generates 1,2% of Finnish GDP while employing roughly 200 000 individuals in Finland (Tapahtumateollisuus ry, 2023). Globally event industry was valued at 1 135,4 billion dollars in 2019, with expectations that it will grow to 1 522,9 billion dollars by 2028, Although covid pandemic is likely to dampen these numbers a January 2022 released market research still expected global event market to grow with compound annual growth rate of 11,2% from 2021 to 2028. (Dinesh, et al., 2022.)

In their 'A Future For Event Management: A Taxonomy of Event Management Terms' (2000) Arcodia and Robb define conference as "-a meeting where the primary objective is participation in the exchange of ideas." Although conferences and conventions are at times regarded as synonyms, they differ in scope and attendees of conferences share either interest of career. (Arcodia & Robb, 2000.) As such it is no wonder conferences and seminars held majority share of 53,2% in 2021 of the global corporate event market (Maximize Market Research, 2022). Allen's study (2009) further supports Arcodia and Robb's definition and adds as other potential objectives of a conference other than to exchange information and ideas are to launch new products and recognize sales (Allen, 2009). As such the range and focus of conference event activities are defined if they are designed for business or for academic exchange of ideas. Although the value of knowledge transfer is sometimes overlooked in event design it holds insurmountable benefits. For instance, the 2018 European Congress of Radi-ology in Vienna amounted to 813 million dollars, which exceeded the direct economic impact with the ratio of 10:1 (Rogers & Wynn-Moylan, 2023)

To create successful events, the organizer must understand the visitor's primary and secondary motivations. All the attending visitors are likely not to share their motivations, but they may be thematically linked. (Shone & Parry, 2010.) Attendees may be encouraged as a primary motivation to attend a conference to gain information, but their secondary motivation could be to create connections. Another attendee, a startup company CEO, could have a primary motivation to create connections. The event designer should be able to provide situations for both attendees to fulfill their motivation.

Non-routine special events, such as conferences, can be further defined by eight characteristics: Uniqueness, perishability, ambience and service, labor intensity, fixed timescale, intangibility, ritual or ceremony, and personal interaction (Shone & Parry, 2010). The eight characteristics define and differentiate events from regular service product encounters and are likely to create memorable experiences for the attendee. Experiences are all defined by their spontaneous nature that may be created as a response the company managed cues. During events, these happenstances are even

more limited due to the schedule, so careful design is required to provide customer experiences and enhance the felt customer value.

2.3 Experience Economy

Experiences are nowadays a heatedly discussed topic that is still changing. In 1994 Interactions magazine held a design competition, where qualities of an experience in an interactive product was defined as: "…all the aspects of how people use an interactive product: the way it feels in their hands, how well they understand how it works, how they feel about it while they're using it, how well it serves their purposes, and how well it fits into the entire context in which they are using it." If the product was deemed to include all these characteristics, the experience was deemed to hold value, which described the "quality of experience". (Alben, 1996) The definition of experience has been further defined by multiple researchers. Pine and Gilmore popularized the concept further in 1998 with their definition of experiences as progression of value through personal customization of staging services to memorable experiences (Pine & Gilmore , 2011).

Nowadays the concept of experiences has been accepted and acknowledged in relation to services, marketing, and business management. Still there is no clear and concise definition of experiences. In research experience has been defined in relation to something extraordinary and mundane, both in relation to specific context and more generally emerging in customer's lives. Jaakkola and Becker aimed to compile these carrying views on experiences to resolve the confusion and create generic premises from the differences and similarities. (Becker & Jaakkola, 2020.)

Becker and Jaakkola have defined customer experience as comprising of:" non-deliberate, spontaneous responses and reactions to particular stimuli along the customer journey", and that these experiences can range intensity from mundane to extraordinary. Customer journey refers to the continuation of interactions the customer faces with the company directly and indirectly. These singular interactions are referred to as touchpoints and moments within these touchpoints are called cues. Furthermore, these responses to company generated cues are subjective and they dynamically affect the customer experience, and as such customer experiences cannot be created, but a range of stimuli can be designed, monitored, and managed, which can affect a positive customer experience. (Becker & Jaakkola, 2020.)

As such Becker and Jaakkola's research distances the concept of customer experiences, from customer and service quality, where they used to align heavily with, and instead creates ground to individually study experience as its own entity (Becker & Jaakkola, 2020). Although Becker and Jaakkola's definition provides good ground it does not feels solid and it does not provide tools to structure experiences further, but instead it provides the approach to think of the created customer

interactions in a multi-layered and dynamic perspective, and of the potential customer responses and reactions that could be created.

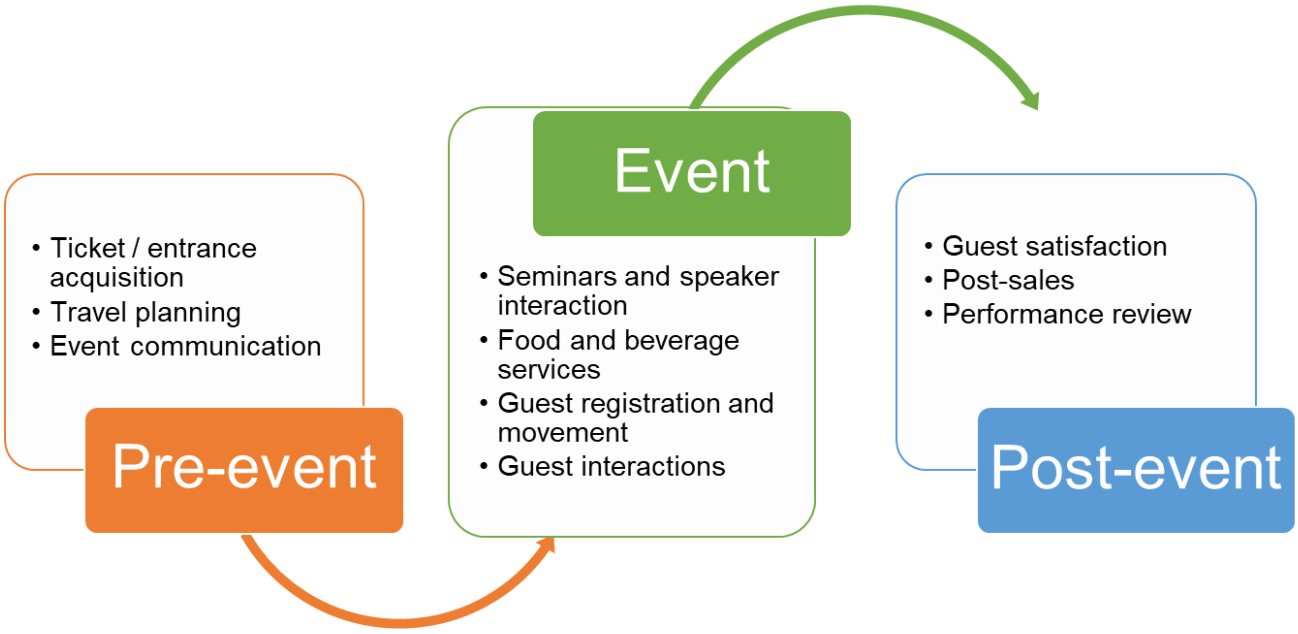

Figure 4 The Conference event customer journey.

Although these interactions are difficult to control, we can use tools like customer journey planning to create the ideal situations for desired outcomes. As such customer journey planning will be used to assess the development opportunities of mixed reality developments in conference events and customer value management. Conferences range in their potential touchpoints depending on the organizer, the intent, and the attendee base. For the purposes of this thesis, I choose to assess the customer experience in a more general way instead of focusing on a specific customer journey. As the customer behavior is likely to change with the time as well I do not think it is currently valuable to consider specific customer base.

The conference customer journey is described in figure 4. As these actions are unlikely to happen in a specific order and can even happen concurrently I have chosen to divide the journey into three sections: Pre-event, Event and Post-event. Pre-event consists of all potential actions happening before entering the event area. These include touchpoints, such as ticket acquisition and planning of the trip and how these processes are made possible and easier with the event organizer

communication. The second section, the event itself, consists of all activities during the event. These touchpoints include: the seminars guided by the speaker with potential speaker to conference attendee interaction and the interactions between the attendees, the food and beverage, and other services provided by the organizers, and the check-in and other planning used to ensure the ease of the event attendee. Post-event includes processes and touchpoints for guest satisfaction and post-sales that are made to ensure continuity for customers relationship and return of the attendee in the next year's event. These could include polls or reminder emails of the future events or article compilations of the speakers.

2.4 Customer Value

In our rapidly changing world businesses are aggressively competing for customers, and to win the companies must provide higher value for its customers than the competitors and as such it is necessary to systemically assess how customers are gaining value (Pynnönen, et al., 2011). Still the concept of value has evolved constantly as previously value was seen purely as products centered, in comparison to nowadays, where brands and brand affiliation may provide a substantial portion of the experienced customer value.

As an ever-developing concept Sheth and Uslay (2022) have combined the varying customer value definitions and value creations together and they have defined ten processes in three value categories, which create value for the customer. As with experience each customer perceives value differently. The three categories are service value, performance value, and affordability value. Although many businesses claim they provide high customer value it is unlikely they pro-vide value through all ten value processes.

Performance value consists of three processes of quality, differentiation, and innovation. Performance value is the most known and used way to create customer value. By providing high quality products and services that are different from the market share it is easier to separate from the flock, and with greater and smaller innovations take the lead to provide more Performance Value. (Sheth & Uslay, 2022.)

Affordability value consists of processes in relation to the customers' ability and willingness to pay. Thus, the three processes under affordability value are target costing, mass customization, and global sourcing. Target costing refers to a process of reverse-engineering the product based on a price the target audience is willing to pay, instead of adding profit margins on top of the costs spent to design the product. Mass customization instead refers to the process of providing multiple choices with lower prices, and as such giving more power and control for the customer. Global sourcing instead describes the process of procuring global products and providing them to local

markets and potentially with lower prices. (Sheth & Uslay, 2022.) Although for the author the process of attracting global products for local markets makes business sense it is also important to note that in the rising importance of social and environmental sustainability differentiating with shared social and/or moral values may also play bigger importance to some customers than globally sourced cheaper items.

Finally, service value consists of the processes enabling the buying process. Service Value is divided into four processes: Frontline information systems, Universal access, Easy to do business, and post-sales support. Frontline information systems refer to ICT systems that can be put in place to enhance the customer's ease of use. The process of universal access as a term refers to the value of availability using online services for extra services, ordering and delivery. Easy to do business is also quite self-evident as any friction on the way to make the purchase lowers the felt customer value. Post-sales support instead refers to how the customers are treated after the purchase has occurred, and how repairs and resales are dealt with. (Sheth & Uslay, 2022.)

Figure 5 Ten processes to create value for customers (Sheth & Uslay, 2022)

Experience quality has also been studied to have significant effect on customer value and positive experiences are highly likely to enhance the felt customer value (Kusumawati & Rahayu, 2020) Sheth and Uslay's process map provides a more tactile understanding on the customer value with products and services and in combination with understanding of experiences it is possible to manage the intensive yet short-lived event. For the purposes of this thesis, we will be focusing on the performance value process in relation to the mixed reality experiences. Innovative mixed reality experiences will be a definite way to create differentiative and innovative customer value and it is at this point very difficult to determine the affordability and service value of mixed reality experiences.

During these chapters I have discussed the theoretical framework of this thesis. I have described the three themes of xReality and mixed reality development, and experience and event management. This thesis aims to combine the principles of these three themes to approach the future opportunities provided by mixed reality implementations in event experience management. In the following chapter we continue to the methodology of this thesis and what kind of methods and principles I used to approach and study my set research questions.

3 Methodology

This research thesis assumed the foresight principle on future studies. Foresight principle means that we assume that we can foresee the future to a certain degree, but with the acceptance of irreducible future uncertainties (Birkmann, et al., 2013). I chose this perspective as without assuming that there are recognizable patterns we wouldn't be able to consider scenarios created for future prediction and assessment, which would mean that it would be useless to prepare for future, which I think is too pessimistic. Both research questions were approached through a set of qualitative interviews that were conducted with an array of specialists, who were working currently in fields that were relevant with the topics of this thesis ranging from event and experience management to xReality technology development.

I chose to approach the research questions through qualitative methods as the topic of the research focused on customer value and experiences. Qualitative research and methodology refer to an interpretive and naturalistic approach, which aims to make sense and describe phenomena through the terms and concepts brought to them. Unlike quantitative research, qualitative research provides room for interpretive inquiry as the data in qualitative research is more non-numerically quantifiable. (Guest, et al., 2012) Both concepts of value and experiences are very subjective, and as such required in my opinion a more interpretive approach, which qualitative methodology provided.

Furthermore, as the topic consisted of the future time-frame to create more reliability for the collected data I chose to focus on specialists of their field, who I believe would be likelier to hold a required perspective and experience to assess what the future holds and to reduce a bit of the uncertainty of the future. Although interviewing just a singular specialist would lead to a quite uncertain estimations of the future, my aim was to create a large enough a base of specialists, where we could by comparing their views create a framework for what the future of can be expected to hold. To create data which was comparable I chose to use interviews as the littered interviews would provide suitable data for theming and analysis. Although delphi method has been popular in the future studies research and had been my initial plan, it had to change for interviews due to resource limitations. The delphi method would have involved multiple rounds of interviews, where the specialists would have been able react and assess each other's thoughts of the future, but as I was conducting research by myself this would have taken too long for the thesis research time scale. (Alastalo, et al., 2017.)

These interviews were designed based on the theory of experience economy and how experiences create cumulative customer value through touchpoints. The interviews were further analyzed using thematic analysis and using a realist approach to the analyzed data and results. The realist

approach was created in 2021 by Wiltshire and Ronkainen to release the tensions researchers must manage when dealing with the extremities of deep and surface level information of thematic analysis. The realist approach accepts that there are things with real objective existence in the world, but with the long history of science it is also known that knowledge can be fallible and the belief that we can completely understand the objective world is naïve. (Wiltshire & Ronkainen, 2021.) A realist approach was necessary in my opinion for the acceptance of irreducible uncertainty of future studies. Thematic content analysis refers to a method of generating themes from qualitative data through a systematic process of identifying and grouping data into themes while offering insight (Juhila, 2021).

The results were used to determine a thematic list of use cases for mixed reality technologies in conference experience management and a list of best practices for mixed reality experience management for a in the future conference event, thus answering the Q1 research question. Based on these results a scenario was also built to describe a potential future conference event attendees' journey to further describe the future customer value of mixed reality, thus answering the Q2 research question.

3.1 Interviews for the possibilities and future developments of mixed reality

Interviews were conducted to understand the future potential of augmented and mixed reality technologies in creating customer value. I chose to include both concepts of augmented and mixed reality as they are such new terms to invoke thought and discussion among specialists. During my analysis I still focused to define the high local presence mixed reality experiences within the spectrum of Augmented Reality experiences. I conducted interviews with both mixed reality technology and event and experience management professionals and academics to gather potential future scenarios of mixed reality technology use-cases in conference customer experience. Interviews were conducted until saturation was fulfilled and no new information was gained through the following interviews. I chose to use open-ended questions to provide more freedom of thought and expression for the specialists. The list of questions was provided to all specialists prior to the interviews. Each interview was recorded and transcribed for data analysis.

Interviewed individuals were chosen based on their experience in the fields of mixed reality, augmented reality, virtual reality, conference event management, and experience management. A pool of 18 potential specialists was created and contacted for interview. In the creation of the specialist pool, I aimed to maintain equal amounts of specialists for the studied fields to maintain balance in the discussion. Six specialists accepted the invitation. I acknowledged during the research process that as the interviewed individuals were chosen by the interviewer it may have affected the results of the study, but it was necessary to choose experienced professionals that were likelier to have

insight regarding the future of conference events. Furthermore, with the continuation of interviews until the fulfilment of the saturation point it is likely that a similar saturation point would be fulfilled through a similar set of experienced participants.

The research questions were compiled from open questions in four segments, where the first was designed to set the scene and get the interviewed participant settled into the interview. The second segment involved the issues and benefits of mixed reality. The third segment approached the actual use cases of augmented and/or mixed reality applications for conference events, while the fourth segment reflected the design practices that should be considered in the future. The interview questions are shown in appendix 1.

Each interviewee was provided with the questions prior to the interview with an accompanying quick information on the central terminology of augmented and mixed reality experiences and conference experiences to enable understanding on both sides of the technological and event management. These descriptions are shown in appendix 2. Interviews were conducted as an online video call due to provide flexibility with time and resource management for both the interviewed and myself. Video-call based interviews have received criticism due to their less direct discussion that doesn't allow as natural eye contact and due to the potential technical issues, which may harm the quality of the interview if the internet connection drops and the video feed lags. Still, it is important to consider. how video calls have become a more natural way of communication due to the pandemic era changes in the ways we work. Furthermore, studies have shown that although in-person interviews tend to last longer and have as such a larger set of statements about topics, video-call based interviews provide the similar volume of data and breadth of topics (Krouwel, et al., 2019).

I conducted six interviews, which already provided satisfactory saturation as multiple themes of the topic continued to be repeated on the interview answers and no new directions for alternate themes were introduced. The interview participant pool included four professionals with further academic expertise on their topic and two practical experts. The division of experts was also quite wide as participants ranged with their background through all the themes of thesis as two were experts on XR development, and four were from the event background. Event specialists were further enhanced with the participation of an event space stakeholder's participation and an immersive experience specialist. To maintain the anonymity of the specialists, from now on the participants will be referred to as Specialist 1 through 6. For the context of their responses each specialist's background is further explained in the following chapter. The specialists are introduced in the order the interviews were conducted. All interviews were organized in the span of two weeks between the dates of 14th to 21st of April 2023.

Table 1 Specialist description table

Specialist	Specialty	Profession	Length of interview
1	Experience management	Senior Lecturer	49 min
2	Staff training and events	Training producer	22 min
3	Event venue management	Sales Director	45 min
4	VR and gaming experiences	Business Advisor	51 min
5	XR experiences	R&D Lead	27 min
6	Event management	Senior Lecturer	57 min

Specialist 1 is a senior lecturer in a university of applied sciences with 10 years of experience in teaching service design and concept development. Along with their responsibility of teaching students, they have also continuously done research on service design and experience management.

Specialist 2 is also from an event background with specific knowledge of 5 years on creating staff events and training for their customers, which includes specialist understanding on knowledge and conference event management.

Specialist 3 is a sales director of an event company, which operates regional event spaces that can host event capacity of up to 20 000 participants. Specialist 3's background in event sales management spans through a course of 20 years. Furthermore Specialist 3 is connected in congress network management and provides understanding of the event space stakeholders.

Specialist 4 is a VR specialist with ICT technical and gaming industry expertise. Specialist 4's background holds more than 10 years of experience as a business advisor and management consultant with technical understanding, while providing their service as an ICT teacher and lecturer at university level.

Specialist 5 is an XR specialist, who has researched and developed augmented and virtual reality technologies for more than 10 years and has been in the position of leading research and development of XR for 4 years in their company.

Specialist 6 comes from a tourism and event production background with more than 20 years of experience in tourism and event management and 20 years of experience as a senior lecturer in university of applied sciences.

3.2 The interview result analysis and scenario building

As stated, the transcribed interviews were analyzed with a realist approach using thematic content analysis and systematic process to understand the underlying themes raised from the interviews. Although the systematic process has grown in popularity in the 21st century it was brought to popularity by Braun and Clarke as they introduced their six-step process for themed content analysis. Braun and Clark's six steps, that they called phases of the research, were: familiarizing yourself with the data, generating initial codes, searching for themes, reviewing potential themes, defining and naming themes, and producing the report (Braun & Clarke, 2012.) To create potential future scenario and best practices, the open-ended answers were deciphered and categorized following the Braun and Clarke process to understand the underlying thematic similarities in participants answers. The answers were analyzed in relation to experience and customer value theory to understand the future value potential of AR and MR applications in conference event management. Finally, the interview data was transformed into practical future use-cases of MR applications in conference experience management as suggestions for experimentation and adaptation.

These potential implementations were further elaborated in the form of a scenario entailing the future conference experience. Scenarios are not created as objective representations of future realities, but to clarify present action in a possible and desirable futures. For these scenarios to be useful and credible, they need to consider five conditions: pertinency, coherency, likelihood, importance and transparency. (Durance & Godet, 2010) The created scenario assumed that the mixed reality technology development continues rapidly according to the estimated trends, and the technology becomes part of everyday use in the form of a technologically advanced headset. The scenario also assumed a change in the cultural and social acceptance of information management, that would support an intensive and extensive development if mixed reality technology. I have chosen to use scenario building to describe the potential future these technologies could bring, but as with realist approach I understand that it may not be objective representation of the future.

4 Future of AR and MR

Now that I have explained the theoretical framework, and the methodology used in my research, it is time to discuss the results gained from my research. Thematic analysis of the specialists' collective answers revealed how throughout most participants there was tangible interest and optimism towards the future of AR and MR development. The specialists described that within the use of AR and MR technologies there is still unused value due to both technological limitations, but also due to lack of meaningful implementations as AR and MR is treated more as an advertorial novelty to attract attention instead of in-depth implementations, which the specialists believed to change in the future.

> *"It [future] is really promising, because it's going to evolve a lot and it's going to be used in innovative and immersive way that will enhance the experience. (Specialist 1)*

> *"it [the usage of augmented reality and mixed reality] will normalize, that currently it is viewed as an added value that can be marketed as novelty to be tried, but in the future is will be really a thing that is used constantly and the focus will move from the novelty to the content". (Specialist 5)*

While there was shared optimism, there was still some variation in how the specialists perceived the future. Specialist 4 ascribed future of conferences to focus more on virtual experiences claiming that due to the changes that occurred in working culture due to the Covid-19 pandemic, the lifestyle and distant working culture changes that have happened will continue to cause people to value their time and money more carefully and consider strongly if it is necessary to travel to a shared location, which may in turn diminish the amount of in-person conferences.

> *"… complete on-site conferences are going to become a small minority… It has been noticed that most jobs are easier and nicer to do without going to office to spend a lot of money to fly people to an event, when you are able to get the same information value and networking opportunities while sitting at home". (Specialist 4)*

Specialist 5 instead made no specific notion on the future form of conference experiences as either physical or virtual, mainly referring to growing mixed use of various realities based on need to provide meaningful experiences.

> *"…you need to help to ensure that everyone is able to use this and not just use but use it effectively and in a meaningful way that also enhances rather than detracts from the conference experience." (Specialist 5)*

Specialist 6 described that the future of augmented and mixed reality would be primarily integrated into phones in the future, while specialist 4 described that it may be within 10 years that wearable technologies such as smart glasses or smart clothes with hidden compartments for computation or battery life extension may become common use. The interview questions offered no specific timeframe was assumed, which may explain differences in the answers. Within the range of

answers and their undertones most interviewees seem to describe the future within the next 10 to 20 years, but this was not confirmed within the course of the interviews.

4.1 Unique benefits of AR and MR solutions in conference experiences

Interviewees raised multiple different benefits and concerns for the use of AR and MR technologies in conference experience management. Within this chapter I will discuss specifically the themes of benefits that I found within the data. Thematic analysis and the color coding I used is visualized in figure 6. The benefits raised by the specialists were further grouped into four themes of: Customization, Enriched visualizations, Real-time information, and Engagement. Out of the mentioned four themes Engagement was found to overarch as a singular theme throughout all the benefits

Out of these mentioned four themes Customization and Enriched Visualization were mentioned most frequently among the Specialists. Outside these four themes Virtual attendance was also mentioned by the specialists as a benefit for the use of AR and MR technologies, but as it can be considered as an effect of various overlapping definitions of mixed reality that have been used it was treated as a separate entity outside the parameters of the definition of this research.

The theme of Customization benefits was seen as possible to be attained with AR and MR technology as the use of mobile or wearable devices provides general information on the wearer, which could be used to enhance the experience. With customization the specialists referred to a process of transforming and selecting information and experiences provided to the user based on their interests and needs. As mentioned prior, experiences are individualistic responses to stimuli, which means that if you can cater experiences more individually it is possible to provide more meaningful experiences. Information provided using these devices also eases the work of the event planner as they are more able to cater for the individual needs of their attendees.

> *“… because augmented solutions are usually used with personal mobile applications, which allows us to get some information of the user, which can be used to customize digital services better.” (Specialist 5)*
>
> *"It [customization] really gives you the things that you really are interested in, and I think that also helps, on the other hand with cutting down the time that we spend on things." (Specialist 1)*
>
> *"Being able to tailor more to specific persons needs and wishes. It could be pre-made based on chosen interests… making an event for 300 or 50 people but being able to target single individual’s needs.”. (Specialist 2)*

Figure 6 Benefits of AR and MR solutions

The theme of enriched visualizations refers to the wide range of content that AR and MR solutions can provide with limit being merely the imagination of the designer. AR and MR visuals can provide more contextual imagery than a flat picture on a piece of paper and it depends on the style of projection it will also be visually closer to you than a screen at the end of a long lecture hall. Consider a lecture on the architectural design of a building and in unison to the lecture you were able to interact with a three-dimensional visual of the layout that you were able to interact with and maybe even slightly modify. These visuals van be perceived to provide more flexibility and usability for business and product applications and could even be used in event management and in environment design to introduce event sponsors.

> *"You can make the content and presentation livelier, if you enrich the data with enlivening solutions… giving parameters for the context [of the performance]" (Specialist 3).*
>
> *"If you have an AR enabled product demos or services that you have that can allow attendees more to see these products in action in a virtual environment rather than just having to use their imagination." (Specialist 1)*
>
> *"conferences, congresses and trade shows have big partners and sponsors, so bringing forth the brand sponsors in a way that it brings up extra value, which can at-tract sponsors in the future as they see that they are brought forth in a new way… a benefit for event houses would be of being able to show customers easier the different modes of the space - bringing forth the different spaces physical solutions [while walking through the space]" (Specialist 6)*

Third theme of benefits surrounding use of AR and MR in conference experiences is surrounded in the theme of Real-time information. As conferences tend to have a variety of speakers and larger unknown spaces with multitudes of activities, an ability to provide real-time information on the visitor provides true value for the visitor. In combination with considerations for Customization and Enriched visualization AR and MR application can:

> *“It can give you the real time information, like directions to certain sessions where you are going, while going to some exhibition booths or something, and this can in general improve navigation and reduce the confusion of people” (Specialist 1).*
>
> *“Showing you who spoke and what they are speaking about. What is the schedule and where should I head at this moment? This kind of information adding value solutions we are very close and could also technically already be fulfilled.” (Specialist 4).*

The fourth theme brought from the interviews consists of the theme of Engagement. Engagement was only brought forth by one specialist, but it permeates in my opinion as an underlying benefit among all themes.

> *"You can create a lot of interactive immersive experiences for attendees. And once you do that you can enhance the engagement and make the event even more memorable for them." (Specialist 1)*

All the other benefits suggest to further proof the value of better engagement for the visitor that can be made possible with mixed reality implementations. Customization opportunities of technology provide engagement with the event surroundings from a more personal perspective. Real-time information provides ease of use for the visitor and allows the visitors to focus on the event instead of being distracted by logistical issues. All in the while Enriched visualizations can be used to provide more impactful and memorable experiences. As such the first three themes create a funnel to enhance the engagement of the visitor. This funnel is further elaborated with figure 7.

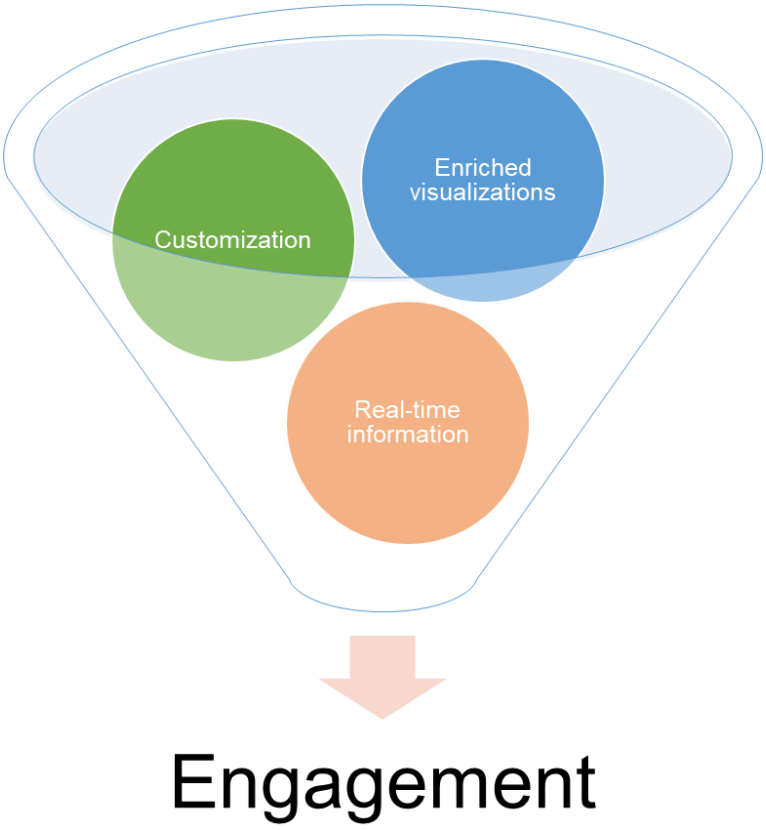

Figure 7 Themes of unique benefits of AR and MR

Although Virtual attendance as a theme of unique benefits associates more with virtual reality solutions specialist 6 introduced an idea of visualizing the speaker in a manner of a hologram or mixed reality entity allowing that the speakers to perform anywhere from the world without the need for the use of time and resources for travel arrangements. These kinds of virtual performances could be then further introduced with mixed reality applications to bring the speaker into as if they were in the room, for instance by using mixed reality glasses and projecting the recording or live feed of the speaker.

> *"The speaker could perform anywhere in the world. Speaker transportation from different parts of the world is quite expensive and there can be scheduling issues, which as a benefit can be overcome." (Specialist 6)*

4.2 General Concerns of AR and MR experiences

Although the unique benefits and potential value brought by AR and MR solutions can be perceived to be varied and valuable, it is impertinent to be aware and consider the potential concerns and backlash for the applications. Specialists were interviewed on the potential concerns of AR and MR. Like with previously discussed benefits their responses were analyzed and thematized. The analysis process visualized in Figure 8. From the concerns the specialists stated can be

formed two major themes: Health and safety concerns and Lack of knowledge. Health and safety concerns consist of the physical, mental, and digital harm that could be caused by AR and MR solutions and devices, while Lack of knowledge consists of the issues in relation to the difficulties brought on by the newness of these technologies and the uncertainty in relation to it. Within the Health and safety concerns the specialists mentioned the topics of privacy, addiction, ethical considerations, physical safety, and health effects. On the other hand, within the theme of Lack of knowledge there are topics of prejudice usability, utility, and transformation of events.

Figure 8 Concerns of AR and MR solutions

With privacy concerns the specialists referred to the amount of data that can be procured using AR and MR devices. questioned the process of data management and maintaining privacy while in use. What kind of data do we procure and how is this data stored and how can we as a service provider allow for a sense of security for the user? As brought on by the specialists it is imperative to be able to accommodate a sense of security and transparency for the users on the data

collected of them and how, and why it is collected, so that there is trust between the user and the solution provider.

> *"How do you access personal data in this case and information in order for this [AR solution] to function effectively? – How do you collect the data; what do you do with this data that you collect and then how do you protect the data?" (Specialist 1)*

> *"Practically based on person's hand and head movement it is possible to recognize a person better than with a fingerprint, so there are real risks that need to be considered." (Specialist 5)*

Addiction and other ethical consideration concerns were brought by specialist 1 from the perspective of immersive experiences as escapist experience solutions may enable addiction. Specialist 4 also noted from gaming industry perspective a warning word as gaming like escapist behavior provides an escapist dopamine hit through in-game item purchases which may resemble a hit of substance abuse. As such we need to be aware of the repercussions of different solutions that are produced and consider how to maintain them.

> *“[ethical consideration] is particularly when it comes to things like realistic simulations, violent or dangerous situations, even virtual reality pornography. - AR and MR technologies could be quite addictive, and especially if they are used for entertainment." (Specialist 1)*

> *“In gaming industry especially, mobile games have been designed to resemble almost drug trafficking. Giving free samples until people are so hooked that they cannot stop and must put money into their games, so it is valid to ask is it sensible to support this kind of development?"*

Other than mental and online safety it is necessary to consider the potential physical harm caused by the usage of various devices and applications. Engrossed users of AR and MR solutions have a chance to lose their understanding of what is real and what is not, which creates confusion, and, in that sense, it could be possibly wise to consider breaking the realism and immersivity of the experience for the sake of safety.

> *“They [AR and MR solutions] can have negative effects on your physical, on your mental health, particularly if they're used for long extended periods of time. What if people become way too engrossed in the virtual world? What if they lose track of their surroundings, the track of their time and so on." (Specialist 1)*

> *"If a person focuses to the augmented reality, do they observe their surroundings enough? - Considering logistics. When we move large amounts and loads using augmented reality, navigating may cause issues." (Specialist 4)*

As mentioned, another range of concerns surrounded the theme of Lack of knowledge. There is a certain amount of prejudice towards AR and MR solutions. Potential users question the current usability utility, and transformation of events. As the technologies are still new and suffering through their struggles of implementation it is still proving its value. As such it is also difficult for event

organizers to implement these technologies, which further perpetuates the lack of knowledge as no actual attempts are made. Although the concern of uncertainty and unknown is inevitable with the new, being able to provide the new service and experience that overcomes these uncertainties will pro-vide inevitable business success. Furthermore, with the more engrossed virtual lifestyles that have been brough forth by the post-pandemic life, does the idea of augmented and mixed reality have the same appeal and novelty? At the same time a specialist questioned on a chance of counterculture movement towards new technological implementations.

> *"Why am I paying for something that is not real? - How is it going to work in actuality? Is it here just because it is trendy?" (Specialist 2).*
>
> *"… do visitors want augmented reality applications… what kind of added value does it bring compared to other technologies?" (Specialist 4):*
>
> *"… there is lack of knowledge how to utilize augmented reality. You might not know what to do with it and might be a bit frightening to try something new" (Specialist 5),*
>
> *"We have now moved from online mode back to face-to-face mode and we enjoy it that we can be face-to-face. Are our brains yet in tune with these technological solutions… or do they just burden us?". (Specialist 6)*

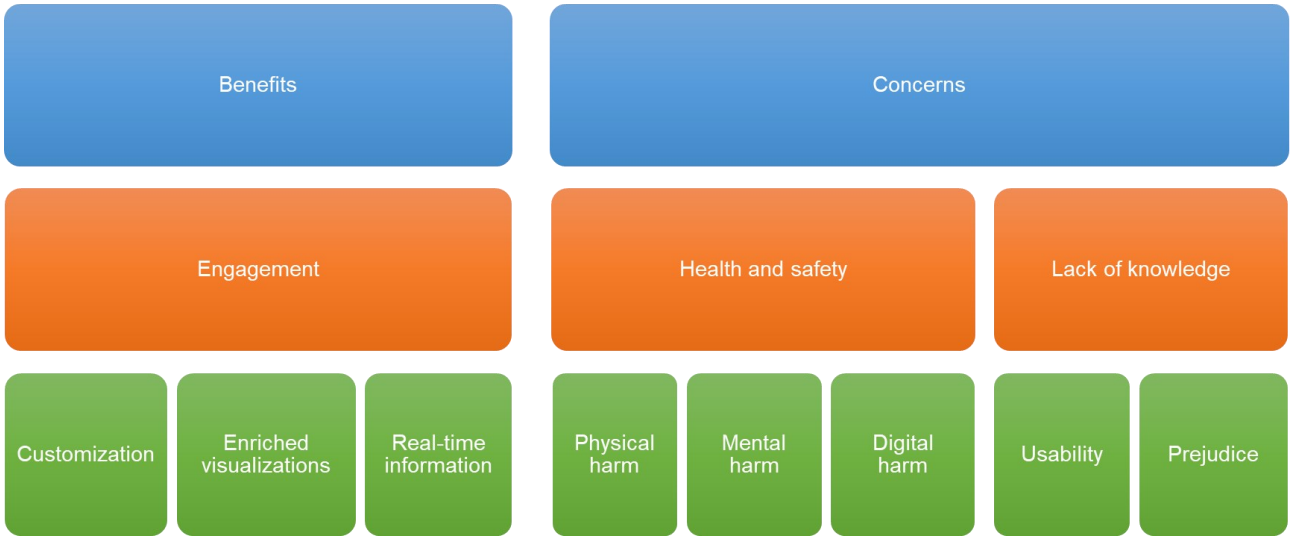

Figure 9 Benefits and concerns of AR and MR

During this chapter I have discussed the results of the interview on the benefits and concerns that were brought by the specialists in relation to the use of AR and MR technologies in conference experience management. The collective thematized benefits and concerns and their subsections in relation to AR and MR are visualized in figure 9. In the following chapter we will be focusing on how the specialists recommended improving the conference experience in the future as technological development can be perceived to support a wider range of opportunities on the use-cases of AR and MR technologies.

4.3 Improving the conference experience using AR and MR technologies

Although AR has already for few years become publicly utilized and understood, such as in the forms of QR-codes MR is still undergoing the adoption process. Broader use of MR can be perceived to provide benefits on customer experience, but it still has limitations on its technological capabilities and overcoming the public concerns as mentioned before. Although it is possible to generate MR content the use can be still cumbersome and at times unstable. According to specialist 4 it may be that within 10 years the wearable technologies could develop so that MR experiences could be enjoyed with wearable technologies that would be light and comfortable to carry

During this chapter I will discuss the shared knowledge of the specialists on future improvements to conference experience that could be implemented with the use of future capabilities of AR and MR technologies. The discussion is divided into the relative stages of the experience pre-event, during event and post-event, as mentioned before. I will begin by discussing results for pre-event improvements, which are then followed by during event and finally post-event improvements.

4.3.1 The pre-event improvements

The specialist brought forth varying perspectives on how to improve the conference pre-event experience. The analysis process with specialist quotes is visualized in figure 10. I defined the underlying further into three themes of improvements: Marketing, Practical information and Tours and event space planning. These three themes are further visualized collectively in the end of this chapter in figure 11. Before the event it is important to settle in for the visitor and make them feel safe and secure to arrive at the venue and engage them with the topics of the event to get them excited by providing them with engaging information on the event. Furthermore, in the pre-event phase it is already to introduce the business partners that have made the event possible. Although it is well understood that this stage before the event is important it is still quite underdeveloped. (Specialist 1)

> *“Introduce and engage the customer to the event and with the themes of the event to provide an understanding what, when and where things are happening” (Specialist 3)*
>
> *“Introducing the event, activities and partners prior to the event” (Specialist 2)*

Figure 10 Analysis of pre-event improvements

Often these kinds of information are provided via PowerPoint-slide attachments in emails, or on the event website or social media. Although it can be an effective way to provide information, it may not be the most interesting or engaging, and this is where the specialists also believed that AR and MR could improve upon. In the case of a project launching or new discovery visitors could even be provided with 3D renders to acquaint themselves with the products before the event.

> *"Being able to acquaint yourself to the topic in a more interesting way than PowerPoint slides prior to the event" (Specialist 2)*

> *"In a case product launch creating a 3D render of the product and providing an opportunity for people to observe the product before" (Specialist 4)*

For marketing purposes outside of traditional forms, the specialists suggested the use of AR-enabled posters, flyers, and brochures. Digital entities that could be introduced into the background of your everyday activities as you were wearing the MR glasses for instance, almost as a modern popup, but more intentional. A customized projection that you could encounter in your surroundings plastered on a wall after signing on the event. Real posters in the world could even be programmed to show different kinds of content based on their user data. Normal posters, pdfs, or slides could even be enhanced with gamified AR and MR elements, such as trying to find clues for

a larger mystery throughout the pre-material for some hidden information to create engagement and entertainment.

> *"AR enabled posters, flyers, and brochures and stuff that people can interact with in a little bit different way rather than the traditional way. If you add the layer of gamification into this and then you hit the sweet spot because then people become intrinsically motivated"" (Specialist 1)*

Using MR technologies, the future visitor could be provided with a way to plan and "walk" through to the event space and even around the event space. These kinds of pre-emptive "tours" could be used to help in designing and providing the information to the collaborators, such as speakers. With MR technologies speakers could be able to visualize the stage and their surroundings before the event to get settled in.

> *"Virtual tours are something people are quite interested in. This is not only for the attendees, but for people who are exhibiting things, or a conference speaker. Maybe you want to see how the stage looks like. Where am I going to be? How big is the space?" (Specialist 1)*

> *"Using these [AR and MR] technologies, it is possible to visualize the end-result, and maybe so make the design work faster and easier." (Specialist 5)*

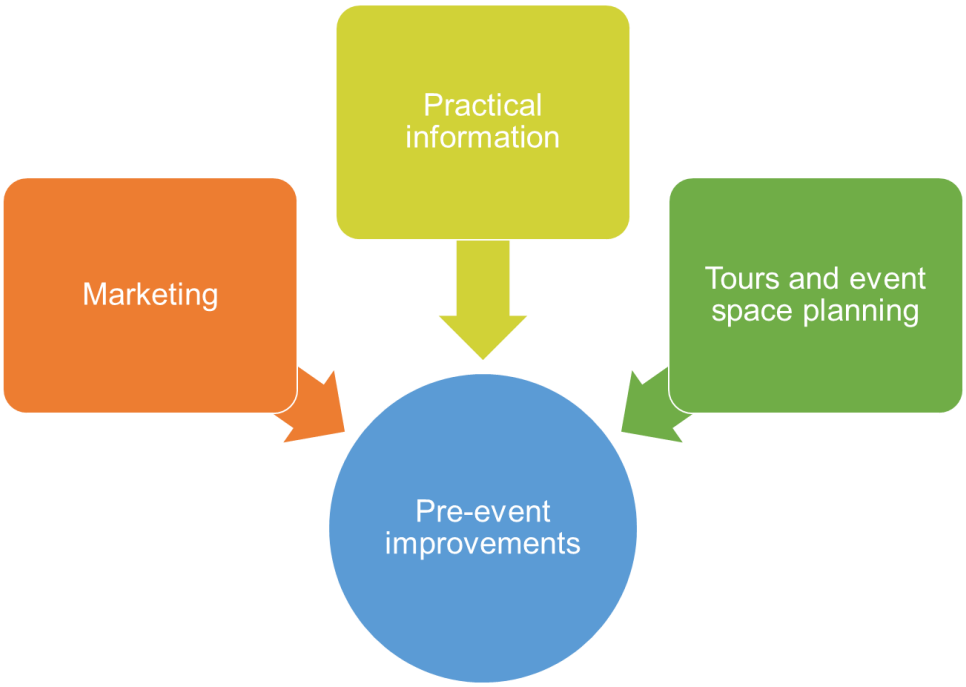

Figure 11 Themes of pre-event improvements.

Now that I have introduced the recommended implementations for the pre-event stage of the customer journey. I will continue by discussing the results regarding during the event implementations. With all the suggested opportunities, the most important thing to keep in mind is the purpose and how do these implementations fit the needs of customers. When implementing additions, it is

important to keep in mind factors that can be either too difficult to use or too invasive for personal security. Not considering these factors could even cause the guests to lose interest or even create a misunderstanding of the purposes of the event. This priority does not focus on just the pre-event stage but should be remembered, when designing all steps of a customer journey, before, during and after the event.

> *"What is the purpose of integrating this stuff? Is this here just to entertain people? Do all people have to use this and utilize this or is this here just to show I'm flashy and I'm using the latest stuff where in fact people are just having headache using it" (Specialist 1)*

4.3.2 During the event improvements

Specialists suggested varying perspectives for improvements of during the event experience. Specialists focused especially on enriched and interactive visuals that could even be customized for individual users for enhanced value. As with pre-event the analysis process I used is visualized in figure 12. Improvements that resulted from the interviews and their underlying themes were divided into different perspectives of improvements: Customized experiences, Interactive presentation and informatics, Enriched visuals, and Entertaining and gamification. These four perspectives are visualized at the end of this chapter in figure 13.

Figure 12 Analysis of during the event improvements

As customization was one of the most frequently mentioned benefits of AR and MR it is no wonder it was mentioned as one of the major sources for improvements in the conference experience.

Individualized experiences could be introduced for instance in the form of networking. Creating and pinpointing new contacts in the crowd through AR or MR glasses based on user interests or event schedule.

> *“Being able to introduce people based on their interests and [using AR] pinpoint them from the crowd” (Specialist 4)*

As with practical information before the event, visitors require vast amounts of information during the event, and AR and MR technologies could be used in the future to replace information pamphlets with crunched up maps and schedules or cluttered websites, viewed on the phone. With AR and MR glasses, interactive map and navigation tools could be visualized directly in front of the user. These could take the form of a navigational arrow leading you to your desired destination or a 3D rendered floating floorplan of the event venue.

> *“Interactive maps and navigation tools that can help people find a way around the venue, locate specific sessions, especially if it's a big space” (Specialist 1)*

> *“Being able to see what is happening, when it is, who it is, and what is happening. Having all this information directly in you use” (Specialist 4)*

Event presentations could be enhanced with the possibility of increased interactivity between the speaker and audience, allowing a wider range of discussion on the topic. At the same time, in product presentations audiences could even be provided with a closet from the comfort of their seat instead of peering on the stage from a distance.

> *“Bringing more visualization to support the presentation instead of just a speech with slides” (Specialist 5)*

> *“Not everybody has a physical product to present, so it [AR] provides a visual for them.” (Specialist 2*

Still these implementations are often barred by their novelty as it is difficult to communicate their benefits and value clearly to partners, investors, and even to the customers. Furthermore, it is risky to implement new technologies without certainty that users want it or that the scale of the event will be manageable for the technology.

> *“Learning to communicate with a customer [about the implementations] and finding a price-point to how much customers want to pay for these and what is the added value of customized experiences” (Specialist 3)*

> *“As a large operator we always consider the scalability and for new innovations it often takes a long time before scalability is possible, which is why it takes time for us to implement them.” (Specialist 2)*

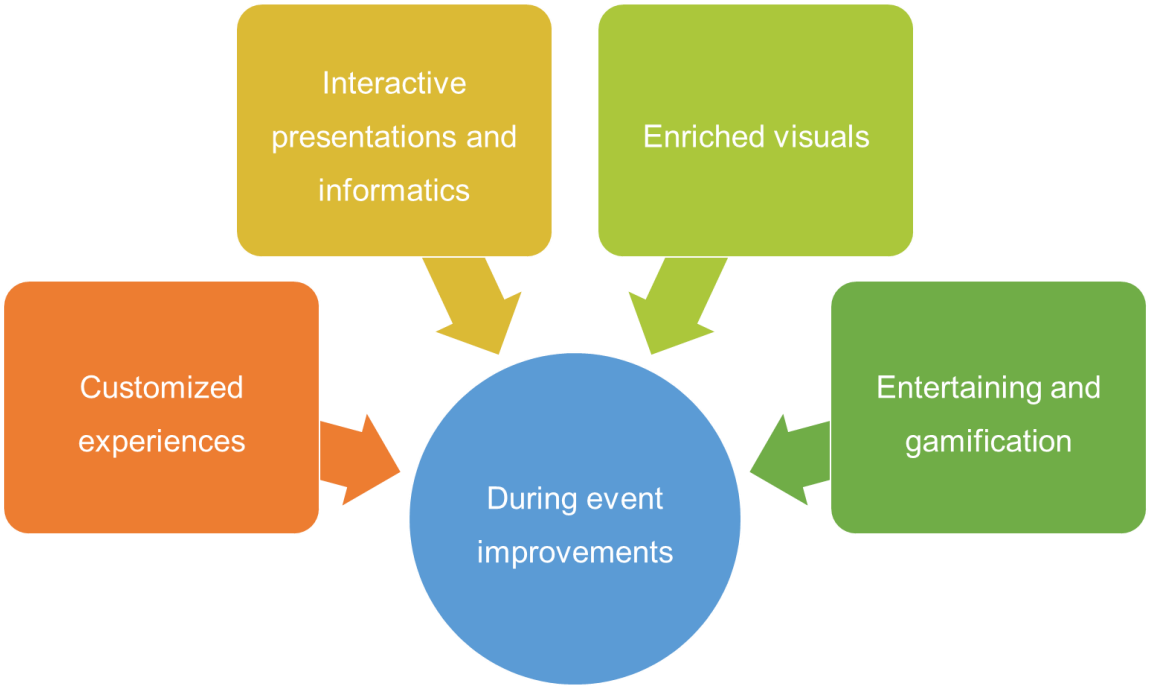

Figure 13 Themes of during the event improvements.

Now that I discussed the results for during the event improvements, I will continue to discuss the resulted post-event improvements based on the interview analysis. As already mentioned in the benefits and concerns the engagement opportunities provided by augmented and mixed reality is really one of its most valuable benefits for the customer experience. In the results of the during stage we can further observe as four themes implement new ways of engaging with the event,

4.3.3 Post-event improvements

For post-event improvements there weren't as many foreseen opportunities provided by the specialists for augmented reality implementations, which is understandable as augmented reality is defined by the local presence and after departing from the event space it becomes more difficult to maintain that contact. Furthermore, creating a line between consecutive events becomes semantics to describe, when post-event ends with post-marketing and pre-event begins with the marketing for a new event. Still the specialists recognized three themes for post-event improvements: Revisiting materials, Networking opportunities, and Measurements. As with pre- and post-events, the analysis process I used and associated themes and specialist quotes are visualized in figure 14. Out of the three themes. material revisitation and networking opportunities were mentioned more commonly, but I believe that one of the specialists brought out a very valuable improvement consideration in the form of transformational measurements.

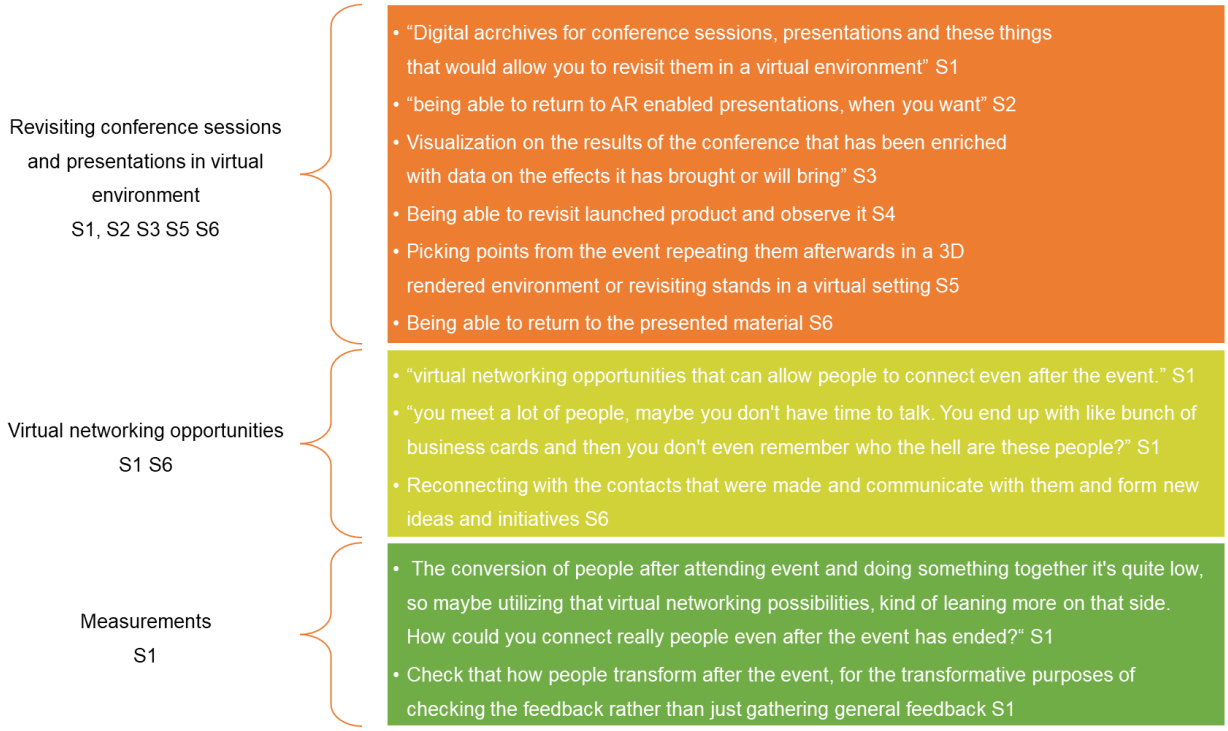

Figure 14 Analysis of post-event improvements

The theme of Revisiting materials consists of different opportunities of elongating the experience between the discussed materials, workshops, and presentations in the event with the attendee. These solutions could consist of AR enabled presentations that you could experience at home, such as relistening to a speech provided by a 3D rendered speech giver in your living room or in a virtual environment or re-examining a launched product through a 3D rendered objects displayed in your room. One of the specialists also brough out an idea for a data visualization on the created or future effects brought on by the event.

> *"Picking points from the event repeating them afterwards in a 3D rendered environment or revisiting stands in a virtual setting." (Specialist 5)*
>
> *"Being able to revisit launched product and observe it." (Specialist 4)*
>
> *"Visualization on the results of the conference that has been enriched with data on the effects it has brought or will bring." (Specialist 3)*

Virtual networking opportunities refers to implementations to support the continuation and development of connections created through the event. So, creating new ways to remind the people met there, such as in the form of 3D profiles or calling cards could be provided after the event to remind the attendees of the people they've met.

> *"You meet a lot of people, maybe you don't have time to talk. You end up with like bunch of business cards and then you don't even remember who the hell are these people?" (Specialist 1)*

> *"Reconnecting with the contacts that were made and communicate with them and form new ideas and initiatives." (Specialist 6)*

As mentioned, one of the specialists brought out a new concept for the measurement of the effect of the event in the form of transformational measurement of the attendees. In essence this would mean the measurement of how much the event transformed the way you behave and think and what kind of effect it had on you. Although interesting and beneficial to estimate the success of an event, it would be a tremendous task, as no officially accepted form for quantification of transformation yet exists, but it would provide valuable data to examine the success of an event.

The conversion of people after attending event and doing something together it's quite low, so maybe utilizing that virtual networking possibilities, kind of leaning more on that side. How could you connect with real people even after the event has ended? Check that how people transform after the event, for the transformative purposes of checking the feedback rather than just gathering general feedback (Specialist 1)

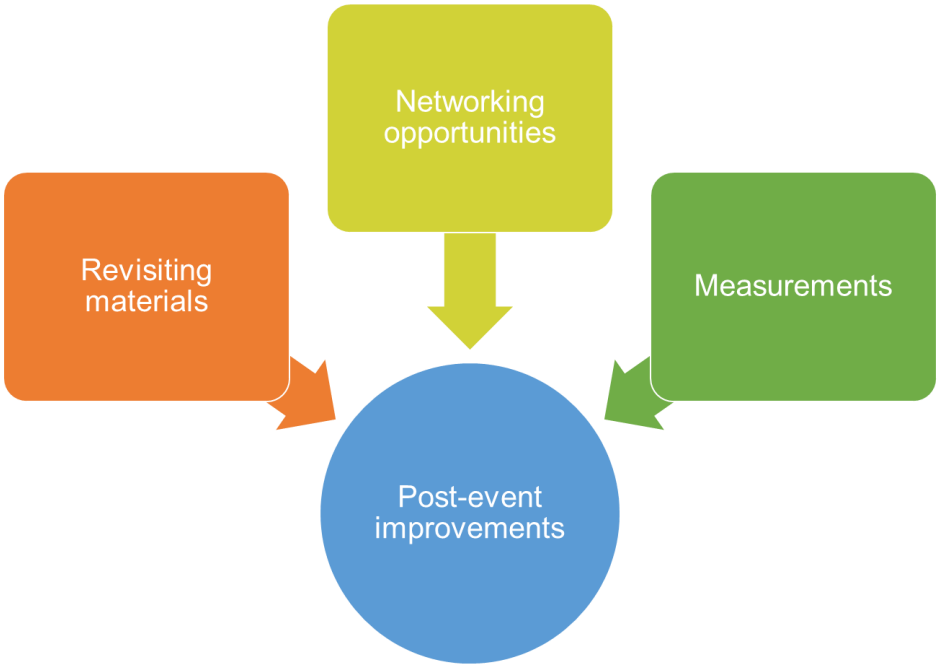

Figure 15 Themes of post-event improvements.

The themes gained from post-event improvements are visualized in figure 15. Now that I have introduced the resulted opportunities for the three stages of the conference customer journey it is time to combine them and consider how to implement them. An idea is only as good as its execution and as I already described in the experience theory section, even the best implemented touchpoint has a chance ruin the experience, if it is not well implemented.

4.4 How to maintain design cohesion

The new customer journey with suggestions for potential mixed reality implementation for improvements is visualized in Figure 16. As we see, mixed reality provides many opportunities to create added customer value throughout the customer journey. If we assume these are successful implementations we can perceive how these can be expected provide customer value.

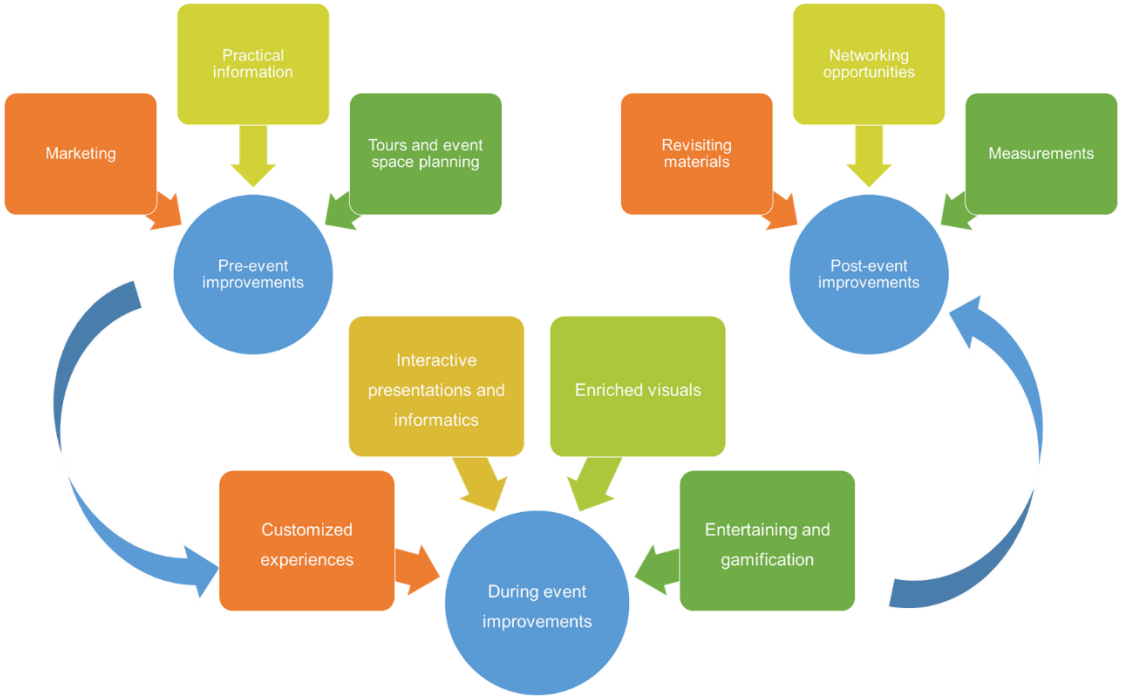

Figure 16 Improved conference experience journey

if we compare the intent of these implementations to the previously described Sheth and Uslay's (2022) framework we can perceive multiple interacting and supporting values. Enriched visuals, interactive and enriched presentations and visuals with gamification are likely to enhance the performance value of the with the way they would be able to enhance the quality and differentiation for the event, while at the same time impressing with the innovative use of technology. Similarly, the technological abilities using the big data provided by connected digital devices and online accounts would provide chances for mass customization of experiences. This can be expected to enhance the affordability value of the experience. With elongated experiences that are designed for the post-event stage and further it can be expected to provide post-sales support and as such generate further service value for the attendee.

Even though the potential value is phenomenal as stated by the specialists there are challenges to deal with. Although it would be easy to just add all the new technological embellishments, they may not work for all, and as mentioned by the specialist they may even become preventors of enjoyable

experiences. To create enjoyable experiences all implementations, need to work together, and they need to feel as a cohesive whole.

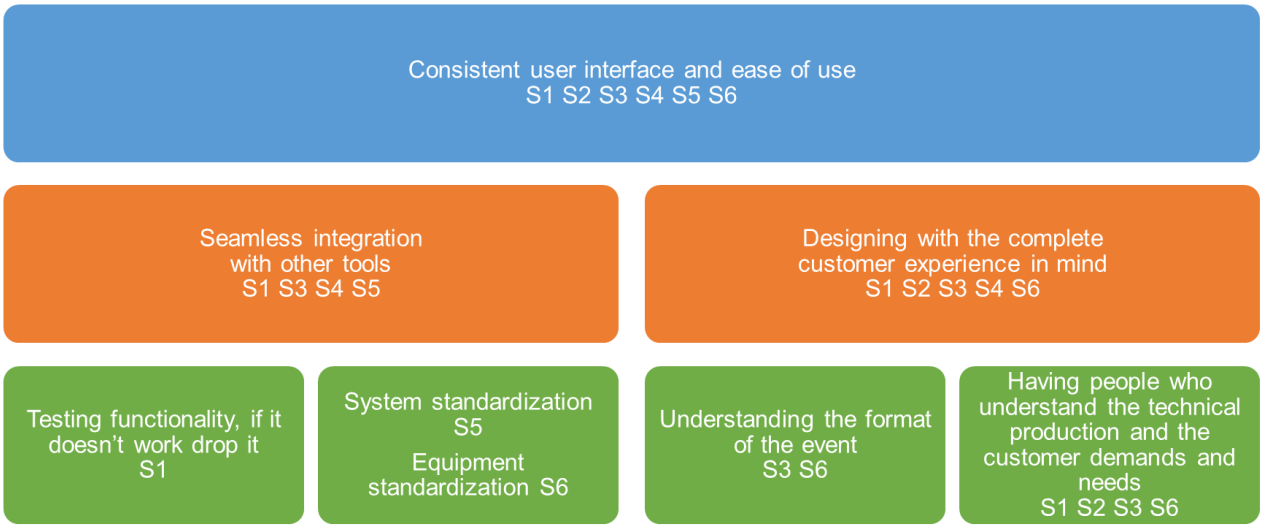

Figure 17 Cohesive mixed reality experience design practice.

That is why I had chosen to ask specialists on this topic. The resulting themes and underlying enablers for cohesive mixed reality experience design are depicted in figure 17. These themes and practices are a new design practice my research would like to promote to use in creating new mixed reality enabled conference event experiences. To create cohesive mixed reality experiences, the main thing all specialists noted is the requirement for a consistent user interface that is easy to use. In the case of conference experiences this could either refer to a future digital event application that would be used via the wearers own mixed reality device in a future, where we assume devices with mixed reality applications become more commonly owned and used. In the near future it could even refer to a mixed reality device that is provided in the event space, such as 3D glasses being provided at a cinema for a showing. If the device or application is difficult to use it will not feel natural, 'nor will the attendee be even willing to begin their experience.

To enable ease of use, the device or application should naturally integrate with other tools physical and digital. Specialists pointed out how all these implementations' functionalities should be heavily tested before the event, and if they do not work they should be scrapped instead of using them with a band-aid solution. Another enabler for the seamless integration would be to set a certain standard for developed systems and equipment. As mixed reality advancements are still blossoming and developing now would be the best time to influence the future of development by providing a stable ground for the future of mixed reality use. With standardized equipment and system requirements it would also provide easier access for other developers for faster technological development.

Still, it is not enough to just consider the technological or physical ease of use from one standpoint. To provide ease of use for a cohesive experience, we need to also understand the varying customer's needs and wants for the event. We need to understand their journey throughout the event from even before to past it. To provide this, we need to consider and understand the type of event we are providing and what is the intent of it, and we need to understand the customers, but also the current technical capabilities. One of the specialists even pointed out this as a new direction for the future development of event planning specialization. Another dismissed the idea of a whole new career but considered more of a need for a better tool for communication between these differing parties of event and technological development.

Although all specialists agreed on the positive future of mixed and augmented reality, there was a major enabler on all their mind, the cultural shift required for these applications to be used. All specialists stated that for a more common use of mixed reality implementations there would have to be a drastic cultural shift in the event producer and attendee side. Specialists stated that with the current high costs and no shown returns of investment it is difficult to argue for the benefit of these implementations. Above the cost of development of the application the cost of training the staff for new applications and producing ways for the customers to use them more instinctively would be excessive to invest in. Furthermore, two of the specialists from the event production background also brought the point that in the case of academic conferences the events are quite set in stone in their tone and a set of activities and rites. As such it would require a cultural change from the customer side to accept new ways of enjoying their events, even though they might enjoy them more afterwards.

In the following chapter I will go through a scenario of a future conference attendee in a conference event, where this cohesive design practice has been used to implement mixed reality applications to enrich on a healthcare conference. The created scenario follows the described customer journey and implements all the described potential sections of mixed reality customer journey, while following the cohesive mixed reality design practice.

4.5 The future conference experience

Mikko Salminen is a respected Finnish healthcare researcher attending an international healthcare conference in London. Although he does not speak fluent English his travel has been easy with the current mixed reality innovation. Although the change had felt quick to using an optical headset that had replaced his phone, it did not surprise him. He can still remember as a child the heavy Nokia 3310 that had changed to a sleeker smart phone with a large touch screen. Change had become the new norm Mikko sighed briefly. Even this event he was going to, where he had gone to multiple times had decided to change their ways after years of the same routine.

Mikko had first noticed the changes while using his headset at home a flyer had flown as if through his window. Surprisingly, it was not magic, but just a digital flyer that had been sent to him. They must have had his information still saved from his previous attendance. The flyer was a reminder of the event and could even be used to directly move to event registration. Registration was simple with the Mikko's information stored safely into the device so Mikko could just autofill all the information without the need for speech to write functions or pulling the digital keyboard down. For the convenience of attendance Mikko had chosen a recommended package for his hotel room and flight booking. Although he might have been able to get it cheaper himself, he did not want to waste his time saving pennies. Mikko had also opted to install the event application prior to the event to be able to research the interesting event offering and had allowed the application to send updates.

After registration, and about a week before the event Mikko had also been sent a digital leaflet to peruse the event activities and schedule. Within the information package was also a provided 3D rendering of the event space floorplan with information of the schedules and even recommendation of speakers in relation to Mikko's research. Although the leaflet was digital it responded to Mikko's gestures following along and turning each page. On the day before his flight to London, the event application sent a reminder for his departure and an estimation of the weather for the coming days.

Arriving in London had been a breeze all the updates on the flight schedule and boarding information had been sent directly to Mikko's headset and he had had no worries of looking around for his gate. After arriving in London a car had been waiting for Mikko as expected, which took him to his hotel right next to the event space. While leaving the car Mikko had even quickly noticed that his headset displayed the logo of the event on the side of the car, but while glancing one the open side of the headset there had been nothing there. With the identification capabilities of the head-set signing in was easy as he had no need to look for his passport. It was more like a relic that he was used to carrying around while traveling. Headset had also automatically overlaid the pound prices to euros according to the current change rate while he had grabbed coffee while waiting for the event to begin.

As Mikko had already the event application registration for the event and entering meant just walking through the gates for him and being provided with an event lanyard with his name on it. While preparing for the event Mikko had already made a list in the application of speakers and showcases he wanted to hear and where they would be presenting, some of them he had picked from the list the application had recommended. With the application Mikko could activate his list, which then provided him with a projected line on the ground directing him to his destination. While

walking to-wards his destination, Mikko took a few detours stopping to look at different showcases, to which the projected line adjusted.

The event space was decorated with the sponsors visuals banners on the walls. Some with animated caricatures of their mascots. Although they were visually interesting Mikko found it a bit too distracting and chose to mute those visuals in the application. While walking through the event space he could also see some of the younger attendees participating in a networking event that was a gamified egg hunt. The participants were looking around for the largest collection of people who were working in the same field as them. To succeed the players would walk around meeting new people and scanning their lanyards to see what field of research they were working on currently. The most successful networker was promised a prize of a business lunch for two to take one of their new contacts to. Although Mikko was not as excited by the prize he shared his contact information with few interesting sounding participants.

Finally arriving to his first speaker of the day he noticed that although obviously esteemed and respected Italian researcher, he did not speak English ‘nor unsurprisingly Finnish and Mikko did not speak Italian. Luckily the device automatically translated the presenter’s speech and Mikko could notice that it was also creating a recording for later revisiting. The presentation also did not lack the Italian flare as it had been embedded with 3D visualizations of the topic, which Mikko could bring closer to him, even though he had trouble seeing from his sport further away from the stage. With the interactive presentations Mikko could easily follow through as the presenter discussed the inter-acting systems and how they worked together. With the presentation finished the participants were also able to discuss the presentation with the speaker as all could submit their questions through a voice-controlled chat that was visible to the speaker and the audience.

With the first speech done Mikko thought it was time for lunch. Luckily even though he had not remembered to add his dietary restrictions. He was able to add them in the app which guided him to the appropriate lunch options within the conference. The rest of the day went as well as expected. With the technological support Mikko was able to immerse in a day of discourse and latest ideas, if he felt confused on a topic or a new term he was quick to google it within the application. Even if he did this during presentations the recorded transcript was easy to catch up with.

Even after coming back home Mikko was able to go back to these transcripts and speeches and enjoy them from the comfort from his home. All the contacts as well were saved on the event application.

5 Discussion

This thesis aimed to answer two research questions:

> Q1 “How mixed reality technologies can be expected to be used to create customer value in conference event experience management?”
>
> Q2 “What kind of customer value mixed reality technologies can be expected to provide in the future?”

In response to my question Q1, I have created an improved conceptualized mixed reality conference attendee’s customer journey with recommendations of how these implementations could be included in the event. Based on the interview results I have also created a design practice of how to create cohesive mixed reality experiences. These implementations and practice are further elaborated through a positivist future scenario that is designed to create discussion on the design opportunities mixed reality applications provide. As these implementations and practice were based on specialist interviews and as such hold high credibility. At the same time the thesis discusses the large range of benefits and concerns the attendees may have regarding mixed and augmented reality implementations for consideration while creating new event designs. As such I believe I have extensively described how mixed reality technologies can be used to create customer value in conference experience by providing higher likelihood of felt performance, service, and affordability value, which also answers the secondary research question.

The research conducted in this thesis is to support hybrid event development and design with the focus on conference experience. From the results of this thesis, it is possible to further see the opportunities for new technological development in the mixed reality technologies could provide in the event experience management. With the development of these technologies the results of this thesis can be supported to ideate the future opportunities and to support the developing design practices.

Although I believe that the implementations and the cohesive design practice that is promoted in my research provides a great base as it is future oriented, that is how it should be approached. The thesis has been successful in estimating the opportunities mixed reality would provide for conference experiences, these have not been tested with actual attendees. Furthermore, as the setting of the thesis is future oriented it is not possible for me to consider all the potential social and cultural changes and how they could affect the usability and appeal of mixed reality technologies and their development.

Based on thesis research the greatest benefit of augmented and mixed experiences is in the creative opportunities for customer engagement it provides throughout the current customer journey to enhance the experience of the conference event attendee. These results are based on specialist interviews, but they require further user research. It would be valuable to test the thesis research results on conference visitors and evaluate for instance by comparison of mixed reality enabled experiences versus the visitors who are enjoying a purely physical experience. Also, a sample of international specialists should be considered for further research to compare results and if they differ, which could then be considered why that is.

5.1 Research evaluation

If I were to begin the thesis process anew, I would try to share the work with a project team to ease the burden of the project and to speed up the process. Although in the scale of technological development no large leaps have been made new research is continuously beginning to appear on the opportunities of MR technologies as the adoption of the technology continues and as such rapidity of the result analysis should have been quicker in the continuously changing environment, as even now people are more aware on the opportunities of mixed reality than they were half a year ago.

The thesis project focused on the future best practices and there are inherent risks in research in my assessment of the future scenario. Although the use of interviews provided a group specialist opinion, the process of finding factuality of future in them was daunting already in the beginning of the thesis. Still my aim was throughout to attempt to maintain objectivity and provide space for open discussion. Also, when designing the surveys, the questions needed to be clearly thought-out not to skew the results and guide the answers, while at the same time providing context on the specifications of the thesis. Still these risks were handled to a degree with a clear scope of the research and mindful analysis of the survey data. With the collaboration of the Digisti Live -project there was a wider web of connections between the specialists of the field and the author was able to create a set of motivated specialists, who were interested participants in the study.

After finishing the research, I have also doubted my choice of using an online platform for the interviews due to the ease and the flexibility it allowed for scheduling, especially considering the busy life of the specialists as well. Still with the topic of the interview being so conceptual it could have been useful to consider a walking interview. A walking interview is as name states and interview, which would be conducted while walking with the interviewed person, which are said to be good to get the interviewed person to process better what they’re thinking (Bamberg, 2017). To provide space for gathering of their thoughts I provided the questions to the specialists before the interview for them to prepare, but it may have been slightly naïve to think how much time the specialists would spend on their preparation of the topic.

5.2 Suggestions for development and research

During the study the future wasn't defined as a specific timeframe to provide more freedom for assumption of ideal technological development growth for potential solutions and developmental opportunities, but providing such could have provided more closed vision of the future. As an explorative case study this would provide more structure, but I believe it to have also been an unnecessary limitation on perspective. Still a more limited timeframe of future could be a fruitful source for future research. Choosing a specific point of time for specialists to discuss would provide a relative similarity in the scale of considerations and opportunities.

Although I believe that I was able to create a successful collection of specialists and target saturation was achieved for reliable results to be created, If I were able to continue this research with better resources I would either consider still choosing possibly a larger international set of specialists. Partially I believe that the saturation was achieved because although not all participants were Finnish all participants were living in Finland and were likely affected by Finnish range of development in the use of mixed reality technologies and Finnish standards for conference event management. With an international sample it would be highly likely that a larger sample would be required to create broader and more generic assumptions. Although I believe that the results are likely to be affected by these social and cultural attitudes and assumptions I think that my results can be also used to support the future discussion of mixed reality conference event design.

During the whole process of this study, I have learned on the large range of difficulties the study of future withholds and have gained a newly founded respect to the early 1970s and 80s estimations of what our future might look like. It is easy to mock nowadays of their futuristic perspective and expectations for the future that we still feel so far off. I personally believe it is partially influenced by how we individually experience the presence. As we age things feel like they change immensely as major technological developments leap us forward in large steps changing our reality. If we consider the 1970s reality, where computers were in their first proof of concept from were created in 1937 and already in 1971 there was a first personal computer for household use sold (Computer History Museum, 2024). Naturally the use cases were very different than what we consider normal currently, but still these were humongous leaps that had happened. In the same way we can compare the recent leaps in the way we live past the popularization of smart phones and the global mass popularization of social media.

As such the mixed reality technologies do not even feel that far off from the near future and enveloping our everyday life as smartphones did, and I believe that the range of use cases mixed reality devices promote are likely to allow for quick adaptation as soon as current development is able to

pass the current limitations of computational power and battery storage, which limits the current casual wearability of these devices as stated by the interviewed specialists..

Even though the wider adaptation of mixed reality feels currently like science fiction, I believe it is closer than we even think, and I believe we should be ready for it. Those who are ready and prepared for these new opportunities mixed reality technologies have only a wide blue ocean of business opportunities and a new customer base waiting for them.

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Appendices

Appendix 1. Interview questions

- Could you explain who you are and what is your profession?
- Do you work with the themes of the thesis, and what kind of opinions do you have of the topic?
- What do you believe to be the general concerns in relation to augmented and/or mixed reality experiences?
- What do you believe to be the unique benefit of augmented and/or mixed reality technologies for conference event management?
- In your opinion, how could augmented reality and/or mixed reality technologies be used in to enhance the conference experience in:
  - Pre-event development?
  - During event development?
  - Post- event development?
- How do you think these technologies could be designed to create a cohesive experience?
- How do you see the future of augmented reality of conference experiences?
- How do you think it could be possible to enable the use of augmented and/or mixed reality applications in the future?
- Is there something you think we should discuss that hasn't yet been discussed yet?

Appendix 2 Terminology definitions

Augmented reality (AR) and mixed reality (MR) experiences

In the context of this thesis AR and MR are defined according to the Rauschnabel, Felix, Hinsch, Shahab ja Altin 2022 xReality-framework, which attempts to combine the varied terminology used in reference to augmented and virtual reality experiences. XReality framework evaluates AR experiences based on how present and believable the digital entities seem to be part of local space. This range of presence between different AR experiences is defined as their local presence. AR experiences scale from assisted reality to mixed reality applications. Assisted reality applications are designed to be more information oriented and stand out from your surroundings to be more noticeable. Mixed reality solutions on the other hand are often interactable and the entities are able to take into consideration your surroundings and adapt to it. Through the following link you are able to see, how mixed reality is used in the field of medicine:
https://www.youtube.com/watch?v=h4M6BTYRlKQ

Conference experiences

Conferences are pre-planned formal larger events, where participants congregate on a shared topic to discuss, share information, solve problems and to consult on the issue. Conferences are in size smaller than congresses, but larger and more official than daily office meetings. In the context of this thesis conference experience is assessed in three stages pre-event, during event, and post-event. Pre-event is the time before the participant arrives to the event space, and post-event begins after the participant has left the event space. During the event it is situated between these two stages. According to research, the event experience can be enhanced before and after the event by providing support and information to ease needs and provide support, which is why the author has chosen to define all three stages. Experiences themselves are a subjective spontaneous reaction to stimuli based on the individual background, experiences and surroundings. Different stimuli can further interact with each other based on their order and intensity. Experience management is as such not about creating a specific experience, but rather a range of stimuli that would guide the desired customer in a right direction.