jamk.fi

Futures Research: The Application of VR and AR Emerging Technologies in New Media

Future of Immersive Visuals Online

Madina Baikulova
Elizaveta Suderevskaia

Bachelor Thesis
November 2019
School of Business
Degree Programme in International Business

Jyväskylän ammattikorkeakoulu
JAMK University of Applied Sciences

jamk.fi

Description

Author(s)	Type of publication	Date
Baikulova, Madina Suderevskaia, Elizaveta	Bachelor's thesis	November 2019
	Number of pages 77	Language of publication: English
		Permission for web publication: x

Title of publication

Futures Research: the Application of VR and AR Emerging Technologies in New Media

Future of immersive visuals online

Degree programme

Degree Programme in International Business

Supervisor(s)

Saukkonen, Juha

Assigned by

Abstract

Today, technologies form our relationships with information. Proper use of digital visualization tools influences brand-audience relationships. Virtual Reality (VR) and Augmented Reality (AR) technologies are developing rapidly, providing new ways of content creation and perception. This study was focused on investigating the potential that these technologies have in terms of shaping the way information is shared and acquired in New Media channels, and gaining insight on the way customers perceive them today. The main goal was to predict the development of VR and AR in the New Media industry for the next 10 years.

Inductive approach with qualitative method was chosen for the study. The collection of primary data was based on triangulation method, which included two focus group interviews with media end users (7 people each) and five semi-structured personal interviews with professionals. As a method of futures research, Technology Roadmapping was used.

The main outcome of the study – Technology Roadmap - reflects the development of VR and AR from the technical, product and industrial point of view and represents different milestones that the technologies will reach in the next 10 years, along with their interconnections. Data analysis stated that today the issues with quality of VR and AR content and high pricing of the devices, along with lack of possibilities to experience immersive technologies keep the audience doubtful. However, big players in the New Media industry continue trying out and introducing more VR and AR content. The technological advances promise to enhance the usability of devices in the next 5 years. Within the span of 10 years, immersive technologies are promised to shape the evolution of visual media and become a part of people's routine. Businesses that take predictive approach and try integrating VR and AR content will be able to achieve a profound connection with the audience and a new level of engagement which will bring more prospects for business development.

Keywords (subjects)

New Media, Virtual Reality, Augmented Reality, Digital Media, Technology Roadmap, Immersive technologies

Miscellanous

Content

Pictures

Figures

Tables

1 Introduction

1.1 Background

Digitalization has become a great part of global technological development in the last decades. Modern media technologies form our everyday habits and contribute not only to our social lives but also to the professional communication patterns. Proper usage of visual elements in media environment can fasten the process of customer acquisition and significantly influence the consumer behavior trends. However, the tendencies in visualization technologies are changing rapidly nowadays. The role of this tool has never been as substantial as it is today. Creating positive experience online by using not only relevant information but also visually capturing elements is already a winning combination for numerous businesses. Virtual reality (VR) and Augmented reality (AR) are no longer unreachable. These technologies have become two of the most promising innovations of the last years. Now they are creating a strong platform for upcoming innovations that may influence different sides of customers' activity online. The shift from a traditional, fully digital experience to a complex immersive technology has become more visible during the last years. The aim of this research is to identify what are the main patterns of VR and AR development in the future and how those trends can change the world of modern media business.

Immersive technologies can be used to create games, sharing news, watching films, slowing down the pace of experience obtained. The closer the way of experience perceiving is to our real life, the more accurate and more valuable the view of the content will be (Balakrishnan 2017).

The existing media industry has been built around idea that the technology enabled us to receive information more quickly with least interruptions and maximum content involved, that has been one of the major features that Internet provided

society. However, as looking more on the futuristic picture, immersive technologies create a different perspective of this process. The time perception might no longer be a priority in achieving result. With immersive technologies, the psychological need of maximizing the outcome will shift into natural need of creating a memorable yet valuable experience. In other words, the process of information acquisition might carry more practical value than the information itself. Therefore, the integration of VR and AR will require a deeper transformation not only in the technological element, but also in the social interpretation of the core idea behind immersive technologies as a New Media tool.

There are numerous factors that suggest the possibility of VR and AR development. The researchers aim to produce a deeper data collection that will focus on New Media and on specific phenomenon that may allow the integration of those technologies into different aspects of people's lives.

1.2 Motivation for the research

The topic for this research was formed based, first and foremost, on the personal interest of the authors towards New Media innovations and the opportunities that they provide for the audience. It is no secret that New Media has a great power over business development today. It builds trends of customer behavior in the way that would seem unbelievable even a decade ago. It is present in every type of business and it highly influences decision-making process of consumers. Not to mention, there are tons of various information sources, which make data available to anyone with an access to the World Web.

Augmented Reality and Virtual reality are some of the most rapidly developing innovative technologies nowadays. More and more enterprises are trying to find a way to apply the possibilities, which these technologies bring, to their business. AR and VR have the potential to bring new changes in the digital media, enabling publishers to create a new level of engagement of an audience in their content.

Futures research aims at exploring data and creating possible scenarios and visions, that can further be helpful in terms of generating winning strategies and business plans, adapting to the likely circumstances.

In this study, authors forecast the possibilities of integration of AR and VR into New Media channels and its implications. The aim of the research is to create a technology roadmap that will display the holistic overview of opportunities that VR and AR may bring to the media business sector. The outcome is to potentially be beneficial and influence strategic planning and decision-making for the companies in the field.

1.3 Research questions

Virtual reality and Augmented reality already have a strong background of technological practice and have been used as a unique way of creating an immersive experience for the audience. However, the lack of their utilization on commonly used digital platforms encouraged the researchers to make a step in creating a possible scenario for future implementation of these technologies in people's everyday lives.

Based on the preliminary research made and the existing application issues related to virtual reality utilization in media sources, the main problem was defined as:

The lack of VR and AR integration into the New Media channels as potential tools for content creation.

Thus, the main objective of this research is to introduce possible solutions for VR and AR technologies utilization in New Media platforms. The researchers aim at investigating the potential that these technologies might bring to the New Media, and further predict the attitude of potential customers and audience towards these changes. Furthermore, they investigate the relations between well-known VR utilization services and the ones that may appear to be sufficient platforms for

technology integration. The outcomes that will provide exact VR and AR utilization opportunities will be reflected in the Technology Roadmap.

Based on the defined research problem and objectives, the authors managed to determine three main research questions that they will give answers to by the end of the research process:

- How high is the potential that the integration of VR/AR technologies have in terms of shaping the future of web-media?
- What is the possible scenario of VR utilization in New Media in the next 10 years? (The outcomes of this question will be presented in Technology Roadmap)
- What is the customers' potential perception of the upcoming technologies?

1.4 Structure of the thesis

The presented thesis is designed as a qualitative research with literature study, personal interviews with professionals from the field, audience focus group interviews, interpretation of the results and the discussion of the obtained findings with their potential future applications. The literature review, which findings are also reflected in the Results, is focusing on the current media industry, the role of visual technologies in the online content, the futuristic view on media of tomorrow, the immersive technologies and their potential use in media, and investigating predictions about the future of VR and AR and the way they will be utilized in different areas. As a conclusion for the research, the researchers provide their personal view on the obstacles and limitations that may appear in similar studies in the future and the possibilities of developing the studied topic in a more practically oriented project.

1.5 Glossary

Since this research uses various terms that might have different connotations, authors include this Glossary to state definitions that should be guiding the reader through the research.

New Media – forms of entertaining or informative content provided through electronic ways of communication such as computers or Internet, and not through traditional media such as newspapers, television or radio.

VR – virtual reality; a simulated environment created with the use of computer technologies and provided by the utilization of special VR equipment such as VR glasses.

AR – augmented reality; an interactive experience based on integration of digital objects into real environment using a camera of tablet or a mobile phone, or other AR devices.

Emerging technologies – new technologies that are appearing or are going to appear in the upcoming years and represent innovations in different fields, such as science, education, technology, etc.

Immersive technologies – a technology of integration of created digital environment elements into the real world with the help of special devices that allow the user to engage with the simulated content.

2 Literature review

2.1 New Media definition

The concept of New Media has numerous interpretations that have changed throughout the period of its development and progression. According to Hennig-Thurau, Malthouse, Friege, Gensler, Lobschat, Rangaswamy and Skier (2010, 312)

New Media are websites and other digital communication and information channels where active consumers engage in behaviors. In contrast to traditional media, they can be consumed by other people in real time or long afterwards regardless of their physical location. However, in modern understanding, the term has experienced a slight shift from general concept of "websites" to more complex one. A different, but more classical approach is given in Oxford Dictionary that suggests New Media to be "Means of mass communication using digital technologies such as the Internet". Therefore, core idea of New Media that differentiated it from traditional media channels is its digital form.

Nowadays New Media includes numerous online channels, such as websites, blogs, social media (Facebook, Twitter, YouTube, etc.), email, mobile, videoconferencing, broadcasting and others (Murphy 2010).

Chen (2012, 3) explored the interactive quality of digital media. He stated that the interactivity that New Media possesses now brings a lot of freedom to users regardless of the content of information produced. According to Chen (2012, 3), New Media made the process of information retrieving both available and convenient to users. Therefore, in contrast to traditional media, new platforms enable audience to be online instantly with minimum effort and interact with other users on constant basis. The main characteristics of New Media were named: digital, pro-active, visible, real-time and memory, ubiquitous networks. (Hennig-Thurau et al. 2010, 312).

Summarizing all approaches that contribute to the concept of New Media, it is fair to define New Media as *new forms of entertaining or informative content provided through electronic ways of communication such as computers or Internet, and not through traditional media such as newspapers, television or radio*.

New Media has played a significant role in development of customer relationships and business model patterns nowadays. Hennig-Thurau and others (2010, 312) has outlined the modern implications of business tendencies online. As an example, he

shared the common trend of viral user-generated content that may specifically encourage buying behavior by sharing personal attitude to a product via most popular networks, such as Twitter, Facebook or YouTube.

It is stated by various business developers that media presence is necessary for a company, no matter how big it is or how many ultimate followers it will reach (Schmid 2018). However, this does not imply using all existing media sources for self-advertising. It rather means that the media sources that the company is using must be relevant and in alignment with its prior activity and target audience. Thus, New Media is a vital tool for companies that want to bring visibility to their business with maximum reach.

2.2 The role of visual technologies in media

Visual communication has become a vital part of media development during the last years. Marketers now put more value into visual content than ever before. In the last 50 years, the popular format of communication has shifted from text to visuals (Towner 2017). Nowadays, former traditional media activities (journalism, broadcasting, news spreading, music and film steaming, entertainment, etc.) has occurred to gain popularity in online sources, having more and more people following the trend and joining mass movement. It is no secret that visualization is a very powerful tool in terms of creating specific atmosphere, sharing the full spectrum of product/service/news' character. According to Ferrell (2014), 65% of all people are so-called visual learners, and the human brain processes visualized content 60,000 times faster than it does written material. Therefore, it is obvious that in terms of business development, the value of visual technologies should not be underrated. Technological progress has already introduced the brand-new solutions for information representation and immersive customer experience, including VR and AR. Now it is just a matter of time and possibilities - how to use these tools for effective communication and take most out of it in the quickly developing environment of New Media?

CMO Council has conducted a research concerning the role of visual content in different media sources and the perception of the above by the audience. The findings indicate that almost half of the respondents see the video and photo as crucial parts of brand storytelling online. Results of another survey clearly show that in the future, the importance of video (79%) and photo (50%)
will increase significantly, which justifies the fact that digital forms of visual content will empower in the nearest future (The Role of Visual Media in Impactful Storytelling 2015).

Speaking of the basic visual effects, another study done by Buffer showed that tweets with images received 18% more clicks, 89% more favorites and 150% more retweets (Kimball 2015), which justifies simple fact: people appreciate visualization.

It is undoubtable that people love having great memories. The way the story is designed and the way it is presented to the audience has a significant influence on how memorable the experience is going to be. Adding a multi-sensory element may create a deeper engagement to the presented story (Jorden, Marshall 2017).

Nowadays consumers want to be inundated with the shared content. It is though challenging to create an experience that is not only entertaining, but also authentic in nature. There is a rise of live media experiences that provide a very powerful immersion into the event of customer's interest. (Yoon 2017). The most important aspect for the companies though (in this case – online sources) is to develop a consistent story behind the experience, the one that will influence customers' perception of the brand and will provide a valuable foundation for brand image creation.

However, there is a core difference between engagement and immersion, two perspectives of an experience that individual may receive. Engagement takes place when a story encourages audience to take part in the activity, while immersion makes the audience forget that it's an audience whatsoever. (Rose 2015). In this case

immersion has a much more powerful effect on people's minds. Technologies such as 3D recently have been the mainstream of profound visual effects that now have become a part of almost every cinema, and even domestic film systems (home theaters).

On the other side, an interaction that involves a full immersion into alternative reality has its own limitations that should be taken into consideration. Nowadays, immersive technologies are highly used in numerous gaming consoles and platforms in order to enable gamers to feel a deeper connection with the story behind the screen and try themselves in the completely different reality. The experience shows that the downside is, however, that the full immersion may seem scary or even psychologically harmful for people with a particularly low level of self-control in the unknown environment. The amount of benefits that visual, engaging and immersive tools bring to digital media is outstanding, but they should be treated with necessary precautions. Just as much engagement and connection with the brand one immersive story might bring, just as much misunderstanding and fear the other might bring.

2.3 The future of New Media

To study the further development of AR and VR in New Media, it is important to identify the key trends in digital media that will shape the future of it. To begin with, it is important to mention that traditional media (in the form of newspapers, TV, radio etc.) is starting to lose its value as such. For example, according to Pfanner (2013), in the next ten years all publishers will be mostly present only in digital form. Such switch occurs because traditional media is more expensive and less available to audience, what is more it cannot align with the technological progress.

This change is well represented, for instance, by the raising popularity of internet streaming services. According to Benady (2017), since such services use world web to transmit their content, they enable a list of benefits for the audience. These benefits

include the ability to watch the content from different places and different devices, and, what is more crucial, manage the time of watching process. Now, such streaming services as Netflix and Amazon Prime have over 60 million subscribers, and they are predicted to grow even further, replacing traditional TV completely in the next twenty years.

Speaking about specific New Media challenges, in the modern era digital publishers must adapt to significant changes every year.

Firstly, globalization is predicted to influence New Media journalists. The main content producers from Europe and USA will face some competitors from other creators that have not yet reached the world-wide audience – new publishers will come from Asia and Africa. Technological advances will allow publishers to automatically translate and distribute content all around the globe, making it available to people of any nationality. (Pfanner 2013)

Another trend that will not only shape the future of New Media but is already active on the World Web is Participatory Journalism. According to Bowman and Willis (2003), *"Participatory journalism is the act of a citizen, or group of citizens, playing an active role in the process of collecting, reporting, analyzing and disseminating news and information. The intent of this participation is to provide independent, reliable, accurate, wide-ranging and relevant information that a democracy requires".* In the digital era, more and more people start to openly share their opinions and report on certain events, and as technologies become more affordable the tendency is only predicted to rise.

In his article, Eric Feng (2018) states that the whole consumption process of the content online is predicted to become digitally native. That implies that interactions between the user and the media will become more of a participatory experience. New technologies will bring the opportunity to not only passively read, listen or watch content, but engage with it – talk to media, navigate your media.

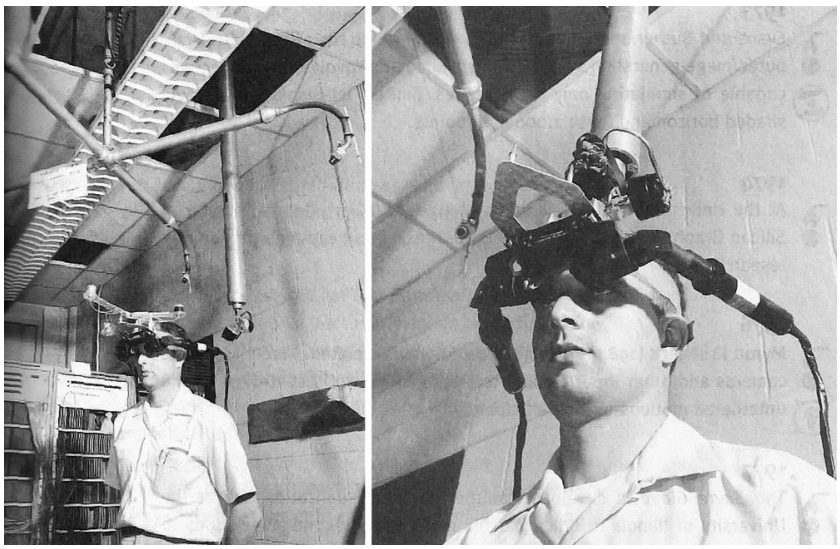
Concerning the content itself, the popularity of video production and consumption is rising rapidly nowadays. According to Cisco Visual Networking Index: Forecast and Trends (2019), video content is predicted to account for 84 per cent of the Internet traffic in 2020 already. Visual content tends to stand out among huge amounts of information that audiences consume every day. The demand for high-quality video content is huge among the audiences of media today.

There is no doubt that this technology-driven industry of New Media is only going to grow and innovate. Technologies, like AR and VR are predicted to give people opportunity to immerse themselves in publishers' storytelling and live streaming videos in the nearest future.

2.4 History of VR and AR

Many researchers have described the history of VR and AR development throughout the years. Different approaches towards what to be called as "highlights" of this process were taken. However, most of the authors, such as Mazuryk, Gervautz (1996, 2), Mandal (2013, 304), agreed on naming the origins of VR as we know it today. The first idea of it was presented by Ivan Sutherland in 1965 in his seminar paper called "The Ultimate Display" (Picture 1). He described the core idea of Virtual reality as it has been seen by him and as it was further developed afterwards:

"The screen is a window through which one sees a virtual world. The challenge is to make that world look real, act real, sound real, feel real" (Sutherland, 1965)



Picture 1. The first ever head mounted display by Ivan Sutherland, 1965

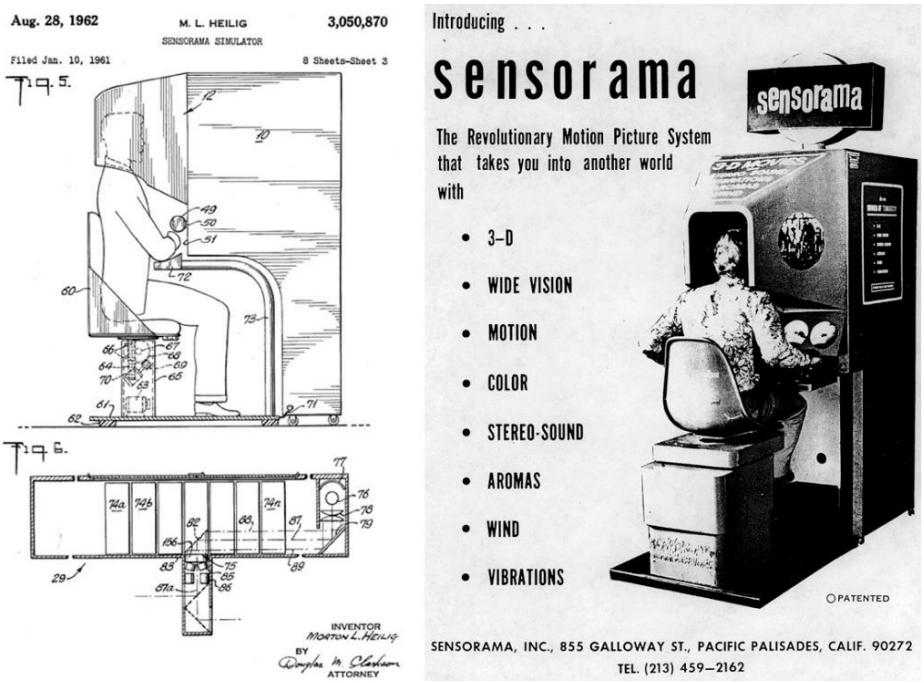
VR though has experienced great modifications since then. Earnshaw (1993) has put together the remarkable steps that led us to the current use of the tool.

Sensorama (1962), flight simulations, NASA Ames (1984), cinematic virtual tours and "Private Eye" were named as the most significant implications of VR in the latest history. In 1991 Sega released the Sega VR headset for arcade games and the Mega Drive console. LCD displays, stereo headphones and in-built sensors enabled the system to track the movement and the position of user's head. In 1995 Nintendo launched The Virtual Boy and released it in Japan and North America. The Virtual Boy was a top-table video game console that happened to be the first game console ever that was capable of displaying a non-common for that period stereoscopic 3D graphics.

There were different approaches to defining AR technology. According to Alkhamisi and Monowar (2013, 26), AR influences physical real-world environment by adding virtual computer-generated information to it. On the other hand,
some researchers broaden the definition by identifying the experience stage of the tool. For example, Ford and Höllerer (2008) in their work specify that AR is not only

restricted to the technological hardware of uniting the real and virtual objects, but also records those objects together and runs jointly in real-time in 3D.

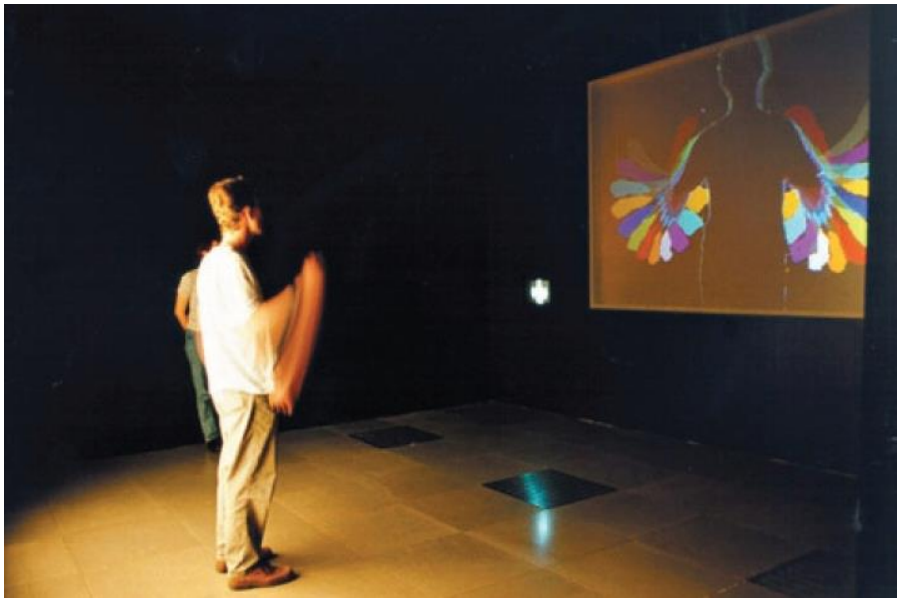
The term of AR was first used by Morton Heilig, a motion picture cameraman, who suggested that cinema should be able to draw the audience into the on-screen activity. In 1962 he developed a "Sensorama", that he claimed in 1955 to be "The Cinema of the Future" (Picture 2). (Alkhamisi, Monowar 2013, 26).



Picture 2. The world's first VR device - Sensorama, 1962

Therefore, it is fair to say that Augmented reality has been developed as a concept and took its origins a little before the Virtual reality was described. After Ivan Sutherland's first AR prototype in 1968, Myron Krueger created an artificial reality laboratory named "Videoplace" (Picture 3). His idea was for the created reality to surround the user and respond to his/her movement without additional impacts. The Videoplace consisted of cameras, projectors, special hardware and onscreen silhouettes of the users. Participants could interact with each other through the use

of this technology, even though they were in separate rooms. The movements of the user were reflected to the screen that created a sense of presence and feeling of interaction with the virtual objects, as well as with other participants.



Picture 3. "Videoplace" by Myron Krueger, 1974

In 1997 Ronald Azuma presented the first Survey on Augmented Reality. His paper contained crucial findings on the state of AR in the field of interactive reality and the way 3D is placed in the AR systems, including detailed discussion of the balance between the optical and video blending approaches as technological elements of AR. He also defined main characteristics of Augmented reality: it combines real and virtual, it is interactive in real time, and it is registered in 3D (Arth, Grasset, Gruber, Langlotz, Mulloni, Schmalstieg & Wagner 2015, 6). In 1990s AR became a field of study.

In 2000 Bruce Thomas invented ARQuake – the first mobile AR game which he displayed on the International Symposium on Wearable Computers (Picture 4). In this game physical world was presented in a form of 3D graphical model. The see-through display enabled users to see the virtual world. The developed system was based on GPS data, digital compass and fiducial vision-based tracking. It was able to

track the movements of the user and the position of his/her head which were sensed by the applications. (Thomas, Squires, Donoghue, Close, De Bondi, Morris & Piekarski 2000). The ARQuake was truly a breakthrough in the technology of portative devices that provide the experience of Augmented Reality.

Picture 4. ARQuake - The Wearable Computer Lab

Next 10 years augmented reality developed from simple gaming consoles into complex experience-providing devices that were a base for currently existing AR/VR apps. The most significant innovations in the field were SAS Cube room in 2001 (the first PC based cubic room), Google Street View in 2007 and Google 3D Street View with a stereoscopic 3D mode in 2010.

In 2010 the prototype of currently most well-known VR headset was created by an 18-year-old entrepreneur Palmer Luckey. The headset featured a 90-degree vision and relied on computer's power of delivering images (Barnard 2019). This has started a new era for virtual technologies.

2016 is considered as the year of burst in VR devices. Companies such as Sony, Samsung, HTC, Google, Vive, PS VR launched few of the most innovative VR related

devices. Smartphones, motion controls, laptops and PS4 console attachments – commonly used technologies are becoming adapted to the virtual experience that audience is getting more interested in. (Jomst 2016). Nowadays, AR devices are widely used in Medical learning and training, education, commerce, advertising and entertainment fields.

In September 2018 the Oculus announced the upcoming Oculus Quest which was named as their first all-in-one VR headset with positionally tracked controllers that allows users to take up objects in simulated games. Another release – Manifold - professional-grade 3D/360 camera created by partnership of Facebook and RED that enables capturing views from multiple angles at the same time within a given volume Picture 5). What made it special is post-processing toolset created from partnerships with Adobe, Foundry, and OTOY. (Lambo 2018).

Picture 5. The Manifold on display at Photokina 2018. Photo by Chad Davies.

2.5 Current use of visual immersive technologies in media

The main benefit of a content created via emerging technologies like AR and VR is how they allow to put the audience in the story told by the publisher, giving a sense of being present in that environment (Martin 2017).

At this point AR and VR technologies might be still too advanced for mass users. For instance, according to "Virtual Reality Industry Report" (2016), VR is only predicted to reach its point of maximum mainstream adoption by year 2025. VR and AR content creation still requires a lot of resources – high investments, professional knowledge and special equipment. Nevertheless, some leading media companies and brands have already started to invest in either related research or experimental production. (Ward 2017). No matter in which industry, VR and AR promise to become a tool for a better communication between the company and its customer, serving an experience that humans never managed to reach before.

Experts from Forbes Agency Council believe that todays' striking rise of popularity of these technologies is not only a passing trend, but rather a possibility for an emergence of New Media channel. It will not necessarily replace other ways of delivering content but increase the amount of opportunities for it.

For instance, more companies nowadays start using the benefits of AR technology in retail. Lamoda – one of the e-commerce brands of Global Fashion Group, launched an AR shoes fitting action in their mobile app. As the brand solely operates online, the function becomes very useful for customers – and eliminates the need to go to the real shop instead.

IKEA, a Swedish furniture brand, has launched an AR app – IKEA Place - that allows its users to choose pieces of furniture from IKEA inventory and allocate them around their houses to overview the potential design of the place.

With a quick pace, event industry is coming up with new solutions for VR and AR audience-participation as well. A young world-known star Billie Eilish has recently recorded a whole concert in VR – it will soon be available online for fans with VR headset to enjoy. Lindsey Stirling has performed a live VR concert on 26th of August 2019, visible for audience in a digital avatar form. In South Korea, Riot Games developer organized a concert in which virtual pop-star group K/DA joined the real performers on stage real-time through AR.

In online journalism, “The New York Times” was one of the first publishers to integrate VR and AR content. The publisher has developed a special app called “NYT VR”. It allows its users to watch films created by “The New York Times” using Google Cardboard, VR glasses or smartphone, to experience a full immerse in the story. NYT believes that these technologies will form the future storytelling.

BBC has created a VR story “We Wait VR” based on the interviews with immigrants. It takes the audience on the journey with a Syrian family, experiencing what it is like to be present in the heart of refugee crisis. The Guardian’s “6x9” allows the user to experience living isolated inside a US solitary confinement prison cell through VR headset. These are just the few examples out of different experiences that big publishers try to create today with the use of VR and AR. Such technologies allow publishers to shape storytelling immersive as never before.

An American journalist and a pioneer in VR content production, Nonny de la Pena, has collaborated with multiple publishers in creating meaningful documentaries using various technologies to change one’s perception on important issues. When presenting her TED talk, she underlined the ability of VR films to destroy the border between the viewer and the story. She believes, that with the benefits that VR storytelling brings, soon it will become a common and simple way to experience online media. (Peña 2015).

Not to mention, Augmented Reality is significantly more present in social media nowadays. Mobile games, such as Pokémon Go, and applications as Instagram and Snapchat allow users not only to experience AR but participate in creating the content themselves through AR filters and lenses. (Ward 2017).

2.6 VR and AR in the light of Gartner Hype Cycle

Gartner Hype Cycle is a tool for tracking emerging technologies and innovations that allows to forecast their evolution for the nearest future. It was made and is updated annually by one of the leading research and advisory companies in the world – Gartner Inc.

According to Linden and Fenn (2003), the benefit of this tool is that it not only measures the stage of innovative technology perfection from scientific sight, but also allows business planners to understand its level of adoption by audiences.

It is made in a form of a graphic, which serves as a great visual representation. The usage of this tool makes it easier to identify the value and place of the new technology as well as its stage of adoption among mass audience, its potential to grow further and make impact.

There are five main stages of a technology growth that are represented in a Gartner Hype Cycle:

1. Innovation trigger – the first stage of the cycle. It represents the concepts that are yet on a developing stage and might possibly turn into technological breakthroughs. At this stage, the technology mentioned is usually not familiar to the audience.
2. Peak of Inflated Expectations – the next stage of the cycle. At this phase technology is meant to reach some great amount of preliminary success quite quickly and grab the attention of the early technology adopters. The success reached is unstable yet.

3. Trough of Disillusionment – Third stage, at which the technology faces a lot of failure in implementations and needs some proven satisfaction from the early adopters and the potential for development to be invested in.
4. Slope of Enlightenment – the phase at which the technology becomes more understandable for the audience and the market is filled with newer and more reliable versions of the products with technology embedded.
5. Plateau of Productivity – the last stage. Represents the final and stable phase of the technological life cycle, when it is being satisfying enough even for the mass audience to adopt and promising in terms of return on investments.

Gartner Hype Cycle is mainly used for managing different operations with new, emerging technologies. With a help of it, is becomes easier for businesses to predict the risks and benefits for adopting or investing in a specific technology at a certain time, depending on one's goals. Analyzing the development of VR and AR in the light of Gartner Hype cycle over the last few years could give a better understanding of the technologies' potential in businesses.

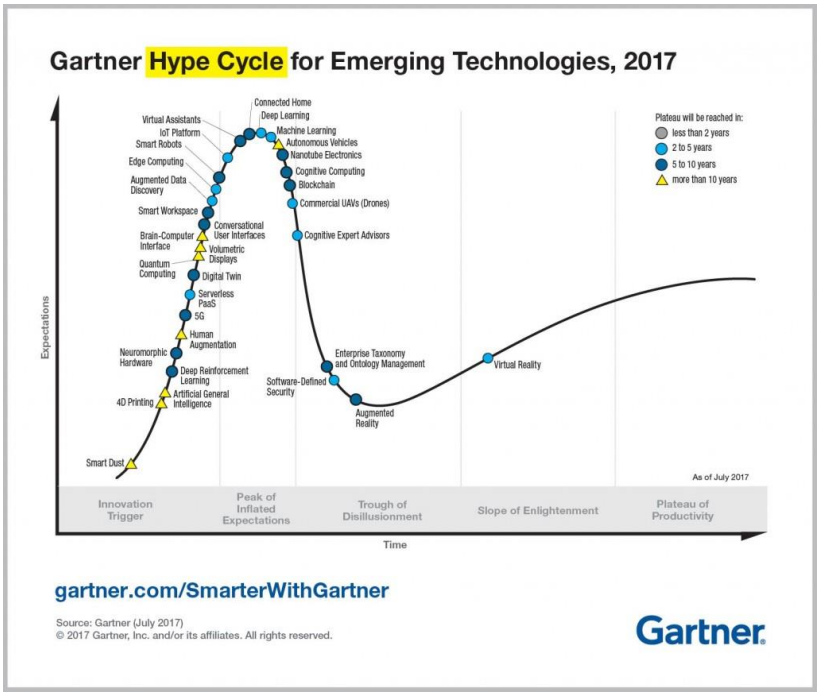


Figure 1. Gartner Hype Cycle for Emerging Technologies, 2017

The more detailed business-reflected description of the tool's stages was presented in "Understanding Gartner's Hype Cycles" report by Linden and Fenn (2003). To understand industry relations with VR and AR technologies in the light of this tool, it is crucial to get an insight in the last stages of Gartner Hype Cycle specifically, as VR and AR were going through them in the last couple of years. In "Sliding into the Trough of Disillusionment" stage, a technology first faces lack of interest from the audience due to some previous failures in implementation. This stage also refers to the development of innovative trials of the invention, with the goal to improve based on previous feedback. During "Trough of Disillusionment", it is crucial for the vendors to deliver their devices to the mass businesses in order to get to the next phase. (Ibid.)

"Climbing the slope of Enlightenment" then refers to the stage at which different businesses massively invest in the technology or adopt it, producing third-generation products with different additional tools. Technology is developing within the knowledge gained on previous experiences and is now more understandable in terms of its capabilities, advantages and risks. (ibid.)

In the Gartner Hype Cycle 2017 (Figure 1), Augmented Reality was in the stage named "Sliding into the Through of Disillusionment", while Virtual Reality was in "Climbing the Slope of Enlightenment" phase. At that time, Gartner Inc predicted that AR and VR technologies will be in use of 20% of large businesses around the globe already by 2020. It was claimed to be a perfect and easy-in-use tool that will enable delivering of the exceptionally personalized products, services and experiences to the consumers. This type of new content was predicted to vividly change the way people operate with each other and computers. (Forni 2017).

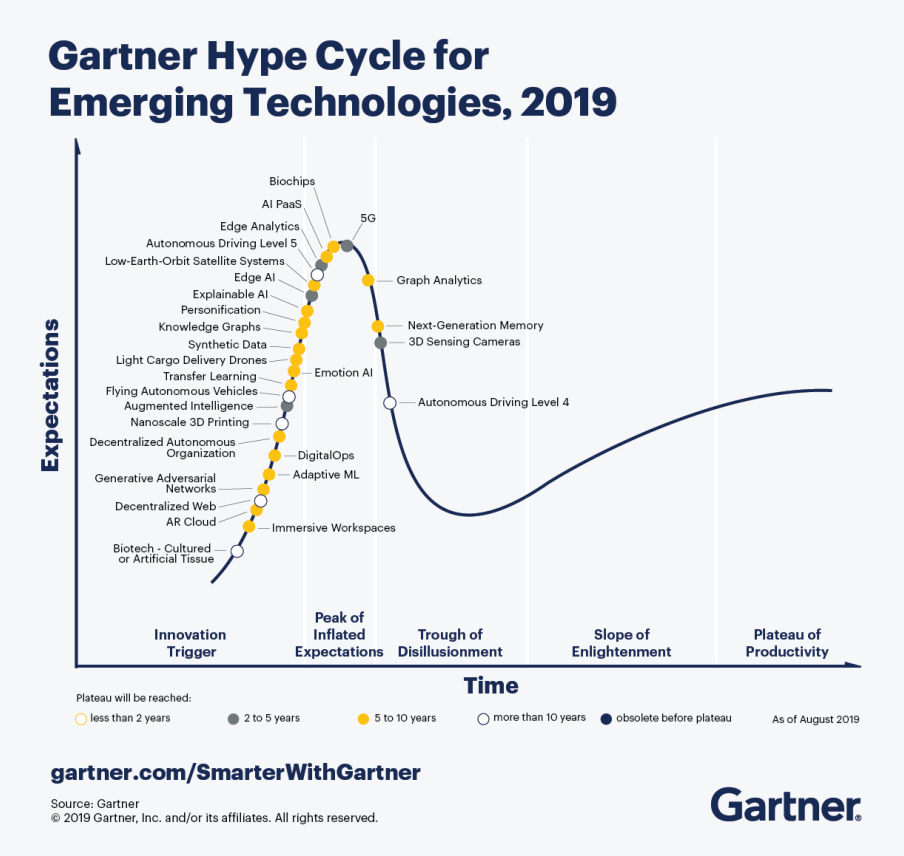


Figure 2. Gartner Hype Cycle for Emerging technologies, 2019

Now, in Gartner Hype Cycle 2019, AR and VR have been removed from the curve (Figure 2). This means that these technologies have moved passed the stage of emerging innovations and moved into mature state. In other words, they had already become usable and useful. According to Vitillo (2019), this change might refer more to the B2B market than to consumer market, in which VR and AR still have a long way to become as mainstream as smartphones, for example. However, Gartner Hype Cycle is a reliable tool and the disappearance of AR and VR from the graph only reflects how fast those technologies become adapted in both businesses and personal use.

2.7 Future of VR and AR

Having the past and present of VR technologies studied, the future of it is yet blurry. To become mainstream adopted, it requires to be developed to a point where

potential customers not only can see VR as a useful product for their purposes but also practically usable and easily utilizable in everyday life. There is a number of aspects in VR production that must be developed in order to bring new potential to the market and attract new customers. (Bradley 2019).

First aspect is comfort. Currently the physical appearance of VR headsets does not bring value to the product in terms of usability. People tend to be attracted by comfortable and easy-to-use solutions, especially if it concerns the entertaining or relaxing parts of their daily activities. Another aspect yet to be improved is resolution. When the technology states that it is able to transfer people from one world to another, users expect to be a part of a unique, high-quality experience. Third aspect is sense of presence. People should not only see a realistic environment around them but also feel that they are actually a part of it. "VR has the potential to be the most intuitive computing platform ever built," – stated by Devin Reimer, CEO over at Owlchemy Labs (creators of the breakout VR hit Job Simulator). Indeed, developers already bring new solutions for a better experience, including lighter headsets, multifunctional use of devices and higher adaptability to customer needs.

One of possible implications of VR was suggested to be an immersive movie experience. Instead of being a part of the audience, you would be a part of the movie. You would be the hero in your own story. (Bradley 2019). This kind of experiment would bring a new perspective to entertainment industry, where you can not only look at your favourite characters but also interact with them as if you were a part of their world.

In order to progress in media industry, VR producers need to shift the current trend in virtual simulation use. It is noticeable that 59% of VR utilization is concentrated in a gaming space. Education and training, however, are expected to come after game industry, holding 33% and 27% of growth respectively. (Rubin 2019). Thus, even though media business is not the most promising area of VR integration for the

upcoming future, developers are managing to find new creative solutions for VR/AR utilization in their both online and offline platforms.

Since the first launch of Oculus Rift in 2012, the progress has made a significant impact on characteristics of VR devices. For instance, the headset now is wireless, self-contained and almost 35% cheaper than in its first appearance on the market. (Metz 2019). However, the price is still the main conflict point that prevents device's entrance to the mass market of technologies. The parts of a headset that need to be reconsidered in order to adjust pricing are already determined. For instance, the cameras that are responsible for the tracking system behind the headset are rather inexpensive which can make the overall product less costly for potential users. Another issue that seems to be preventing people from using VR devices is lack of available content. The amount of possibilities that are shared with smartphones or gaming consoles exceeds the content created specifically for VR and AR. Some professionals believe that introduction of new applications and even industries where VR can be useful might boost the interest of the audience. (Metz 2019).

According to professionals in the field of VR, the implications of such technology in the future vary widely from medical innovations to journalism and social interactions. It is suggested that apart from engineering, education and medicine, VR will find its place in artistic industries including media, journalism and even filmmaking. *"VR has the capacity to let you embody another person or thing, to literally put you in their shoes, in a way none of our media has before. I think we're going to start seeing VR art pieces, films and games that really challenge audiences and make people think differently. That's one way of changing the world"* - Rob Morgan, game writer at GameStory UK. VR has a power of creating a human connection with other worlds, therefore, it may as well provide a space for establishing connection with each other. Documentary storytelling and news production can both be a relevant source of meaningful stories that in the future can become an actual content for VR.

In medical practices VR will become a part of innovations in narrow branches. For example, virtual space for people with disabilities that enables them experience full spectrum of regular activities by using VR headsets or some additional equipment. Moreover, VR will be highly relevant in research processes, such as medical examinations. Doctors might use the virtual copy of a person's body or organ and implement a virtual research on it in order to gather more information on the patient. (Metz 2019).

The future timeline of virtual reality development is based on multiple different aspects such as technological advances, economical fluctuations, global marketing efforts, customer behaviors, etc. Nevertheless, some of the changes can be predicted by projecting the pace of VR development from the past years into the world of future technologies.

In the nearest two to three years, AR and VR technologies are predicted to rapidly grow in quality due to upcoming technological advances that can be applied to them. The release of 5G connection in 2020 is expected to have a positive effect on the speed, quality and connectivity of virtual stimulation. (Metry 2018). The transition from a PC-based to a standalone mobile VR and AR devices will make the headsets more transportable and increase the usability of the technology (Diamandis 2019). The resolution of the VR devices is also expected to become higher at almost no cost increase due to the future use of lower-cost graphic cards which will positively affect the field of view and eye-tracking. This cut in costs is expected to allow system architects to introduce a higher quality visual into VR and AR devices (The three crucial VR headset developments you don't want to miss 2019). The better visuals will consequently lead to a better experience and a more natural communication.

According to Panetta (2019), by the year 2023 Artificial Intelligence technology will be able to track biometrics and detect consumer emotions. This will lead to better face recognition and emotional intelligence of AR and VR technologies and their applications.

Another development which is being discussed now is the creation of “mirror worlds” which will be highly based on the better understanding of surroundings by AR devices. This way the real-world elements can easily turn into simulated pieces. The prediction is that in the next 5 years the scanning accuracy of AR devices will rapidly improve to provide the alternative dimensions. (Diamandis 2019). This will ultimately bring the technology to a real-time 3D map of the existing world that will store and organize the information to be displayed through special devices. The “copy of the world” will change the perception of simulation technologies and introduce numerous possibilities for virtual communication (How the AR Cloud will transform immersive technology 2019). With such a progress in the quality of technology, within the next five years the upcoming VR devices are expected to boost VR growth on market and consequently decrease in production costs which will affect the prices of the headsets. Devices will become more affordable for users and bring a broader variety of possibilities for technology utilization. (Neiger 2016).

The size of the headset will also become less of a concern in the upcoming years. Ultra-thin headsets will start a new era for VR users allowing them to use the technology with less difficulties (Fingas 2018). The practical proof of that development was recently presented by Apple which filled a patent for a device that appears to be much more lightweight than any other AR or VR headsets previously produced by Microsoft and Oculus (Davies 2018). By 2026 the audience might be able to experience next step in VR and AR development which would be downsizing the headset equipment into a regular pair of sunglasses (Lopez 2016). Considering the size of the current VR devices available on market, adjustment of those to the customers’ needs is highly important and may bring new opportunities for VR use in the future.

Professionals in VR field suggest that the industries that will experience the application of simulated reality in the upcoming decade are also space exploration (Mahoney 2017), job recruitment, machine learning and cloud computing. As one of

the most influential developments, the VR industry is expected to reach an appearance of Universal protocols and frameworks which will present a collected unified platform for a more convenient use. The platform will bring a common standard for quality, user interfaces, and file formats of VR and AR. (Metry 2018).

2.8 Summary of Literature Review

This chapter provides an overview on the literature sources utilized in the data collection process.

New Media has opened a new chapter in content creation practices. Media developers produce online platforms where users can engage with the content, modify it or give a feedback on it. Recent studies identified that 65% of people are visual learners which illustrates the significant role that visuals carry on media platforms (Ferrell 2014). The new form of visuals that has been a topic of numerous studies and discussions in the scientific community is immersive technology. Starting its history in the 1950s, virtual reality has developed into an independent technology. Although immersive technologies such as VR are already proposing various use cases, they still aren't entrenched in online media. Augmented reality, in contrary, has become a field of study only in 1990s (Arth et al. 2015), however, it already has found its use on popular media and gaming platforms such as Snapchat, Instagram, Facebook, reaching a higher number of users interacting with the technology daily. 21th century has brought several significant innovations in the VR industry.

Despite of the fact that VR is yet to reach mass application in media channels, it already drives progress in different industries including retail, interior design, music and entertainment, news production, medicine, etc. The latest transformation of VR/AR as emerging technologies can be tracked by the evolution of Gartner Hype Cycle. Comparing the Cycles in 2019 and 2017, the changes in VR/AR development are visible – both technologies have shifted to the stage of maturity. This starts a new chapter in utilization of the technologies, bringing more prospects and

possibilities for their integration into New Media platforms. However, the maturity of simulated environments doesn't ensure highest quality of the technology. VR is still in need of major investments to make the technology accessible for a bigger audience. Some weaknesses that prevent VR from a transition into a mass market product are the quality of image, inconvenient physical appearance of the devices or pricing issues. More than that, limitations in the content produced for VR and AR devices results in the limitation of industries where technology can find its application. (Metz 2019). Those factors might significantly affect the speed and track of VR development in the future. However, specialists already predict the appearance of industry innovations, such as VR-AR merger and VR sunglasses, which might become available for users already in the upcoming decade.

3 Methodology

"Business and management research - an act of undertaking systematic research to find out things about business and management"

(Saunders, Lewis & Thornhill 2009)

This part concentrates on identifying the suitable for authors' objectives research approach, as well as stating the methods of data collection and analysis.

3.1 Research approach

This study is predicting the development of VR and AR technologies in New Media industry – it uses futuristic methodology. Futures research has a purpose of analyzing existing data and forming visions concerning a certain topic. It is helpful and crucial for efficient planning and determining the opportunities for businesses. In the modern world, where the change is fast and always present, foreseeing the possibilities plays a huge role in strategy and decision-making. (Glenn 1994, 10).

Generally, there are two different types of approaches that can be applied to research: deductive and inductive. According to Easterby-Smith, Thorpe and Jackson (2008), it is important to define an approach for the research, because it helps the researcher to recognize strategies and methods that will suit the study best. Deductive research implies stating a specific theory prior to conducting the research and then testing it within data collection evaluation, while inductive refers to the development of a theory from a raw data collected. The Inductive research should be used when the goal of research is to organize raw data, find the linkage between research questions and findings and create a theory based on these evaluations. (Thomas 2006).

Since this study aims at creating a futures theory based on findings, an inductive approach is applied, as the most suitable one for a futures research, which main aim is to make predictions and theories on a certain issue. Inductive approach is usually meant to be followed by a qualitative analysis. Qualitative research, according to Boodhoo and Purmessur (2009), is an exploratory research which integral parts are collection, analysis and interpretation of data while observing human behavior. Speaking of quantitative research, it is primarily based on the collection, analysis and interpretation of patterns that occur while observing figures and numerical data. In this study, qualitative research has potential to give authors more reliable data and variety of opinions due to the futuristic approach of the study and potential difficulties in numerical evaluation.

3.2 Data collection

Based on the research approach and specificity of the topic, the research was defined as qualitative. Thus, as a main source of primary information the authors used qualitative methods for obtaining data. Since the goal of the research is to predict VR and AR development in the New Media industries, with the aim of obtaining a holistic and comprehensive data, authors have chosen triangulation method of data collection. According to Denzin (1978), *"Triangulation is the*

combination of methodologies in the study of the same phenomenon". Triangulation is known to bring more comprehensive and reliable data, that leads to better understanding of the studied phenomenon. Using two data collection procedures is meant to eliminate the weaknesses of using only one procedure and enhance the strength of the results of the study. (Bekhet, Zauszniewski 2012, 3). Authors have chosen interviews as well as focus groups as the data collection methods since they provide an opportunity for gathering primary data from different perspectives and in different circumstances.

The main goals of interviews are to gain some detailed data from individuals in order to obtain a deeper understanding of a phenomena, to investigate different related views and beliefs (Gill, Stewart, Treasure & Chadwick 2008). There are three types of interviews – structured, semi-structured and unstructured. To this research authors decided to apply semi-structured interviews. This method is often used for qualitative data collection, as a core source for information, as it is beneficial in terms of delving deeper into the topic discussed due to its conversational nature. Semi-structured interviews are usually to be assigned in advance, at a certain date and location. They imply a prepared set of open-ended questions, that will lead to creation of the conversation between researcher and interviewee on the stated topic. (DiCicco-Bloom, Crabtree 2006). The aim of this research is to get insight on the issue from the perspective of professionals in the field of VR/AR and media. Authors use semi-structured interviews to gain a competent view on the problem, and to verify that the data will be comprehensive enough.

The main purpose of focus groups is to collect a diverse perception on the phenomena and identify core ideas that lie behind it. They are organized as a group discussion on the topic related to research. (Gill et al. 2008.) One of the main advantages of focus group interviews is that they imply a dynamic interaction between the participants. This contributes to emergence of deeper and more diverse data, giving a range of opinions on a certain issue. The respondents in the focus

groups should not be acquainted, though be likely to engage in a discussion. Respondents usually share the same demographic characteristics. The appropriate number of participants is usually six to ten respondents (Rabiee 2004, 656). Authors have decided to conduct two focus group interviews among potential VR and AR content consumers, to gain insight for the third research question. It brings versatile data from a little larger sample of respondents, as well as gives a new perspective on the studied phenomena – from a non-professional, customer point of view.

3.3 Data analysis

Qualitative data is often large and complex, and the outcomes of qualitative study are drawn from words and interpretations, rather than from standardized numbers. Proper qualitative data analysis requires a lot of thoughtful and attentive exploration (Saunders, Lewis & Thornhill 2009).

Miles, Huberman and Saldana (2014) introduced the method of analyzing raw qualitative data. It consists of three steps: data reduction, data display and drawing conclusions. Data reduction refers to the processes of simplifying the collected data, with the aim of summarizing the information. The data is being condensed with the use of one of the appropriate methods – for instance, categorizing data. The next step, data display, is referred to organizing and presenting the data. The goal is to identify key trends and patterns and recognize the relationships between them. This is crucial for implementation of last step, which is drawing conclusions – finding the answers to research questions through critical examination of the results. While the above explanation holds rather a general description of data analysis, it is important to identify the specific method of analysis and the sequence of actions within the analysis.

There is a wide variety of data analysis techniques that can be applied in a qualitative research depending on the nature of data, form of data, research design and research questions. Evaluating the data sources and purpose of the research, the

authors have selected the constant comparison method for semi-structured interviews analysis. This method is generally used when the researcher wants to utilize the whole dataset in order to identify underlying themes presented through the collected data. (Leech, Onwuegbuzie 2007). Within this method the researchers read through the entire dataset, identifying the main patterns. After that, the data is sorted into smaller meaningful parts, where each part is "coded" with a relevant keyword. Each keyword represents the main focus of the piece of information. After the whole information is "coded", similar keywords are grouped and formed into categories which will consequently provide an overview on the results of the data collection from different perspectives (Leech, Onwuegbuzie 2007).

This category construction method is based on *analytical coding* – *"*coding that comes from interpretation and reflection on meaning" (Richards 2014). The goal of the process is to create categories that capture recurring patterns that cut across the whole dataset. Once the categories are identified, the pieces of evidence from the primary data need to be sorted and distributed among the categories. This data analysis method is highly inductive since it leads authors from the analysis of detailed bits of data to their merger into sub-topics and final category construction. (Merriam 2016).

Constant comparison analysis can be applied to focus group analysis as well. However, there are some differences in approaching focus groups contrary to semi-structured interviews that need to be considered. Firstly, when analyzing focus groups the group dynamics need to be investigated alongside the discussion. Focus groups transcripts, that perform as the main source of data during the analysis, need to contain all descriptions of the process, such as impressions, interactions, emphasis etc. These descriptions are to be captured by authors already during the interview conduction. As the dynamic interactions between participants is one of the main advantages of the focus group interviews, they all need to be captured. Otherwise, simple responses might be misleading and true meaning of the words will not be

revealed. (Morrison-Beedy, Cøteé-Arsenault & Fischbeck Feinstein 2001). Then, constant comparison analysis is to be performed as described above, however, authors add one more stage to the process. In this research, both focus groups interviews are first analyzed separately, because they have different group dynamics and interactions. Later, when data is coded, authors need to compare the results and access if themes that emerged from one focus group also emerged from the other. Those themes that overlap are to be formed into final categories. That way, the benefit that constant comparison analysis brings is allowing researchers to access data saturation across groups by continuous comparison on different levels (Onwuegbuzie, Houston, Dickinson, Leech & Zoran 2009).

3.4 Plan for research and result quality

To eliminate flaws in the data credibility of this qualitative study, researchers are responsible for data gathering, data processing and interpretation to be justified at every stage and supported with relevant explanations.

Quality

To prove the quality of methodology chosen for the research, it is reasonable to begin with the fact that the study is based on a triangulation method of data gathering. Triangulation method of data collection ensures the reliability of results and gives the research a broader set of perspectives. It helps to obtain a more holistic view on the studies phenomenon and enrich an understanding of the issue by bringing a combination of different perspectives on the same topic. (Jick 1979, 603-604).

What is more, investigator triangulation is applied to the research. This term implies the use of different data observers and interviewers. In this study, two authors are working on the process of obtaining and processing data. Such approach contributes to eliminating subjective views and observations of an individual, as it is viewed from two different individuals. (Flick, Kardorff, Steinke 2004, 179).

Aside from that, in qualitative research verification of results is highly related to processes of ensuring the validity and reliability of the used sources in the early stages of research conduction. Interview is commonly understood as an interaction between two or more people, therefore interviews considered to be a subjective form of data obtaining that highly depends on the personal, social and professional characteristics of an individual participating in the process.

For the research the authors have chosen a non-probability sampling method. The choice is justified by the fact of the limited number of professionals related to the immersive technology industry, therefore the decision-making was based on their interest in the topic, professional background and current involvement in the visual technologies development. As sub-types of a sampling method the authors have chosen a combination of a purposive and snowball sampling techniques. The candidates for the interview were selected basing on specific characteristics valuable for the research (purposive), while some of the interviewees later provided the authors with a connection to other possible candidates for further interviews (snowball). The researchers ensured the reliability of the gathered data by primarily setting specific requirements for the interviewees, concerning their professional status and background related to the topic of the research. Participants of the interviews have major experience in either digital media field or VR/AR technology development, or both. The authors ensure that every interviewee has a deep understanding of the processes covered in the study (from their educational or professional background) and has a personal insight of the technologies the researchers were aiming to study.

The participants of a focus group interview are normally determined and selected on the criteria that suits the needs of the research so that they would have a valuable opinion on the presented topic. Participants may usually age-range, have similar social, demographic or other type of characteristics. This approach to selection of the interviewees is related to a concept of "applicability". As a result, the data generated

in the social interaction within focus group interview is often deeper than the findings of a regular interview of an individual. (Rabiee 2004, 656).

In this research the selection of suitable participants was based on the specific age range and their personal interest on upcoming integration of interactive technologies and New Media platforms. The internationality of the chosen group might lead to the richer data gathering results due to the cultural differences in the perception of the discussed innovations and their possible applications in the future. Age range of the respondents varies between the limits of 18 to 25. All respondents are current students. Each group consisted of 7 participants. Both focus groups were formed in a way of a complete diversity. The reason for setting similar groups in terms of diversity level (no more than one presenter of each country) was to ensure the truthfulness of the initial results and check the relevance of those results in a different group of participants.

Ethics

Researchers must ensure that the study is ethically adequate and follows the norms of data collection. Three questions most frequently raised in ethical guidelines of a qualitative research deal with codes and consent, confidentiality and trust (Silverman 2016, 32).

Codes and consent element is based on the right of research subjects (in this case – interviewees and focus group participants) to be informed about the fact of being researched, the nature of the research and their right to withdraw at any time. (Silverman 2016, 32). Prior to each conducted interview the authors had provided a written and oral introduction to the topic of the study and asked for permission to record the interview. Moreover, the interviewees were informed about the future transcription of the tape and possible citation of the participants in the final work. Therefore, the researchers ensured that interviewees and focus group participants were fully aware of the circumstances of the conducted research.

Confidentiality aspect obliges researchers to protect the identity of the participants and location of the research (ibid). In order to ensure anonymity of the interviewees, the authors do not provide their direct identifications in the final work. Instead they have created individual descriptions that highlight the occupation of the participants, major accomplishments and relevancy of their professional background to the research topic, as well as the duration of each discussion.

Trust element is a significant part of interview collection process. It sets a suitable field for a discussion without personal misunderstandings that might occur between the researcher and the research subject and disrupt the information flow (ibid.). The authors of the thesis have no prior relation to the interviewed professionals which can ensure the equal involvement of the participants in the research. No prioritizing of opinions was carried neither in the discussion, nor in the results interpretation process.

Semi-structured interview allows a conversation with natural discussion which may bring various results from every interview. Being allowed to change questions and their order depending on the interviewee's background and topic reflection result in a unique set of outcomes. This brings a valuable information for the research as well as differences in the focus of the interviews.

3.5 Technology roadmapping

Futures research demands a method for technological development predictions. Authors have decided to use a tool commonly used for future foresight purposes – emerging technology Roadmap. Technology Roadmaps are widely adopted among businesses as a flexible and comprehensive tool for planning innovations. They represent a technique that supports technology planning for studying the dynamic linkages between the existing resources, objectives of a specific company (in this case – industry) and the continuously changing environment. There are many forms of roadmaps, so it is relatively easy to adapt the tool to the specific industry and

context, to develop an effective business process. (Phaal, Farrukh & Robert 2001, 10).

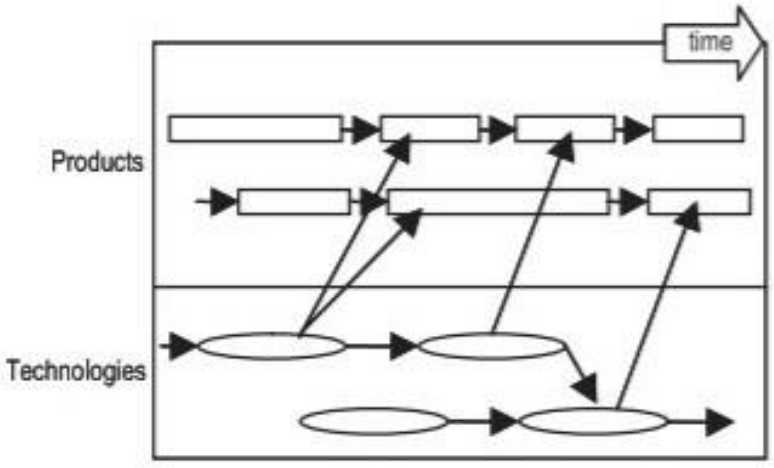


Figure 3. Example of a Technology Roadmap framework

Roadmapping sets a specific time period that is aimed to be explored and presented as a possible scenario for future changes based on the justifying factors. One of the main benefits of this technique is the possibility to bring numerous perspectives on the evolution of a specific technology into one visual diagram (Phaal 2015, 2). This way the inputs from every driving factor are clear and easy to control on different stages of development (Figure 3).

The classification of a technology roadmaps suggested by Phaal, Farrukh, and Robert (2001, 11) is based on evaluation of approximately 40 existing roadmaps. This process revealed 16 potential categories of roadmaps: 8 by purpose of the tool and 8 by its format.

The types of technology roadmaps basing on the purpose of the study are *product planning, service/capability planning, strategic planning, long-range planning, knowledge asset planning, program planning, process planning and integration planning.* The classification by format includes types such as *multiple layers, bars, tables, graphs, pictorial representation, flow charts, single layer, text.*

The wide range of roadmaps categories though is partially attributed to a lack of accepted standards of roadmap construction. Therefore, it is possible that depending on the business purposes, sources of data and potential uses of the tool, the roadmap will not fit perfectly in one of the presented categories but rather will contain elements of more than one type, resulting in a new form, which was not described earlier in the classification. (Phaal, Farrukh & Robert 2001, 15). Taking into consideration the purpose of the research - to indicate the development of VR/AR technologies in the industry of New Media and, therefore, study of three different perspectives on the subject (technology, product, industry) and their influence on each other - the researchers decided to develop a roadmap which can be considered as a hybrid form of various roadmap purposes, done in the multiple layer format. This approach brings a new perspective to the presented subject and is in alignment with the innovativeness of the technology.

Technology roadmap is commonly presented as a diagram of “interconnected nodes” (Glenn, Gordon 2003). As for the process of the roadmap creation, it starts with identifying the nodes - milestones on the roadmap - based on the gathered data. In case of qualitative data, which is applicable to this research, nodes are subjectively defined based on experts’ opinion. Then, authors are to determine the linkages between the nodes, showing the relationships between them. Those links should represent the vectors of nodes revolution: show suggested time for this evolution to happen; determine the sequence of changes; or even mark judgments about the probability of a certain evolution to happen (ibid.).

4 Results

4.1 Process

The following chapter presents the findings obtained during the interviews and focus group discussions, as well as the secondary data review which took place in the beginning of the research.

In order to have comparable results, authors have followed a certain structure of three main parts of the interview. The first part was aimed to introduce the topic to the interviewee, familiarize him/her with the potential research outcomes and find out about their insights on the topic relevance in these days. The second part mainly focused on the scenario of future development of the discussed technologies and their potential of being integrated in the digital media. The last part of the interview included questions concerning the business area and the way this integration may influence general activities within media companies. Specific questions that were used in the interview are attached to this study in the Appendix. The research method was chosen to be a semi-structured interview; thus, the authors have set general themes for each part of the discussion. However, each interview has shaped the researchers' understanding of the topic in a new way basing on the unique experience each interviewee possessed. Therefore, the authors managed to be developing approach to the topic with every other interview to make it more relevant and academically valuable.

The interviewees were chosen based on their professional background related to the study field. The following list will give a deeper understanding on the specific areas each interviewee was proficient in (Table 1).

Interviewed field professionals (codes)	**Area of specialization**	**Position and background**	**Length of the interview (h)**
Interviewee 1 **IT Lecturer**	Information Technologies, game development	Principal lecturer in IT department; former application developer in the gaming field; Ph.D. in Computer	1:06

		Science and Information Systems	
Interviewee 2 **Digital service design manger**	Digitalization and innovations, Media industry	Service manager in digitalization and innovations; former digital transformation manager; MSc in Graphic Arts Technology; degree in Media Technology	1:14
Interviewee 3 **Expert in digitalization and customer experience**	Digitalization and customer experience	Entrepreneur; expert in business digitalization and customer experience; MSc in Economica and Computer Science	0:38
Interviewee 4 **Gaming zone specialist**	VR gaming	Co-founder of a VR gaming zone; VR zone specialist; Bachelor in Logistics Engineering, current student of	0:44

		Business Information technology	
Interviewee 5 Expert in e-learning environments	Digital technologies, e-learning	Senior lecturer in the field of digital technologies; specialist in e-learning environments	1:07

Table 1. Background of the interviewees

As mentioned in the Methodology part, authors followed a constant comparison analysis method for analyzing personal interviews. The process of breaking down data was started by transcribing the interviews and re-reading them. Then, authors capsulized certain citations with the most meaningful and relevant information for the research questions. These citations were extracted from transcripts to the excel sheet and marked with codes of interviewees (Figure 4).

Interviewees	Codes	Citations
I1		it is developing fast and it's promising.
I1		I think it was during slush: I could already remotely participate the slush event. It is a very promising industry.
I2		I haven't seen AR or VR technologies in Media.
I2		younger generations are seeking for new experiences
I2		I think that today people are reading less and they are listening more to the books. And maybe in that area too, It could mean you can experience the book.
I3		quite expensive technologies
I3		they could visualize travel destinations
I3		with AR you are able to make targeted advertising
I4		I am not sure of what exactly will happen later, but I think there is a maximum of these technologies that human can reach, but within ten or more years people will probably reach it.
I4		VR and AR can be aternative for people who don't have possibility for traveling
I5		most of the people they really don't understand what augmented reality is; we have quite a lot augmented reality in all environments but people don't realize that there is such
I5		big business is already using augmented reality for commercial purposes
I5		target group is absolutely youngsters people under 25 or under 30 years old so that's why there is possibilities to create content which are more entertainment

Figure 4. Extract from personal interviews constant comparison analysis, stage 1

This was followed by coding the citations. Authors compared all citations with the aim of finding ones with similar meaning: searched for similar words and identified

relations between the citations. Those citations with similar meanings were labelled with the same codes. Codes were emerged from the data in a form of short and descriptive phrases (Figure 5).

Interviewees	Codes	Citations
I1	Quick development	it is developing fast and it's promising.
I1	VR in Events	I think it was during slush: I could already remotely participate the slush event. It is a very promising industry.
I2	Lack of awareness about AR and Vr	I haven't seen AR or VR technologies in Media.
I2	Younger people adapt easier	younger generations are seeking for new experiences
I2	Books in VR	I think that today people are reading less and they are listening more to the books. And maybe in that area too, It could mean you can experience the book.
I3	Too expensive	quite expensive technologies
I3	VR and AR for travelling	they could visualize travel destinations
I3	AR in advertising	with AR you are able to make targeted advertising
I4	Quick development	I am not sure of what exactly will happen later, but I think there is a maximum of these technologies that human can reach, but within ten or more years people will probably reach it.
I4	VR and AR for travelling	VR and AR can be aternative for people who don't have possibility for traveling
I5	Lack of awareness about AR	most of the people they really don't understand what augmented reality is; we have quite a lot augmented reality in all environments but people don't realize that there is such
I5	AR in advertising	big business is already using augmented reality for commercial purposes
I5	Younger people adapt easier	target group is absolutely youngsters people under 25 or under 30 years old so that's why there is possibilities to create content which are more entertainment

Figure 5. Extract from personal interviews constant comparison analysis, stage 2

When the whole data has been coded, authors compared the codes to find similar patterns. Codes of the similar themes were then marked with same color (Figure 6) and the whole data was categorized in 5 groups: G1 (suggested technologies), G2 (potential threats); G3 (timeline), G4 (demographic factors); G4 (business perspective).

Interviewees	Codes	Citations
I1	Quick development	it is developing fast and it's promising.
I1	VR in Events	I think it was during slush: I could already remotely participate the slush event. It is a very promising industry.
I2	Lack of awareness about AR and Vr	I haven't seen AR or VR technologies in Media.
I2	Younger people adapt easier	younger generations are seeking for new experiences
I2	Books in VR	I think that today people are reading less and they are listening more to the books. And maybe in that area too, It could mean you can experience the book.
I3	Too expensive	quite expensive technologies
I3	VR and AR for travelling	they could visualize travel destinations
I3	AR in advertising	with AR you are able to make targeted advertising
I4	Quick development	these technologies that human can reach, but within ten or more years people
I4	VR and AR for travelling	VR and AR can be aternative for people who don't have possibility for traveling
I5	Lack of awareness about AR	most of the people they really don't understand what augmented reality is; we have quite a lot augmented reality in all environments but people don't realize that there is such
I5	AR in advertising	big business is already using augmented reality for commercial purposes
I5	Younger people adapt easier	target group is absolutely youngsters people under 25 or under 30 years old so that's why there is possibilities to create content which are more entertainment

Figure 6. Extract from personal interviews constant comparison analysis, stage 3

This way, 5 main relevant themes were defined from the interviews. All topics are meaningful in terms of answering research questions and approaching the research problem from different angles. Specific findings are presented later in this part, sorted by categories.

The analysis of the focus group interviews was following the same techniques as the analysis of expert interviews with minor changes. The background of the participants was not considered as a relevant characteristic for choosing the composition of the groups since they did not hold any professional background or expert insights in the relation to the topic. The main goal of focus group interviews was to gain an unbiased customer perspective on the issue. Therefore, the authors did not analyze the opinions of the participants separately, but rather as a dynamic group.

The process began with transcribing the interviews. It was important to capture noticeable interaction patterns that occurred in the discussion. Thus, authors not only transcribed the responses but also non-verbal communication dynamics amongst the participants (Figure 7).

Exact Quote	Additional interactions	Complete Transcript
R2: Maybe VR in sports? If you missed ticket sales for the football match and you still want to watch it you can do it in VR. That'd be cool.	R2 smiling. Other respondents agree with the answer.	*(thinking)* "Maybe VR in sports?" *(smiling)* "If you missed ticket sales for the football match and you still want to watch it you can do it in VR. That'd be cool." [she looks like she had just come up with the idea for the first time, had not seen this before] *(other respondents agree)* [everyone seem to share the awe of proposed solution]
R1: Yeah, I think people already do it.	R1 nodding head.	"Yeah, I think people already do it." *(nodding head)* [he remembered seeing the solution somewhere before]
R4: I think for the concert for example, you need to be there, to feel the atmosphere.	R4 disagreeing, a slightly hesitant tone.	"I think for the concert for example, you need to be there, to feel the atmosphere." *(slightly hesitant)* [she seemed to reconsider her opinion, not sure about changing it when others are on the opposite side]
R1: But you see, with VR you are there.	R1 emphasizing "are".	"But you see, with VR you are there." *(emphasizing "are")* [disagreeing]

Figure 7. Extract from the focus groups transcription

This was followed by constant comparison analysis, alike the personal interviews. At first both focus groups were analyzed separately. Codes that emerged from each group were then compared across groups. Analyzing patterns between those codes that overlapped, authors have identified two main categories, sorted and colored codes accordingly (Figure 8): C1 (appealing factors) and C2 (repulsive factors).

Group 1 codes	Group 1 citations	Group 2 codes	Group 2 citations
VR and AR is not widely adopted among consumers	"VR and AR technologies are kinda weird honestly." (hesitating) (other respondents agree)	VR in Concerts	"Yeah and some people might not be able to go, cause they are handicapped or the tickets are too expensive or whatever. It's an option." [discussing VR in events]
VR in Sports	(thinking) "Maybe VR in sports?" (smiling) "If you missed ticket sales for the football match and you still want to watch it you can do it in VR. That'd be cool." [she looks like she had just come up with the idea for the first time, had not seen this before] (other respondents agree) [everyone seem to share the awe of proposed solution]	Lack of awarness of VR	(thinking) "I think I am so unsure about VR cause of lack of opportunity to try it in different cases before byuing it." [seems like she has just discovered that reason for her own]
Raising awareness about VR and AR	"I think if celebrities promote VR and Ar people will just follow them" (laughing)	No use for VR in news	But I think it might also become too much. When I'm watching a video I don' necessarily always want to be there. [discussing VR and AR in news and media]
Immervion enhances experience	"Sometimes you want to get out of reality and get the full experience" (smiles)	VR and AR is not widely adopted among consumers	"You have to get used to it" [to using such cutting-edge technologies daily]

Figure 8. Extract from the focus groups constant comparison analysis

These categories represent topics that were found to be the most relevant to customer perception. Specific findings are presented below.

4.2 Suggested applications of VR and AR technologies.

After the data analysis process, the authors have identified patterns in the technologies and possible VR applications suggested by the business professionals. In order to visualize the outcome of the analysis, the word cloud has been created (Figure 9).

Figure 9. Word cloud: fields of potential application of VR/AR

The purpose of the word cloud is to summarize the main ideas related to the future VR and AR utilization purposes mentioned during the interviews. The bigger is the

font of the word, the more frequently it came up during the interviews. Therefore, it illustrates which ideas were more common for the experts and which ones were mentioned more rarely.

During the process of data collection, the interviewees shared their own thoughts and ideas about possible implementations of VR and AR in the future media. They stated that VR might bring the opportunity to "travel" around the world virtually ("I think people will have these technologies on the phone and use them to reach places they cannot do in reality" - Int.4). Respondents described such advantage as the opportunity to be present in different places all over the world without necessity of actual travelling ("people cannot travel anymore, it's so expensive, it's so difficult, it's dangerous. There are many reasons why you would like to participate virtually in some events" - Int.1). Another point was that in the future humans will be able to meet virtually in a real-time frame (" telepresence meaning that the people who are not in this facility of this restaurant they can come here as the real person" - Int.5). The experts also mentioned that VR and AR will let people consume pieces of art the way they were never able to consume them before ("you will be able to consume modern movies in virtual reality, like you are inside the movie", "all kind of music could be a new kind of experience, when you are inside the music or in the painting" - Int.5). Another technology discussed was AR and VR glasses in a size of normal glass lenses, which would make the usage of those a part of people's everyday life ("when I look at you with these glasses I would know your name and all the information you want to share with me or other people; just by looking at your face because there will be a face recognition" - Int.5).

Collected data shows that experts see a lot of benefits that VR and AR technologies can bring to different operations. The potential benefit of the technology in media industry, specifically immersive storytelling, was also underlined by many interviewees ("I am interested in a certain show or program, VR would be a great opportunity to be a part of the audience, feel more than just sitting on my sofa at

home" - Int.2; "another thing is easy-to-visualize information and maybe immersive stories told by different media sources" - Int.5).

4.3 Potential threats

Through the data collected authors identified the main threats that can influence the process of the adoption of VR and AR technologies within New Media industry. Respondents shared the examples that included the issues related to complicated process of producing VR and AR content ("any VR or AR content takes time currently and it takes very special knowledge" - Int.1). Interviewees also mentioned the problems that are related to utilization of VR and AR devices ("you can't walk around with heavy devices; you need to have very light specs with lenses" - Int.5).

Social obstacles are some of the major threats that development of VR and AR may face in the nearest future. Feeling of insecurity ("there are people that are little bit frightened in the beginning" - Int.1), lack of experience ("people need the opportunity to use them for example to make it more popular" - Int.3), lack of motivation ("I do not see myself to immerse in them, it would of course have a huge impact on my feelings, but I do not see the point why should I spend my time to feel that" - Int.2) can cause a resistance of the potential audience towards the novel technologies.

Additional pattern that was withdrawn from the data collected is a general opinion on the very high costs of both production and proper usage of VR and AR technologies today ("these are quite expensive technologies at the moment" - Int.3); ("the most advanced devices are pretty expensive" - Int.4). The interviewees stated that the only way to justify the high price would be an equally high quality of the experience ("people are ready to pay for high quality entertainment" - Int.4).

4.4 Timeline

One of the main goals of the presented research was to predict a development of VR and AR integration in media for the upcoming 10 years. Thus, timeline was discussed with the respondents as well.

The shorter period of 5 years was discussed in order to visualize the intermediate phase of such development. According to the interviewees, in the upcoming years the main attention should be focused on marketing activity and content development ("In the nearest future, as you said from two to five years, probably it will need more marketing" - Int.3). The opportunities for potential customers to try the technologies before buying them are currently very limited. Therefore, next 5 years will bring more platforms for actual interaction with novel VR devices for people to get accustomed, before VR and AR become mainstream. ("to see how people react to it and maybe after that probably will be developing rapidly" - Int.3). The pricing issue will remain as one of the major obstacles for the increase of purchases in the nearest years ("In two or three years maybe not all our businesses we'll be able to afford yet" - Int.3), but in over 5 years technologies are expected to become more affordable.

All respondents noticed that 10 years is relatively a long period of time, through which technology can develop and change entirely ("10 years is a long time in technology "; "in ten years it will be completely different" - Int.5). However, even predicting that technologies will be present in a totally different form, interviewees still anticipate that the pace of this development will be substantial ("through 10 years VR and AR will develop steady" - Int.4). The results also indicate that all the interviewees believe AR and VR technologies will be a part of routine both in the individual users and businesses by 2029 ("even in 10 years it will probably be a part of professional, learning and everyday life"; "in 10 years there will be a lot of different kind of applications and people will be using them daily" - Int.1; "in 10 years all businesses will use it" - Int.4).

4.5 Influence of demographics

The primary data shows that demographical factors are influencing the process of adoption of AR and VR technologies among individuals. Some respondents underlined the tendency of young generation being more open to such new technologies ("younger generations, on the other side, are always searching for new experiences" - Int.2; "people, who are less than 30 years old, they know better, they have bigger digital user experience" - Int.1). Older people, on the other hand, tend to face difficulties at least at their first interactions with VR and AR ("my wife was not very enthusiastic at all in the beginning"; "I put this equipment (VR glasses) in teachers' coffee room...people that are little bit frightened in the beginning " - Int.1). The generation gap in this sense may significantly influence the process of technology adoption among different age groups.

4.6 Business perspective

Overall the interviewees agreed that upcoming VR technologies will be a beneficial service for the businesses that will integrate it into their online content ("for entertainment and animation industry it might be beneficial in terms of providing deeper and more engaging experiences" - Int.2).

In the nearest future, the high level of competition will remain mostly among major media companies due to the limited opportunities that smaller businesses possess ("In two or three years maybe not all our businesses will be able to afford it yet; some medias will, and they are still competing with each other so when one does and does it successfully then others have to follow" - Int.1). According to the findings, the biggest media sources will start introducing VR and AR in their content, slowly making it mainstream. The other trend that was mentioned a lot concerning production of VR and AR content was consumer production and first-hand participation ("consumers will be able to produce AR and VR content, like blogging today" - Int.2)

In the industry of New Media, several fields of potential application were mentioned repetitively by interviewees: journalism and storytelling ("immersing stories told by different media sources" -Int.5); news ("AR or VR could make the news richer, it would have an impact on audience's feelings"- Int.2); entertainment shows and movies ("show program with which I could use you utilize VR, that could be appealing" - Int.2); and live events streaming. Concerning the marketing in New Media, the interviewees believe that with utilization of VR and AR targeted advertising will reach a new level ("with AR you are able to make targeted advertising; you will need to see some kind of ad, or there could be this micro transaction if you want to know more" - Int.3). Aside from that, even though the research topic was mainly focused on the applications of technologies in the field of New Media, the process of primary data gathering determined the following. Many professionals believe VR and AR have great potential in the fields that are not directly related to the area of the research. The industries mentioned include but are not limited to construction, engineering, health care etc.

4.7 Assumptions about customer attitude

In order to identify the patterns in customers' views on the upcoming changes in media technologies, the researchers conducted two focus group interviews. The groups consisted of participants with different cultural and user backgrounds which gave the researchers a more versatile collection of data. Based on the discussions results, authors were able to identify two perspectives that represent overall customer expectations: appealing factors and repulsing factors.

Appealing factors.

This category explains issues that potential customers discussed as positive and promising in terms of audience relationships with VR and AR now and in the future.

To begin with, participants mentioned that in the last years the presence of AR and VR has started to become more visible in the daily life of audience, especially

because of the virality of some fascinating apps that are basing their technology on augmented reality principles. For instance, Instagram and Snapchat filters, Face App editing options, etc. ("I think everybody uses that social media with AR it nowadays").

The data shows that some fields of technologies application seemed to be more appealing than others for the focus group participants. For example, music and entertainment business were named as the most interesting one in terms of simulation content. Potential users are attracted to an environment where creativity, innovation, imagination and even artistic approach can come together and inspire people to go over their daily limits ("When you want to enjoy the music and you want to get rid of the outside environment – you just wear those headphones and the glasses and just be there for a full experience"). When expressing their opinions, participants referred to the existing practices of live events experiences through VR devices. For example, NextVR is a pioneer in delivering both live and recorded virtual reality experiences, such as NBA games or Live Nation concerts (Picture 6). Fashion industry was also named as one that raises interest. For example, the application of AR in online shopping ("you can put the image of your face on the model and try on different clothes online seeing if they match").

Generally, audiences seemed curious and intrigued by VR and AR. However, it can't be stated that they are already familiar with technologies. The appearance of VR and AR in the eyes of focus group participants is still a little bit intimidating, and the next category presents related findings in detail.

Picture 6. Golden State Warriors NBA Championship Ring Ceremony and Opening Night Game against New Orleans Pelicans to be available to fans through VR

Repulsive factors.

This category, on the contrary, overviews issues that can somehow distance potential customers from the usage of VR and AR. Focus group discussion shows that nowadays simulation technologies are associated mainly with high-end technologies and not with everyday routine of potential audience. Therefore, the understanding of potential VR or AR implementation is still blurry for most of the society ("the lack of opportunity to try the technologies on the regular basis is a very important point for me because I don't really know how to use it and how I can implement it in my life").

The other concern that interviewees stated is the importance of outstanding performance of VR devices. Currently there is a significant number of diverse tools for VR and AR usage, however, only few of them provide an explicitly high-quality service. The participants stated that "bad experience is worse than no experience". The lack of quality can lead to wrong perception of the product which may build a negative image of the service and the technology itself ("the quality can be so bad and blurry; it's still a good experience but also bad comparing to real life"). Within

the media industry, the users experience is a vital aspect that must be taken into consideration and adjusted to the expectations in order to ensure the successful assimilation of the product.

5 Discussion

This part of the research concentrates on underlying the initial purpose of the study, followed by an overview of results analysis regarding the research questions. It provides the outcomes of primary data collection evaluated in the light of secondary data, as well as the practical value that the research brings, which is in this case a Technology RoadMap tool. What is more, this chapter describes the challenges that authors faced in the process of managing the study, along with the suggestions for possible future research.

5.1 Answers to the research questions

The main objective of this study was to predict the development of VR and AR technologies in the industry of New Media. Authors came up with three research questions to get a comprehensive view on the future of this technologies and their potential in this specific field.

The first research question was: *How high is the potential that the integration of VR/AR technologies have in terms of shaping the future of visuals in web-media?*

As a result of the data analysis, it is fair to state that VR and AR technologies have a promising potential for development in the New Media in the upcoming years. Although the current position of VR within numerous media platforms is quite unstable, it is expected to become both unique and attractive source of experience for the audience.

The difficulties of VR and AR adaptation are currently caused by such factors as high costs of VR and AR utilization and content production, as well as relatively low quality

of the content in comparison with other means of visualizing information. However, because of the increasing level of technological advances and constant research that brings new possibilities in VR and AR devices production, the costs of VR integration into different platforms will decline, and the technological quality will rise. It will allow more of those technologies to become utilized by major media businesses, which will consecutively boost the quality of the content as the competition rises. Resolved pricing issue will also make VR and AR devices more affordable to the audience.

From the social point of view, resistance to novel technologies is something that every innovation face, and VR and AR are currently facing as well. Lack of experience with VR and AR make the potential audience doubtful yet, not to mention that it is significantly more difficult for the older audience to adapt to the changes that VR and AR can bring. However, as more and more businesses are coming up with engaging immersive content and as technology becomes more affordable, industry has a possibility to overcome this obstacle. What is more, in the future the age issue will become less visible due to the generation shift. The audience which is now being familiarized with novel technologies will not be considered as "youngsters" in the next 10 years, therefore, both the older generation and the younger audience will be on the same level of product acquisition.

According to the data, New Media industry has potential to experience natural changes on different levels. The audience will be able to experience wide range of services they could not get while watching a regular video online. The news shared online will become much more than regular videos, it will be a parallel reality now which you can easily become a part of. This will eventually increase awareness among younger people about the worldwide events engaging them with the happenings they can now only look at in the current newsfeed. As a result of these modifications, users will become a part of a new era of Internet when it’s not only a

global network for communication but also a space for mutual experiences, shared virtual content and enhanced reality.

Overall, data shows that VR and AR can help New Media businesses benefit in terms of creating more engaging, rich content, that will lead to a more profound connection with the audience. The factor of exclusiveness of such innovations should not be overlooked. Previous outcomes of digitalization were based on people's minds being involved in a process of information acquisition, while in VR/AR people are being immersed into the different environment which requires completely different sort of attention from them. This experience has a significant influence on product perception which will change the whole system of media sharing. In immersive storytelling, journalism and streaming can provoke the feelings in the audience that the industry was never able to reach before. Although some data emerged from the study shows that New Media might not be the industry in which VR and AR technologies will be able to show their highest potential, compared to healthcare or education industries for instance, these technologies are promised to define the evolution of visual content representation in New Media. It is important for New Media businesses to try and integrate VR and AR content in their operations to stay proactive and competitive in the field.

To answer the second research question, *(What is the possible scenario of VR utilization in New Media in the next 10 years?),* authors have fused their own primary data with findings of prior research (as presented in the literature review) in order to create a comprehensive Technology Roadmap (Figure 10).

It is important to state that the Technology Roadmap represents those nodes and links that were identified as the strongest and most evident based on the data analyzed. There is always possibility for larger linkage web, however Roadmap is designed to not represent weaker connections and rather visualize the most prominent ones.

To easier identify the sources and background of nodes on the Roadmap, authors have marked each node with a visual symbol. Red square represents that the node has been identified with prior findings from literature review. Red circle stands for nodes that have emerged from primary data. Lastly, red triangle represents nodes that are authors' own ideations, that were identified as a logical consequence of a different node based on one of or both prior and primary sources.

This Roadmap is also attached in the appendix for better readability (Appendix 2).

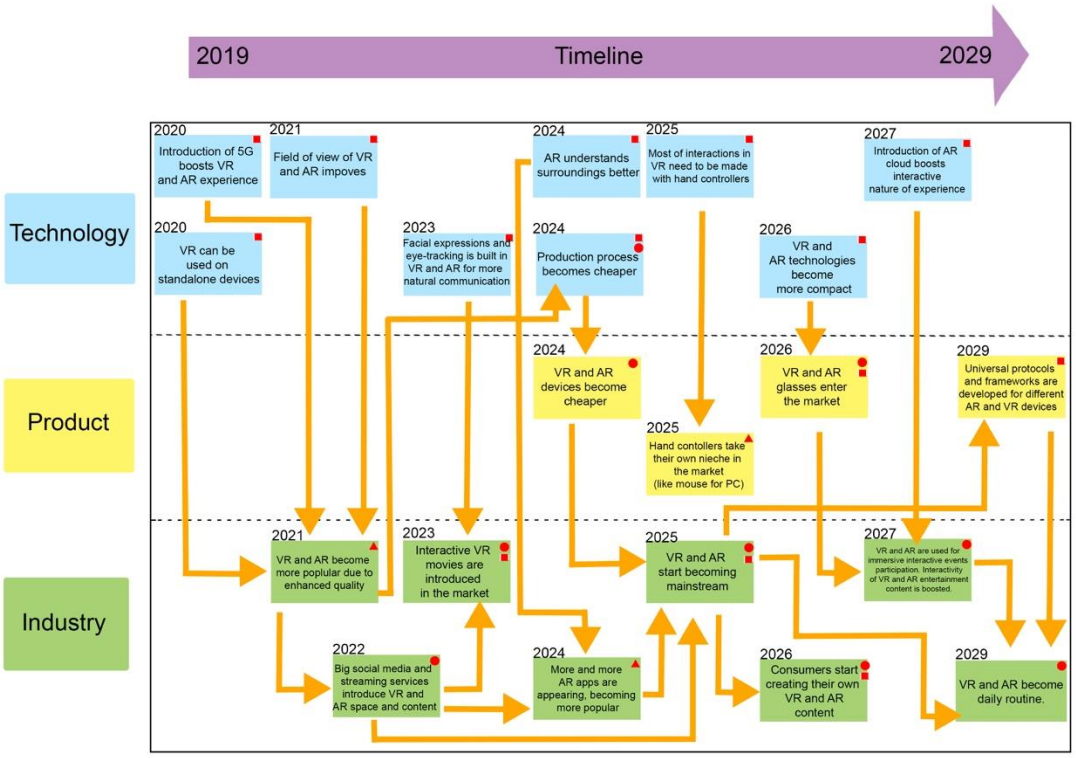


Figure 10. VR and AR Technology Roadmap, 2019-2029

The last question for the research was: *What is the customers' potential perception of the upcoming technologies?*

The answer on the last question was retrieved from the conducted focus group interviews, collecting the views and opinions of a focus group participants as potential users of the described technologies. Relating to Gartner Hype Cycle, one

can state that VR and AR have already went through the stage of being an innovative technology and became mature. However, looking at the data that emerged from focus group interviews analysis, it is fair to state that audience is generally not familiar with technologies yet. Most participants have no experience with AR nor VR apart from social media apps with AR lenses embedded. What is more, the modern audience is exposed to high quality content in media and most AR and VR applications cannot live up to the expectations of the customers.

Despite that, a certain level of curiosity is present. Focus group participants were very happily engaged in the conversation, sharing their knowledge and ideas on the possibilities that immersive technologies can bring that they would be willing to try. They mentioned the functional benefits of the tools such as VR and AR in terms of content visualization. Currently the technologies are introduced in mobile applications which makes the understanding of the concept easier for the users, though people still need time to relate immersive technologies as standalone devices. According to the participants, the interest in such an interactive approach will increase in the nearest future, as soon as the production of VR and AR will reach a higher point in visual quality and the variety of applications. It is safe to say that what the audience needs right now is more opportunities for trying VR and AR, as different media sources will start the active introduction of the technologies into their content. Once people try the new experience, they get new perspective on the issue, as with most innovative technologies.

5.2 Practical/managerial implications

A positive impact of the visual aids on the users' perception is one of the facts that do not need to be justified anymore. People prefer interactive content to massive text blocks, and this research states that people become intrigued by immersive content as well. The engagement that VR and AR bring can be very beneficial for businesses in new Media industry. They can already improvise with a potential integration of AR and VR features or consoles into their online platforms. Testing

mode is a useful tool for introducing the technology, identifying the grey areas and consequently adjusting the features to the target audience for a better experience.

One of the aims of the research was to provide a reasonable yet flexible timeline of a VR and AR development in the New Media industry. Today the VR and AR have already started being integrated in different fields with different applications. Knowing the upcoming potential of such technologies is a great advantage that media and entertainment industries can use already now, because mass adaptation of VR and AR is inevitable with technology developing fast and opening new opportunities to the market. Innovative mindset and predictive, proactive approach are very important in the fast paces of the business world today. VR and AR Technology Roadmap can act as a tool for decision making for numerous businesses of the industry.

5.3 Assessment of research quality and process

There are multiple tools that can help to ensure the credibility of a qualitative research. One of them is triangulation. To this study, data collection triangulation was applied to obtain comprehensive data. Authors not only chose interviewees with diverse knowledge from different fields for personal interviews but conducted focus group studies in order to obtain a customer perspective. What is more, authors made sure to stick to the quality and ethics guidelines when conducting the interview and interpreting data. The process of collecting and analyzing data was thoughtfully explained in the research. Investigator triangulation techniques allowed authors to constantly compare and confirm findings with each other, limiting the possibility of subjective opinions affecting the outcomes.

To support transferability of the research, authors provided a thick description of the process of data collection and characteristics of interviewees. Although interviewees' personalities remain anonymous due to ethical confidential reasons, their profiles allow the reader to get an understanding on their traits valuable for research. Such

information contributes to a better recognition of research circumstances and its applicability to other settings based on reader's impression.

Considering the initial goals of the research, the applied methods and the achieved results of the study, the authors believe the work has reached its initial purpose and revealed a valuable information for both the businesses and potential technology users.

5.4 Limitations of the research

The predictive nature of the study might have limited the realism of the outcomes. As any Qualitative study, this research was based on inductive reasoning, and there are no absolute measures to its reliability, especially so when future pathways of development are under the study. Even though the interviewed individuals are experts in the field of study, and the data was collected and analyzed according to quality guidelines reaching maximum saturation, it still might not be able to provide completely accurate predictions about future developments, at least in terms of presenting more generic results, for which broader studies are needed. Technology innovations depend on numerous factors that may or may not occur in the future, and their occurrence cannot always be predicted.

The other factor that might have influenced the research is the lack of scientific proficiency of authors in terms of technical knowledge of VR and AR. However, among the interviewees some professionals were able to provide an insight from technical point of view, and so did numerous literature sources that were studied. Nevertheless, the study focuses on the business perspective rather than the technology one.

5.5 Recommendations for future research

There is a lot of research that can be conducted on the topic of VR and AR technologies. They seem to appear promising for many industries, such as education,

construction or medicine fields. However, the aim of this research was to predict the potential development of VR/AR application in the New Media industry, thus authors suggest fields of research that can deepen the study.

Authors believe that the area of the study that could turn into valuable research in the future would be the identification of a specific influence that such technologies can have on customer perception of certain media sources: how VR and AR would shape the new relationships between content and audience; in which ways will they allow to build stronger connections between the brand and the customer. This study has provided an overall attitude towards VR and AR technologies today, potential threats and benefits of its application and specific fields of application in New Media industry. Just like today videos allow better engagement, soon immersive visuals will allow even deeper engagement. Deepening the study of the benefits that they could bring in terms of shaping brand image, strengthening brand-customer connections and bringing new possibilities for marketing would be very beneficial for future media businesses.

Considering the utilization of visual content in New Media as a foundation of the research, another area for potential study is development of initially non-visual content in a visual form in a way it was never used before. Indicating new solutions and describing how they will be utilized by businesses can benefit in discovering new channels for communication, advertising and content representation.

Another interesting approach would be to widen the study and determine potential customer's view on these technologies in a bigger scale. In this research, focus groups that gave insights on the issue were formed of young people. However, it would be interesting to discover the attitudes towards VR and AR technologies from the point of view of other groups with more diverse demographic characteristics.

References

Alkhamisi, A., Monowar, M. November 2013. *Rise of Augmented Reality: Current and Future Application Areas.* International Journal of Internet and Distributed Systems. Accessed on 20 January 2018. Retrieved from: https://file.scirp.org/pdf/IJIDS_2013112914255991.pdf

Arth, C., Grasset, R., Gruber, L., Langlotz, T., Mulloni, A., Schmalstieg, D., Wagner, D. 2015. *The History of Mobile Augmented Reality Developments in Mobile AR over the last almost 50 years*. Inst. for Computer Graphics and Vision Graz University of Technology, Austria. Accessed on 12 March 2018. Retrieved from: https://pdfs.semanticscholar.org/408e/59f4df731bffbf0118f4bb0ee56c5b0811dc.pdf

Balakrishnan, A. 2017. *Virtual reality can fix a lot of what's wrong with media, and people are wildly underestimating it.* CNBC. Article. Accessed on 12 August 2018. Retrieved from: https://www.cnbc.com/2017/12/10/virtual-reality-time-storytelling-commentary.html

Barnard, D. 2019. *History of VR - Timeline of Events and Tech Development.* Virtual Speech website. Article. Accessed on 7 July 2019. Retrieved from: https://virtualspeech.com/blog/history-of-vr

Bekhet, A.K., Zauszniewski, J.A. 2012. *Methodological Triangulation: An Approach to Understanding Data.* College of Nursing Faculty Research and Publications. Accessed on 2 October 2019. Retrieved from: https://epublications.marquette.edu/cgi/viewcontent.cgi?article=1395&context=nursing_fac

Benady, D. 2017. *Will online streamers kill off traditional broadcasters?* Raconteur. Article. Accessed on 15 March 2018, Retrieved from: https://www.raconteur.net/business-innovation/will-online-streaming-kill-off-traditional-broadcasters

Boodhoo, R., Purmessur, R. D. 2009. *Justifications for Qualitative Research in Organizations: A Step Forward.* The Journal of Online Education (New York), January 2009. Accessed on 12 June 2018. Retrieved from: https://ssrn.com/abstract=1325607

Bowman, S., Willis, C. 2003. *We media. How audiences are shaping the future of news and information.* The Media Center at American Press Institute. Accessed on 26

April 2018. Retrieved from: http://sodacity.net/system/files/Willis-and-Bowman_We-Media-Ch1.pdf

Bradley, A. 2019. *Does VR have a future, and what does it hold?.* PCgamer website. Article. Accessed on 11 September 2019. Retrieved from: https://www.pcgamer.com/the-future-of-VR/

Chen, G. 2012.*The Impact of New Media on Intercultural Communication in Global Context*. China Media Research. Accessed on 18 January 2018. Retrieved from: http://digitalcommons.uri.edu/cgi/viewcontent.cgi?article=1012&context=com_facpubs

Cisco Visual Networking Index: Forecast and Trends. 2019. Accessed on 5 June 2019. Retrieved form: https://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/white-paper-c11-741490.html

Davies, C. 2018. *Apple smart glasses optics detailed in patent application.* Slash Gear website. Article. Accessed on 4 May 2018. Retrieved from: https://www.slashgear.com/apple-smart-glasses-optics-detailed-in-patent-application-09518986/

Denzin, N. 1978. *The research act: a theoretical introduction to sociological methods.* McGraw-Hill. Accessed on 4 April 2018. Retrieved from: ttps://books.google.fi/books/about/The_research_act.html?id=gfS1AAAAIAAJ&redir_esc=y

Diamandis, P. 2019. *5 Breakthroughs Coming Soon in Augmented and Virtual Reality.* Singularity Hub website. Article. Accessed on 4 May 2018. Retrieved from: https://singularityhub.com/2019/05/10/5-breakthroughs-coming-soon-in-augmented-and-virtual-reality/

DiCicco-Bloom B., Crabtree B. F., 2006. *The qualitative research interview*. Medical Education, 40: 314-321.

Earnshaw, R. 1993. *Virtual Reality Systems.* 1st ed. Academic Press. Accessed on 15 January 2018. Retrieved from: https://www.elsevier.com/books/virtual-reality-systems/earnshaw/978-0-12-227748-1

Easterby-Smith M., Thorpe R., and Jackson P. 2008. *Management and Business Research.* SAGE Publications Ltd, 5th ed.

Feng, E. 2018. *The future of media: how technology has transformed the industry and the changes still to come.* Medium corporation. Article. Accessed on 4 June 2019.

Retrieved from: https://medium.com/@efeng/the-future-of-media-how-technology-has-transformed-the-industry-and-the-changes-still-to-come-ecd05f45c93

Ferrell, R. 2014. *Visual Content: The Key to Effective Brand Storytelling. Content Marketing Institute.* Article. Accessed on 13 September 2018. Retrieved from: https://contentmarketinginstitute.com/2014/08/visual-content-effective-brand-storytelling/

Fingas, J. 2018. *Oculus predicts a VR future that includes ultra-thin headsets.* Engadget website. Article. Accessed on 4 May 2018. Retrieved from: https://www.engadget.com/2018/09/26/oculus-predicts-ultra-thin-vr-headsets/

Flick, U., Kardorff E., Steinke, I. 2004. *A Companion to Qualitative Research.* SAGE Publications. 178-180. Accessed on 23 September2019. Retrieved from: https://www.researchgate.net/profile/Stephan_Wolff2/publication/305496229_Wolff_in_Flick_et_a/links/5792046008aec89db77fca3c/Wolff-in-Flick-et-a.pdf#page=193

Ford J. and Höllerer T. 2008. *Augmented Reality and the Future of Virtual Workspaces.* In: Handbook of Research on Virtual Workplaces and the New Nature of Business Practices. 486-502

Forni, A. 2017. *Transform Business Outcomes with Immersive Technology.* Gartner Enterprise. Accessed on 20 April 2018. Retrieved from: https://www.gartner.com/smarterwithgartner/transform-business-outcomes-with-immersive-technology/

Gartner, Inc. N.D. *Gartner Hype Cycle technology research methodology.* Accessed on 21 January 2018, Retrieved from https://www.gartner.com/en/research/methodologies/gartner-hype-cycle

Gill P. W., Stewart K.F., Treasure E., Chadwick B. 2008. *Methods of data collection in qualitative research: Interviews and focus groups.* British Dental Journal, vol. 204, pp. 291 - 295.

Glenn J.C. Gordon, T.J. 2003. *Futures Research Methodology, v2.0.* The Millennium Project. American Council for the UNU; Cdr edition. 71-78.

Glenn, J.C. 1994. *Introduction to The Futures Research Methodology Series*. AC/UNU Millennium Project. Accessed on 11 May 2018. Retrieved from: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.114.2269&rep=rep1&type=pdf

Hennig-Thurau, T., Malthouse, E. C., Friege, C., Gensler, S., Lobschat, L., Rangaswamy, A., Skier, B. 2010. *The Impact of New Media on Customer Relationships.* Journal of

Service Research. Accessed on 16 January 2018. Retrieved from: https://www.csub.edu/~ecarter2/CSUB.MKTG.490%20F12/Impact%20of%20New%20Media%20on%20Customer%20Relationships.pdf

How the AR Cloud will transform immersive technology. 2019. Foundry website. Article. Accessed on 4 May 2018. Retrieved from: https://www.foundry.com/insights/vr-ar-mr/ar-cloud-immersive-technology

Inside Facebook Reality Labs: Research updates and the future of social connection. 2019. TechFacebook website. Article. Accessed on 4 May 2018. Retrieved from: https://tech.fb.com/inside-facebook-reality-labs-research-updates-and-the-future-of-social-connection/

Jick, T. D. 1979. *Mixing Qualitative and Quantitative Methods: Triangulation in Action.* Cornell University Publication. Accessed on 11 October 2019. Retrieved from: http://www.business.illinois.edu/josephm/BADM504_Fall%202015/3_Jick%20(1979).pdf

Jomst, C. 2016. *The Best Gadgets for 2016: A Year for Virtual Reality.* Mobile and Apps website. Article. Accessed on 12 June 2018. Retrieved from: http://www.mobilenapps.com/articles/25877/20161225/best-gadgets-2016-year-virtual-reality.htm

Jorden, L., Marshall, A. 2017. *The Power of Immersive Experiences.* Brand Quarterly website. Article. Accessed on 28 July 2018. Retrieved from: http://www.brandquarterly.com/power-immersive-experiences

Kimball, D. 2015. *The Importance of Visuals in Social Media*. Regroup Blog. Accessed on 15 March 2018. Retrieved from: https://regroup.us/2015/blog/advertising/the-importance-of-visuals-in-social-media/

Lambo, C. 2018. *A Brief History of VR.* Veer VR Blog. Accessed on 11 June 2019. Retrieved from: https://veer.tv/blog/a-brief-history-of-vr/

Leech, N. L., Onwuegbuzie, A. J., 2007. *An array of qualitative data analysis tools: A call for data analysis triangulation.* School Psychology Quarterly, 22(4), 557-584.
Linden A., Fenn J. 2003. *Understanding Gartner's Hype Cycles*. Strategic Analysis Report. Accessed on 20 April 2018. Retrieved from: https://www.bus.umich.edu/KresgePublic/Journals/Gartner/research/115200/115274/115274.pdf

Lopez, N. 2016. *Facebook says VR headsets will look like Ray-Bans in 10 years*. TNW website. Article. Accessed on 17 June 2018. Retrieved from:

https://thenextweb.com/facebook/2016/04/12/facebook-says-will-vr-headsets-size-normal-glasses-next-10-years/

Mahoney, E. 2017. *Mars Immersion: NASA Concepts Bring Precision to New Virtual Reality Experience.* NASA website. Article. Accessed on 12 September 2019. Retrieved from: https://www.nasa.gov/feature/nasa-concepts-bring-precision-mars-to-virtual-reality

Mandal. S. 2013. *Brief Introduction of Virtual Reality & its Challenges.* International Journal of Scientific & Engineering Research. Accessed on 14 January 2018. Retrieved from: https://www.ijser.org/researchpaper/Brief-Introduction-of-Virtual-Reality-its-Challenges.pdf

Manovich, L. 2001. *The Language of New Media*. The MIT Press. Massachusetts Institute of Technology. Accessed on 16 January 2018. Retrieved from: http://dss-edit.com/plu/Manovich-Lev_The_Language_of_the_New_Media.pdf

Martin, E.J. 2017. *Virtual, Augmented and Mixed Reality opens up a world of possibilities for publishers.* Accessed on 20 January 2018. Retrieved from: http://www.econtentmag.com/Articles/Editorial/Feature/Virtual-Augmented-and-Mixed-Reality-Opens-Up-a-World-of-Possibilities-for-Publishers-117723.htm

Mazuryk, T., Gervautz, M. 1996. *Virtual Reality History, Applications, Technology and Future*. Institute of Computer Graphics. Vienna University of Technology, Austria. Accessed on 16 January 2018. Retrieved from: https://www.cg.tuwien.ac.at/research/publications/1996/mazuryk-1996-VRH/TR-186-2-96-06Paper.pdf

Merriam, S. B. 2016. *Qualitative research: A guide to design and implementation.* 4th ed. San Francisco, CA: Jossey-Bass.

Metry, M. 2018. *5 Future Predictions for the Virtual and Augmented Reality Industry.* Veer VR Blog. Article. Accessed on 11 September 2019. Retrieved from: https://veer.tv/blog/5-future-predictions-for-the-virtual-and-augmented-reality-industry/

Metz, R. 2019. *Facebook exec says the future of VR will be cheaper and increasingly wireless.* CNN Business website. Article. Accessed on 2 October 2019. Retrieved form: https://edition.cnn.com/2019/08/22/tech/facebook-vr-future/index.html

Miles, M.B., Huberman, A.M., Saldana, J., 2014. Qualitative Data Analysis: A Methods Sourcebook. Sage, London.

Morrison-Beedy, D., Cøteé-Arsenault, D., Fischbeck Feinstein, N., 2001. *Maximizing Results with Focus Groups: Moderator and Analysis Issues.* Application of Nursing Research, 14, 48-53.

Murillo, K. 2018. *The future of augmented reality technology will be in the cloud.* Master dc website. Article. Accessed on 4 May 2018. Retrieved from: https://www.masterdc.com/blog/augmented-reality-technology-cloud/

Murphy, D. 2010. *Traditional vs. New Media Channels*. Masterful Marketing website. Article. Accessed on 14 January 2018. Retrieved from: https://masterful-marketing.com/marketing-channel-strategy/

Neiger, C. 2016. *Virtual reality is too expensive for most people — but that's about to change.* Business Insider website. Article. Accessed on 4 May 2018. Retrieved from: https://www.businessinsider.com/why-is-virtual-reality-so-expensive-2016-9?IR=T

Onwuegbuzie, A. J., Dickinson, W. B., Leech, N. L., Zoran, A. G., 2009. *A Qualitative Framework for Collecting and Analyzing Data in Focus Group Research.* International Journal of Qualitative Methods, 1–21.

Panetta, K. 2019. *Gartner Top Strategic Predictions for 2020 and Beyond.* Gartner, Inc. Article. Accessed on 15 October 2019. Retrieved from: https://www.gartner.com/smarterwithgartner/gartner-top-strategic-predictions-for-2020-and-beyond/

Peña, N. 2015. *The future of news? Virtual Reality.* TED Talks. Accessed on 4 April 2018. Retrieved from: https://www.ted.com/talks/nonny_de_la_pena_the_future_of_news_virtual_reality?language=en

Pfanner, E. 2013. *Peering into the future of media.* The New York times. Accessed on 15 March 2018, Retrieved from: https://www.nytimes.com/2013/10/15/business/media/peering-into-the-future-of-media.html?rref=collection%2Fbyline%2Feric-pfanner

Phaal, R. 2015. *Roadmapping for strategy and innovation.* Centre for Technology Management Institute for Manufacturing, University of Cambridge. 1-4. Accessed on 13 October 2019. Retrieved from: https://www.ifm.eng.cam.ac.uk/uploads/Research/CTM/Roadmapping/roadmapping_overview.pdf

Phaal, R. Farrukh, C. Robert, D. 2001. *Technology roadmapping—A planning framework for evolution and revolution*. Technological Forecasting & Social Change

71 (2004) 5 – 26. Department of Engineering, University of Cambridge. Accessed on 14 October 2019. Retrieved from: http://www.alvarestech.com/temp/PDP2011/emc6605.ogliari.prof.ufsc.br/Restrito/PHAAL.pdf

Rabiee, F. 2004. *Focus-group interview and data analysis.* School of Health and Policy Studies, University of Central England, Birmingham B42 2SU, UK. Accessed on 20 May 2018. Retrieved from: https://www.cambridge.org/core/services/aop-cambridge-core/content/view/E5A028A3DA12A038A7D49566F73416B8/S0029665104000874a.pdf/focusgroup_interview_and_data_analysis.pdf

Richards, L. 2014. Handling qualitative data. A practical guide. 3rd ed. SAGE Publications Ltd. 113-120. Accessed on 14 September. Retrieved from: https://books.google.fr/books?id=J93SAwAAQBAJ&dq=handling+qualitative+data&hl=ru&source=gbs_navlinks_s

Rose, F. 2015. *The Power of Immersive Media*. Strategy-business website. Article. Accessed on 15 September 2018. Retrieved from: https://www.strategy-business.com/article/00308?gko=92656

Rubin, P. 2019. *Want to Know the Real Future of AR/VR? Ask Their Devs.* Wired website. Article. Accessed on 11 September 2019. Retrieved from: https://www.wired.com/story/future-ar-vr-survey/

Saunders, M., Lewis, P., Thornhill, A. 2009. *Research Methods for Business Students*. Pearson, New York.

Schmid, V. 2018. *WHY SOCIAL MEDIA IS IMPORTANT FOR BUSINESS MARKETING.* Marketing Insider Group. Article. Accessed on 16 May 2018. Retrieved from: https://marketinginsidergroup.com/content-marketing/why-social-media-is-important-for-business-marketing/

Silverman, D. 2016. *Qualitative Research*. Publisher SAGE. 31-35. Accessed on 11 April 2018. Retrieved from: https://books.google.fr/books?id=9FALDAAAQBAJ&dq=data+reliability+qualitative+ethics&lr=&hl=ru&source=gbs_navlinks_s

SUTHERLAND, I. E. 1965. *The ultimate display*. In Proceedings of IFIPS Congress. New York City, NY

The Role of Visual Media in Impactful Brand Storytelling. 2015. CMO Council and Libris report. Accessed on 28 July 2018. Retrieved from: https://d3kjp0zrek7zit.cloudfront.net/uploads/attachment/file/42928/expirable-

direct-uploads_2F09469a4a-87fa-43c8-afe4-a71d013c5bcb_2FCMO-Council_PhotoShelter_Whitepaper_Final.pdf

The three crucial VR headset developments you don't want to miss. 2019. Foundry website. Accessed on 4 May 2018. Retrieved from: https://www.foundry.com/insights/three-crucial-vr-headset-developments

Thomas, B., Squires, J., Donoghue, J., Close, B., De Bondi, P., Morris, M., Piekarski, W. 2000. *ARQuake : an outdoor/indoor augmented reality first person application.* 4th international symposium on wearable computers. USA: Institute of Electrical and Electronics Engineers Inc. 139–146. Accessed on 19 March 2018. Retrieved from: https://doi.org/10.1109/ISWC.2000.888480

Thomas, D. 2006. *A General Inductive Approach for Analyzing Qualitative Evaluation Data.* American Journal of Evaluation.

Towner, T. L., 2017. *The Presidency and Social Media. The Infographic Election.* Routledge, 1st ed.

Virtual Reality Industry Report. Greenlight Insights. 2016. Accessed on 8 May 2018. Retrieved from: https://greenlightinsights.com/reports/virtual-reality-stats-2016/

Vitillo, A. 2019. *Augmented Reality is reaching a matures state according to Gartner.* Article. Accessed on 20 September 2019. Retrieved from: https://skarredghost.com/2019/09/04/augmented-reality-mature-gartner/

Ward, P. 2017. *Virtual Reality, Augmented Reality and the Media*. Medium. Article. Accessed on 3 April 2018. Retrieved from: https://medium.com/@peterward85/virtual-reality-augmented-reality-and-publishers-d7cd5ba5b1e3

Yoon, E. 2017. Why Immersion Matters in 2017. Huffington Post website. Article. Accessed on 9 September 2018. Retrieved from: https://www.huffingtonpost.com/entry/why-immersion-matters-in-2017_us_58bda90ee4b0ec3d5a6ba120

Appendices

Appendix 1. Interview invitation letter

«Good afternoon, Recipient,

My name is Madina Baikulova. My colleague Elizaveta Suderevskaia and I are students of JAMK University of Applied Sciences. We are currently working on our Bachelor thesis on the topic of Futures research: the application of VR and AR technologies in New media. We are trying to create a roadmap for these emerging technologies and investigate the potential that the integration of them in digital media could bring.

I am writing to you because we believe that your contribution to our research could be extremely valuable. Juha Saukkonen, our thesis supervisor, highly advised you as a person worth contacting. You, as an expert in VR industry, could bring us some crucial for the research facts. What we are aiming to is getting some insights from a professional in the field to rely our forecast on, and we would highly appreciate the opportunity to conduct a small interview with you.

If you would have such a possibility to meet with us at suitable for you time, I will send you further information about our research and the more narrowed discussion topic. Thank you for your time.

I look forward to hearing from you,

Yours Faithfully,

Madina Baikulova”

Appendix 2. Interview questions

Current technologies:

1. What are currently the most influencing visual technologies in the field of media? /Which visual technologies do you find most influencing in the field of media nowadays?
2. Do you believe that VR and AR technologies are integrated a lot in the New Media nowadays? / have you heard about the integration of VR and AR in the New Media? Why do you think it’s happening? What do you think about this integration?

Future technologies:

1. Do you think that VR/AR has a lot of potential for further development in media in the upcoming 10 years? Why do you think so?
2. How exactly these technologies can be applied to the digital publishing in the next 10 years? Can you come up with the examples of such integration?

Impact of the technologies:

1. How will these changes influence the audience of the media?
2. What will change in customer behavior or product perception?

Focus Group questions

1. How important for you is visual content in media sources?
2. Have you experienced any VR or AR integrated content in the media you follow? (Yes - What kind of content was it? No – Would it be interesting to experience?)

3. Do you think that innovative visuals such as VR/AR can impact your perception of the media content? In what way?
4. Imagine that there is a specific event happening (football match, music festival). And you have an opportunity to experience / watch live VR streaming of the event with the help of special devices? Would you be interested of such experience? Would you be willing to pay for such content?
5. Imagine there is a source that provides all content in the form of VR/AR. Would you be interested in using such media? Would you pay for it?
6. Would you prefer using media platforms that contain such VR experience over the traditional media sources? Would you be more loyal to these platforms? Or you would keep VR/AR as an exclusive experience for special occasions?

Appendix 3. VR and AR Technology roadmap, 2019-2029