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# A Critical Look at Metaverse Viewpoints

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<p>In recent years, the concept of Metaverse has become a popular buzzword in the media and different communities. In 2021, the company behind Facebook rebranded itself into Meta Platforms, inc. in order to match their new vision of developing the Metaverse. The Metaverse is becoming reality as intersecting technologies, including head-mounted virtual reality displays (HMDs) and non-fungible tokens (NFTs), have been developed. Different communities, such as media, researchers, consumers and companies have different perspectives on the Metaverse and its opportunities and problems. Metaverse technology has been researched thoroughly, while little to none research has been done on gray literature, i.e. non-scientific sources, to gain insight on the ongoing hype. The conducted research analyzed 44 sources in total, ranging from news articles to videos and forum discussions. The results show that people are seeing opportunities in Metaverse entrepreneurship in the changing career landscape. However, the visions of Meta Platforms, inc. also receive a fair amount of critique in the analyzed articles and threads. The results suggest that most of the consumers are only interested in a smaller subset of features than what is being marketed. The conducted research gives insight on how different sources are seeing the Metaverse and can therefore be used as a starting point for more comprehensive gray literature studies on the Metaverse. While making innovations to the underlying technology is important, studying people's viewpoints is a requirement for the academia to understand the phenomenon and for the industry to produce a compelling product.</p> <p><b>ACM Computing Classification System (CCS)</b>  Human-centered computing → Human computer interaction (HCI) → Interaction paradigms  → Virtual reality</p> <p>Human-centered computing → Ubiquitous and mobile computing → Ubiquitous and mobile computing systems and tools</p>			
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# 1 Introduction

The Metaverse has different definitions but it generally refers to multi-user virtual worlds with a social emphasis. The concept has recently gained momentum due to advancements in related fields of technology, such as virtual reality and cryptocurrency. However, while a lot of research has been done on the related technologies, the hype itself and people's viewpoints about it have been left relatively unstudied. This research is an attempt to clarify what the concept of the Metaverse means to different groups of people and what opportunities and problems they see in it. This chapter first states the research problem and derives the research aims, objectives and questions from it, and then proceeds to address the significance and the limitations of the research.

Existing research has done a good job at identifying the underlying technologies and features of the Metaverse, even though the field has been evolving rapidly [14][15][33]. The details of the underlying technology, such as wireless virtual reality [31][35] and the blockchain [39], have been thoroughly studied as well. However, little to none research has been done on what people are talking about the Metaverse. Existing literature reviews [33] cover the academic sources but there has not been a thorough review on gray literature, i.e. non-academic or informal sources. This research gap should be filled to gain insight on the ongoing hype and people's viewpoints.

Given the lack of research on peoples' perceptions of the Metaverse, this research aims to systematically investigate different viewpoints from many different sources. Thus a variety of sources from sites such as BBC, CNET, YouTube and Slashdot will be analyzed in the research. The first research objective is to identify which groups of people are discussing the Metaverse. The second objective is to analyze the definitions that are presented in different types of sources and see who are presenting these definitions. Because current research does not focus on what people are specifically doing in the Metaverse, the third objective is to identify activities from the sources. Finally, the fourth objective is to investigate which aspects of the Metaverse are seen as a positive or a negative by people.

Considering the research objectives, the following research questions were formulated:

RQ1. Who are discussing the Metaverse?

RQ2. How do their definitions of the Metaverse differ from each other?

RQ3. What kind of activities people are doing in the Metaverse?

RQ4. What kind of problems and opportunities people see in the Metaverse?

This contribution is substantial as it is among the first, if not the first, research paper which is focused on analyzing Metaverse-related gray literature sources. The conducted research can be used as a starting point to future research on the topic, as the study can be repeated with a larger volume of sources or with modified research questions. Knowledge on peoples' viewpoints is concretely valuable for the Metaverse industry, as in order to make a product that sells, they need to know how people perceive the current visions and products and how they are planning to use them.

The most obvious limitation of this research is the narrow research scope. Only 44 sources from 6 sites were included in the research, which most likely is a too small sample size to answer the research questions thoroughly. Also, the selection of the databases may be argued to be biased, as they are just examples of different kinds of sites. Other researchers could have chosen a considerably different data set for a similar research. The chosen research questions require interpretation of the sources, so the research may be prone to false interpretations of what someone is trying to say, especially considering more ambiguous forms of sources like forum threads.

Chapter 2 familiarizes the reader with the main concepts and gives background by presenting the evolution of the Metaverse. Chapter 3 explains the methodology of the conducted research, including all design choices and their justifications. Chapter 4 includes the results of the research and it has a section for results related to each research question. Chapter 5 discusses and interprets the meaning of the results. Chapter 6 finally summarizes the research and answers the research questions that are presented in this introduction chapter.



# 2 Background

The purpose of this chapter is to familiarize the reader with the context of the thesis and introduce them to the main concepts of the Metaverse. Section 2.1 outlines the history of multi-user virtual worlds, which have evolved into the contemporary Metaverse phenomenon. Section 2.2 explains the concepts of virtual reality and augmented reality and how they relate to the concept of the Metaverse. Section 2.3 finally addresses what the concept of the Metaverse accurately means. Section 2.4 introduces non-fungible tokens and tells why they are relevant in the context of the Metaverse.

## 2.1 The Evolution of Metaverses

This section gives a brief overview of the history of multi-user virtual worlds. Each decade has introduced new features that have been serving as foundations for the next decades' virtual worlds. Metaverses are the contemporary multi-user virtual worlds, so it is worthwhile to take a look at the pioneering applications of the past and identify their contributions to the current state of the field. This section is largely based on the descriptions of Metaverse evolution provided by Dionisio et. al. [14] and Duan et. al. [15] but also includes examples and points that are not found in them.

The predecessor of the Internet, the ARPANET, was released in 1969 and it connected multiple computers from different locations, such as universities, in the USA [34]. Students of the universities started to develop the first online games. In 1978, a game titled Multi-User Dungeon (MUD), was released. It is a game with a text-based interface, which allows the user to interact with the virtual world and the other users by typing and reading. The game started a whole new genre of games, called multi-user dungeons (MUDs) after the title of their predecessor [15]. In 1983 the Internet with its TCP/IP-protocol replaced the prior ARPANET and its NCP-protocol, forming the most important infrastructural component for enabling Metaverses. MUD can be seen as the ancestor of Metaverses as it allows the users to interact with each other in a virtual world, but it still lacked the visual aspect of Metaverses.

The first social virtual world with a graphical user interface (UI) was Lucasfilm's Habitat, which was released in 1986 for Commodore 64 [14]. It allowed its users to spawn into a

two-dimensional (2D) virtual world as an avatar and explore the environment together while discussing in text chat. The term for this type of application is Cyberspace, the predecessor of the term Metaverse, which is agnostic to whether the virtual environment is two or three-dimensional. It was a milestone in the development of multi-user virtual worlds to have a graphical environment and visual avatars.

Video games of the 1990s, such as *Wolfenstein 3D* (1992) [40], pioneered three-dimensional (3D) graphics in virtual worlds. 3D graphics were a significant improvement from the previous textual or 2D interfaces and are one of the foundational techniques in creating realistic and immersive Metaverses. The breakthroughs in 3D graphics paved the way to the first online 3D virtual worlds, which include *Active Worlds*, released in 1995 [14], [15]. In *Active Worlds*, the users can generate worlds and content by themselves, and then share their own virtual world to the community. User-generated content (UGC) is an essential concept in Metaverses as it means that users can contribute artifacts to the Metaverses. Users can then spawn as avatars into a user-generated virtual world and interact with the users and the environment.

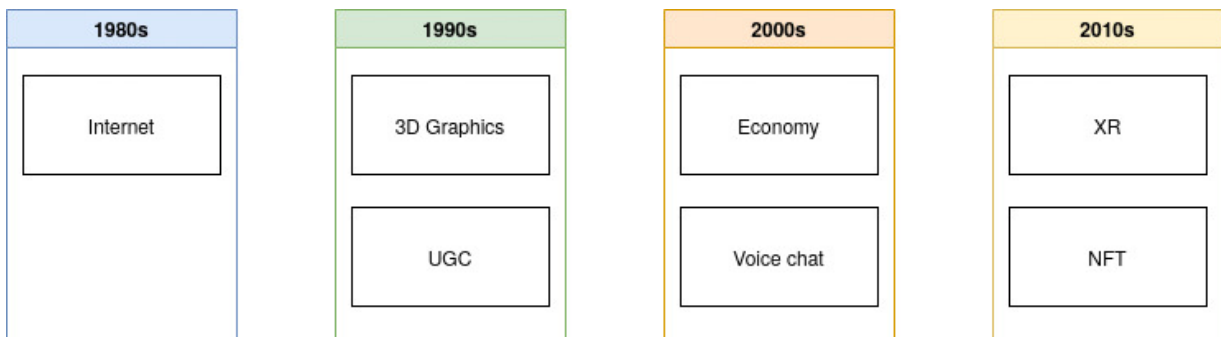
The 1990's were the era when the predecessors of the game engines that we still use today in creating virtual worlds were introduced. For example, the original *Unreal Engine* was released in 1998, and now its successor *Unreal Engine 5* (released in 2021) is used in generating next generation virtual worlds. Game engines and virtual worlds have developed massively since the 1990s, but still the underlying principles such as physics engines and textures can be found in modern game engines.

In the early 2000's, the Internet was getting more common in households, which led to the popularization of Massively Multiplayer Online Games (MMOGs) such as *RuneScape* (released in 2001) and *World of Warcraft* (released in 2004). They brought virtual worlds into the mainstream and they became a platform for socializing with real life friends and online friends. In many MMOGs, real life currency can be transformed into memberships or in-game virtual currency that could be spent for virtual items. Some MMOGs include free markets where users can trade virtual items with each other. Voice chatting was popularized in this era as well, as some games have in-game voice chatting capabilities and many players started using separate voice chatting applications, such as *Skype* (released in 2003), while playing with others.

Along the MMOGs, applications that can be classified more clearly as Metaverses were developed. One popular example is *Second Life*, which was released in 2003. Unlike the MMOGs, there is no such reward system in *Second Life* that would grant the user levels

or other rewards for performing different objectives [30]. Second Life is more clearly a Metaverse with no objectives. It allows users to socialize by speaking to nearby users via a built-in voice channel and to participate in common activities. It emphasizes allowing the users to create UGC and features in-game currency, the Linden dollar, which can be exchanged to real money and vice versa. This created an advanced economy where users buy and sell content, such as virtual houses or clothes, with each other. Some have been able to create real life businesses around creating content into Second Life. For example, Ailin Graef had made one million US dollars by the year 2006 by running a real estate management company that creates, sells and rents virtual houses in Second Life [6].

In figure 2.1, the identified features have been visualized by the decade of their introduction into Metaverses. Finally, it is worthwhile to note that there is no reason to believe that the evolution of the Metaverse would be finished, instead there is a lot left to improve for future technologies.



**Figure 2.1:** The features of Metaverses that were identified in chapter 2, organized by the decade of their invention.

## 2.2 Virtual Reality and Augmented Reality

Virtual reality (VR) has many definitions, but the one that is used in this thesis is that it means artificial stimulation techniques which induce designed experiences to the user [32]. These techniques override the sensing of the natural environment [14]. For example, electrical displays can be considered to artificially stimulate the sense of sight, and headphones can be considered to override the sense of hearing. In this thesis, the discussed induced experiences are a three dimensional (3D) virtual world, or a digital overlay on top of our natural environment. By this definition, VR has been around for a long time, but recently it has been discussed a lot due to increased popularity of head-mounted displays (HMDs).

HMDs are headsets that have a built-in display that overrides the sight of the user, and oftentimes they include headphones to override hearing. They include a gyroscope that tracks the position of the user's head and therefore they can display the corresponding view, letting the user look around in the virtual world. This is an improvement from standard video games where the virtual world is experienced through a regular computer display and the view of the environment is tilted with a mouse or a joystick. Secondly, HMDs can cover practically the whole field of view of the user, unlike regular computer displays or televisions. Finally, wireless HMDs are not tied to a place, which brings the potential of utilizing the mobility of the user. In the context of video games, HMDs have been found to make games more immersive compared to regular computer displays [9].

Multi-user VR allows many users to participate in the same virtual world. Multi-user VR systems can connect users from the same physical space via a local network, or connect users around the globe via the Internet. The users are usually presented as avatars in the virtual world [21]. An avatar is a character in the virtual world and depending on the application, it might or might not resemble the user. The ideal type of the avatar depends on the use case. A more accurate presentation of the user is beneficial in office applications where users want to recognize each other. On the contrary, a made up or randomized presentation is better in a role playing scenario or when the users want to remain anonymous. Another option instead of avatars is to present the users photorealistically with the help of a video camera (webcam) by cutting the users' form from the video into the Metaverse environment. This option may lead to better immersion in conference and business scenarios, but the technology is complex and not widely used in commercial VR-systems.

In a more precise classification, VR is about replacing the real environment with a virtual environment, especially in terms of sight. Augmented reality (AR) on the contrary does not replace the real environment, but rather displays virtual overlays on top of the real environment. Instead of a HMD that would replace the whole field of view, AR can be implemented with smart glasses which let the user see the real environment, but which are able to display content somewhere into the field of view. For example, the user could see the timetables of their most used public transport connections by looking to a corner of their field of view.

Most of the content in AR are so called digital twins, meaning that the content corresponds to some real life entity, such as a public transportation vehicle or the current weather [33]. In contrast, the content in VR often consists of digital natives, meaning entities that do

not have a connected counterpart in the real world, such as a building that a user has built in the virtual world. Mixed reality (MR) brings AR and the digital twins together with VR and the digital natives, creating a coexistence of physical and virtual entities. The idea is to break the duality of the physical and the virtual and form a singular merged reality, which some consider as the definition of the Metaverse (for example [33]). Extended reality (XR) is an umbrella term that includes the whole range of VR, AR and MR.

## 2.3 Definition of the Metaverse

The definition of the Metaverse as a merged reality of the physical and the virtual is promoted for example by Lee et. al. [33]. This definition essentially combines MR-technology with multi-user connectivity. However, as will be shown later in this thesis, many people intuitively consider virtual multi-user environments Metaverses, even if they only operate in the virtual world.

What makes Metaverse applications different from other social applications, such as video conferencing tools (like Zoom) and multiplayer video games? First, in Metaverse applications, the users are present in the same 3D environment. With this additional premise, video conferencing platforms such as Skype or Zoom would not qualify as Metaverse applications, because even though their users can interact via video chatting, there is no shared virtual environment. An inclusive term for multi-user platforms that includes non-3D platforms is cyberspace. Secondly, the Metaverse could be defined as a shared virtual environment where its users can interact with each other without a specific goal. The line between open world video games and the Metaverse can get vague but the difference is that video games usually provide the users with a certain objective and give rewards for achieving the objectives, while the Metaverse features open worlds for socializing without any particular objective [14]. However, many video games are capable of hosting social events without objectives and the Metaverse may contain activities and mini-games that allow the users to play a game inside the Metaverse. For example, in his speech, Brian Jung mentions virtual concerts being performed in the video game Fortnite [29]. In other words, applications often contain features of both, games and the Metaverse, so many applications are hard to classify in an either-or manner.

One relevant question concerning the Metaverse is whether it is a single combined entity or just a certain genre of applications. A metaworld can be defined as a single virtual world in which all of its areas exist inside the same virtual world [14]. However, a hypergrid

(or a metagalaxy), is a platform which allows the user to teleport (relocate) between distinct metaworlds. Hypothetically the Metaverse could be seen as a hypergrid that would connect all different metaworlds together and could be accessed via a browser into a three dimensional Internet [19]. However, currently there is no common hypergrid that would connect all metaworlds together. Instead, Big Tech companies such as Meta Platforms, inc. (referred in the thesis as Meta) and Microsoft Corporation (referred in the thesis as Microsoft) are developing their own competing hypergrids. Time will tell whether a browser will connect all of the competing hypergrids or will a Metaverse monopoly be formed by a Big Tech company and become synonymous to the Metaverse. Another scenario is that many different hypergrids and metaworlds will co-exist separately, like they currently do. Because the Metaverse as an interconnected web of metaworlds does not exist currently, the thesis uses the term freely to describe Metaverse applications (metaworlds and hypergrids) as well as the phenomenon overall, depending on the context.

## 2.4 Non-Fungible Tokens

In 2009, Bitcoin was introduced by Satoshi Nakamoto. It is a decentralized cryptocurrency based on blockchain technology [39]. Bitcoin can be traded without transactions needing to be confirmed by an authorized third party, such as a bank, due to the blockchain based cryptographic proof. Blockchain technologies are based on the concept of decentralized ledgers, i.e. logs of transactions. This thesis does not include a detailed description of how cryptocurrencies and blockchains work but interested readers can find the details on Nakamoto's paper [39].

However, in the context of the Metaverse, an aspect of cryptocurrencies called non-fungible tokens (NFTs) is highly relevant. Later cryptocurrencies such as Ethereum (released in 2015) include the possibility to create and trade NFTs [18]. An NFT is a unique pointer to a file, such as an image or a video. NFTs are stored in the blockchain, containing the data of their owners, and they can be traded for cryptocurrency. The purpose of an NFT is to mark the ownership of a digital item. It can be seen as a sign of authenticity or originality of the file that it is pointing to.

NFTs can be used in the Metaverse to point into digital items that the avatars may possess. Possessing expensive NFTs in the Metaverse can be seen as owning status symbols, similarly to why people are drawn to buying Rolexes and Ferraris in the real world. Many consider NFTs to be the cornerstone of the Metaverse (for example [33][15]), alongside

VR-technology, as they enable a lively digital economy where people are creating and trading NFT items. There are Metaverses with economies that are based on NFTs. For example, Decentraland (released in 2020) is a popular Metaverse where items are traded between users with Ethereum cryptocurrency [15].

# 3 Methods

The goal of this thesis is to analyze and interpret sources that contain different viewpoints on the Metaverse from different groups of people. As the Metaverse has become a trending concept which is discussed in a variety of sources, it is important to research the viewpoints of the different groups.

The contribution of this thesis is a qualitative literature review on Metaverse-related sources. Because the research questions are open-ended, it is justified to approach them with qualitative interpretation rather than quantitative statistics. However, the research contains charts which visualize statistics of generalized labels from the data, so the research can be considered to include aspects of quantitative research as well.

The conducted research is inductive, as it attempts to find patterns from the analyzed sources. Inductive research is more sensible than deductive research in the context of Metaverse viewpoints, as there is no clearly prevailing theory on the topic to be challenged.

A design choice had to be made on which data sets to analyze. Here are the data sets that were selected:

1. BBC
2. CNET
3. YouTube
4. Slashdot
5. Reddit
6. WIRED

In total, 44 sources were analyzed for the thesis; 6 from BBC, 6 from CNET, 12 from YouTube, 6 from Slashdot, 6 from Reddit, and 8 from WIRED. Table 3.1 lists each analyzed article and their types and authors.



**Table 3.1:** Overview of the sources.

Ref	Title	Data Set	Type	Author
[53]	Heineken launches virtual beer in self-mocking metaverse 'joke'	BBC	Article	Jane Wakefield
[2]	Metaverse: Extinct Ice Age animals will be re-created virtually	BBC	Article	BBC
[54]	Zuckerberg reveals AI projects to power Metaverse	BBC	Article	Jane Wakefield
[12]	Metaverse app allows kids into virtual strip clubs	BBC	Article	Angus Crawford
[28]	Disney appoints executive to oversee metaverse strategy	BBC	Article	Jonathan Josephs
[52]	"Facebook's metaverse plans named dystopian and a "bad idea""	BBC	Article	Jane Wakefield
[44]	How the Game Industry Is Charging Into The Metaverse	CNET	Article	Robert Rodriguez
[5]	People Are Paying Millions For Land In The Metaverse	CNET	Article	Daniel van Boom
[4]	Bored Ape Yacht Club's New Metaverse Shows NFTs Evolving	CNET	Article	Daniel van Boom
[58]	Shopping in the Metaverse Could Be More Fun Than You Think	CNET	Article	Queenie Wong
[47]	The Metaverse Isn't a Destination, It's a Metaphor	CNET	Article	Scott Stein
[43]	The Metaverse Will Be a Multiplatform Mess	CNET	Article	Stephen Shankland
[7]	Welcome to the Metaverse   CBS Reports	YouTube	Documentary	CBS
[37]	Meta	YouTube	Commercial	Meta
[1]	Metaverse: Beyond Human	YouTube	Video essay	Aperture
[22]	Microsoft's CEO on the Metaverse and Flexible Work	YouTube	Interview	Harvard Business
[11]	Microsoft's Satya Nadella's Vision of the Metaverse	YouTube	Commercial	Microsoft
[48]	The future of an immersive Metaverse (TEDx)	YouTube	Talk	Artur Sychov
[55]	Trapped in the Metaverse: Here's What 24 Hours in VR Feels Like	YouTube	Video	Wall Street Journal
[3]	Why the Metaverse Is Fashion's Next Goldmine	YouTube	Documentary	Bloomberg
[10]	Metaverse: What The Future Of The Internet Could Look Like	YouTube	Documentary	CNA
[20]	Mark Zuckerberg: Meta, Facebook, Instagram and the Metaverse	YouTube	Interview	Lex Fridman
[50]	These Architects Are Building The Metaverse	YouTube	Documentary	Tomorrow's Build
[29]	How The Metaverse Will Change The World	YouTube	Talk	Brian Jung
[38]	Microsoft Security Chief Issues Call To Arms To Protect Metaverse	Slashdot	Thread	
[17]	Facebook's Metaverse Questioned By A Gaming Veteran	Slashdot	Thread	
[59]	"Zuckerberg's Facebook Burns 500 bil. becoming "Meta""	Slashdot	Thread	
[42]	Samsung held an event in the Metaverse and it didn't go well	Slashdot	Thread	
[45]	6 Reasons Why Meta (Formerly Facebook) Is In Trouble	Slashdot	Thread	
[56]	Walmart Appears to Be Planning Its Own Cryptocurrency and NFTs	Slashdot	Thread	
[26]	I am an architect and I did my homework early on Metaverse	Reddit	Thread	
[57]	What skills/knowledge would you learn now to profit off Metaverse	Reddit	Thread	
[49]	The idea that NFTs will allow you to take items between worlds	Reddit	Thread	
[24]	Have you ever attended a metaverse concert	Reddit	Thread	
[23]	Has anyone actually replaced Zoom calls with a Metaverse app?	Reddit	Thread	
[25]	How can a fashion designer impact the Metaverse	Reddit	Thread	
[36]	The man, the myth and the Metaverse	WIRED	Opinion	Lisa Messeri
[16]	How to build a better Metaverse	WIRED	Opinion	Gilad Edelman
[8]	What should be considered crime in the Metaverse	WIRED	Opinion	David Chalmers
[46]	My Family is Trapped in the Metaverse	WIRED	Opinion	Adrienne So
[27]	The Metaverse Could Radically Reshape Fashion	WIRED	Opinion	Rosalind Jana
[51]	Big Tech Needs to Stop Trying to Make Their Metaverse Happen	WIRED	Opinion	Gian Volpicelli
[13]	Video Games Already Do What The Metaverse Just Promises	WIRED	Opinion	Cecilia D'Anastasio
[41]	What is the Metaverse, Exactly?	WIRED	Opinion	Eric Ravenscraft

BBC was included as the representative of mainstream media articles. CNET is a media site that is focused on technology. YouTube was selected as researching videos makes the literature review more inclusive and YouTube has content from different types of actors. Slashdot is a technology forum and it was included to analyze informal viewpoints. Reddit was selected, as there was a lot of forum threads on Metaverse topics to choose from. WIRED is a website, where writers can publish opinions on concurrent technology topics, so it was included to analyze detailed opinions of tech-aware writers.

For media sites, there would potentially have been other options than BBC and CNET available. However, forums that have a lively Metaverse discussion were hard to find. Popular technology forums such as TechRepublic, AnandTech and TechEnclave did not have discussions on the Metaverse. Slashdot and Reddit were chosen specifically because they had a lot of Metaverse threads. YouTube is an obvious option to find videos on almost all topics. All of the sites that were selected are free to access, except for WIRED, which has a subscription fee. It was included as it had a wide range of detailed Metaverse opinions which are relatively hard to find.

Articles and videos were queried from the data sets with the keyword "metaverse". On Reddit, the threads were searched from a Metaverse-related channel "r/metaverse". On YouTube, in addition to query "metaverse", queries "metaverse microsoft" and "metaverse tedx" were utilized to include viewpoints from different companies and to include speeches on the Metaverse. The selection criteria for the sources was to check that the source brings value to at least one of the research questions. Sources which describe an event that had already been covered by another source were left out as well.

The most relevant data in relation to the research questions were collected into tables. Data tables were formed for each research question and they contain one column for the sources and columns for the relevant data that were searched from the sources. The unprocessed tables are presented in appendix A. A thorough explanation of the main findings related to the research questions, as well as charts that visualize the findings, are provided in Chapter 4.

There are limitations in the chosen methods. The most evident limitation is the selection bias in regards to the chosen data sets. It can be argued that some other data sets would have been more inclusive or insightful. The results of the research might have been significantly different, if different data sets would have been chosen. The analysis of sources such as forum threads is also prone to misinterpretations.

# 4 Results

This chapter presents the findings of the research. Because of the interpretive nature of the research, this results chapter also includes interpretation of the results, even though it usually belongs to the discussion chapter. The chapter has been divided into five sections. The first four sections present the relevant findings to the four research questions. Section 4.1 explains who are discussing the Metaverse and how these people were classified into groups based on their similarities. Section 4.2 looks into the definitions that were presented in the sources and compares how the definitions by different groups differ from each other. Section 4.3 summarizes the activities that were described on the Metaverse-related sources. Section 4.4 examines the opportunities and problems that are expressed in the sources. Finally, section 4.5 is an additional section that looks into agreements and disagreements in the referenced forum threads, to get a better idea on the content of the forum discussions.

## 4.1 Who Are Discussing the Metaverse?

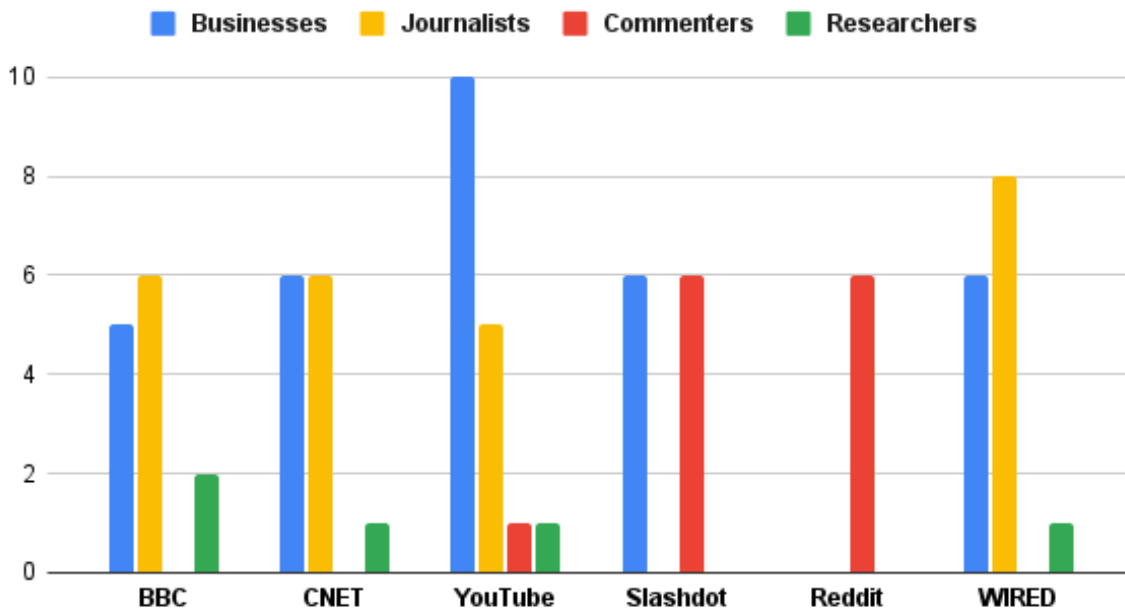
To answer the question of who are discussing the Metaverse, each actor, i.e. a person or an organization, which could be identified from the sources, was recorded in a table. The full table of identified actors by each source can be found in the appendix from table A.1. The actors were classified into distinct actor types based on characteristics that are explained in this section.

There are three types of actors, which are authors, interviewees and discussed actors. A difficult design choice was made to not separate these concepts when using the actor types as labels for charts. The least favorable option would have been to choose one of these subtypes and ignore the others in analyses. Sometimes the author of the source gives definitions and mentions activities, while sometimes the author just reports on some discussed actors' definitions or activities. Therefore to make separate tables and charts for all of the different scenarios seems overly complicated compared to identifying all of the actor subtypes as just actors.

The following actor types were identified from the sources:

1. Businesses
2. Journalists
3. Commenters
4. Researchers

### Actor Types on Different Source Pages



**Figure 4.1:** The occurrences of the actor types on each source site.

Businesses are a common type of actors which can be found from the sources. First of all, there are Metaverse companies, such as Meta and Microsoft who are building the actual Metaverse infrastructure and ecosystem [37][11]. Then there are companies and individual entrepreneurs who aim to make money by investing or creating content into the Metaverse. They operate inside the ecosystem which is being created by the Metaverse companies [7][5]. Finally, there are non-technological companies, such as Disney, Gucci or Walmart, which are expanding their business into Metaverse products [28][58][56]. It was a difficult design choice to decide whether these subtypes should be counted as different actor groups or not. However, it is difficult to justify differentiating entrepreneurs from companies,

because both kinds are involved in content creation into the ecosystem. Therefore they are merged into one actor group in this thesis, but the nuances are acknowledged in the analyses of other research questions. As can be seen from figure 4.1, companies are the most common actor group that is showing up in the sources. A notable observation from table A.1 in the appendix is that Meta has clearly the most occurrences of all of the items in the sources.

Journalists are discussing the Metaverse as authors in many sources that are included in the data set. They often have to define the Metaverse in their articles and they need to describe Metaverse activities and sometimes even participate in them to get first-hand experiences. Some journalists are also opinionated, especially in the WIRED articles [51], and thus active participants of the Metaverse discussion.

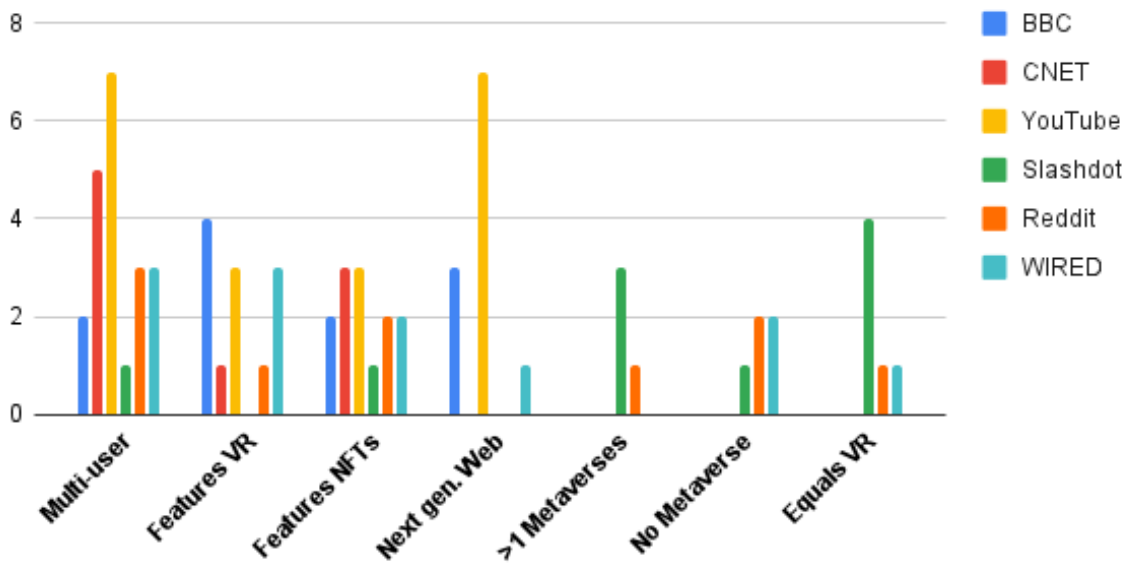
The anonymous authors of the messages in forum discussions are referred to as commenters. In contrast to companies and journalists, they could be seen as the representatives of the public opinion. Many of the commenters are critics, while many others seem to have an entrepreneurial mindset. However, a design choice was made to not separate different types of commenters into different actor types, because it would require too big of a leap in interpretation when there is no proof of who these authors are.

Researchers are also discussing the Metaverse. Because this research analyzes sources outside of research papers, researchers do not appear in the sources as authors. However, for example Dr. Emily Lindsey commented on utilizing virtual models of extinct animals in museums and philosopher David Chalmers appears in two sources giving statements on the Metaverse [2][47][8]. As expected, figure 4.1 shows that researchers are sometimes featured in articles and videos, but not in forum threads.

## 4.2 How Do Metaverse Definitions Differ?

To answer RQ2, each source was analyzed in order to extract their definitions of the Metaverse. The definitions are logged into table A.2 in the appendix. For most articles, it was straightforward to find a definition, but for most threads, it required interpretation of the comments. Figure 4.2 visualizes the occurrences of the most used Metaverse definitions on different source sites. The sites were chosen as the y-axis values of the chart instead of the actor types, because a vast majority of the definitions were given by the journalists while only a few sources included definitions of the businesses.

## Metaverse Definition Occurrences on Different Source Sites



**Figure 4.2:** The occurrences of the most popular Metaverse definitions in the source sites.

The first observation that can be made from figure 4.2 is that a large number of the sources include a notion of the Metaverse being an online multi-user environment ("Multi-user"-label). Therefore this aspect can be seen as a widely agreed property of the Metaverse. Many definitions also specify that the Metaverse is a 3D environment.

In the Metaverse Manifesto, Mark Zuckerberg defines the Metaverse as an embodied Internet, where you are in the experience [37]. According to Zuckerberg, the Metaverse is the 3D successor of the Internet. Journalists, such as [36], have expressed being worried about the narrative which suggests that the Metaverse is the culmination of the Internet's evolution from static pages to interactive social media and now to embodied experiences. It paints a picture that the Metaverse is a paradigm shift with novel functionalities.

Microsoft's Satya Nadella sees the Metaverse being essentially a way to embed computing into the real world and embed the real world into computing [22]. His presentations in [22] and [11] introduce the Metaverse as a tool for productivity, often in a workplace scenario, while Zuckerberg focuses on coming up with new ways of connecting people especially in their spare time [37]. As Microsoft's video [11] shows how their Metaverse technology can be applied at companies, such as the Nth Floor Metaverse at Accenture, it can be interpreted that they may be profiling their Metaverse as a tool for enterprises. Meta on

the other hand seems to currently aim mainly for the same audience as Facebook did, which are private users who want tools to socially connect with people.

On the other hand, figure 4.2 shows that forum commenters, especially on Slashdot define the Metaverse just as virtual reality ("Equals VR" -label). This means that they do not think that there is any difference between VR and the Metaverse. For example, in the Slashdot thread on Samsung's failed event in the Metaverse [42], a commenter wonders how "virtual reality" has turned into "Metaverse" in our culture, after Facebook's rebranding. The definition of the Metaverse as being equal to virtual reality is in conflict with Meta's vision for the Metaverse, which promises future novelties in many types of use cases.

Figure 4.2 shows that many definitions equally from different source sites view the Metaverse as a platform for using NFTs ("Features NFTs" -label). For example, the CNET article on Yuga Metaverse shows the possibility that popular NFTs may even give birth to new Metaverse platforms [4]. The recent hype on NFT collections has therefore made some collectors become interested in the Metaverse as it would allow them to put their NFTs into use in digital worlds.

There are also different interpretations on whether the Metaverse is a singular hypergrid or are there many Metaverses. From most of the definitions, it is difficult to interpret what kind of structure the Metaverse is actually believed to have. Definitions that are describing the Metaverse as a virtual world can be interpreted in many ways, so the reader cannot be sure whether the world is interconnected with other worlds. However, as seen in figure 4.2, there are a fair few sources that describe the Metaverse either as a next-generation Internet or use the word "interconnected" ("Next-gen Web" -label), which implies that the Metaverse is not just an isolated environment.

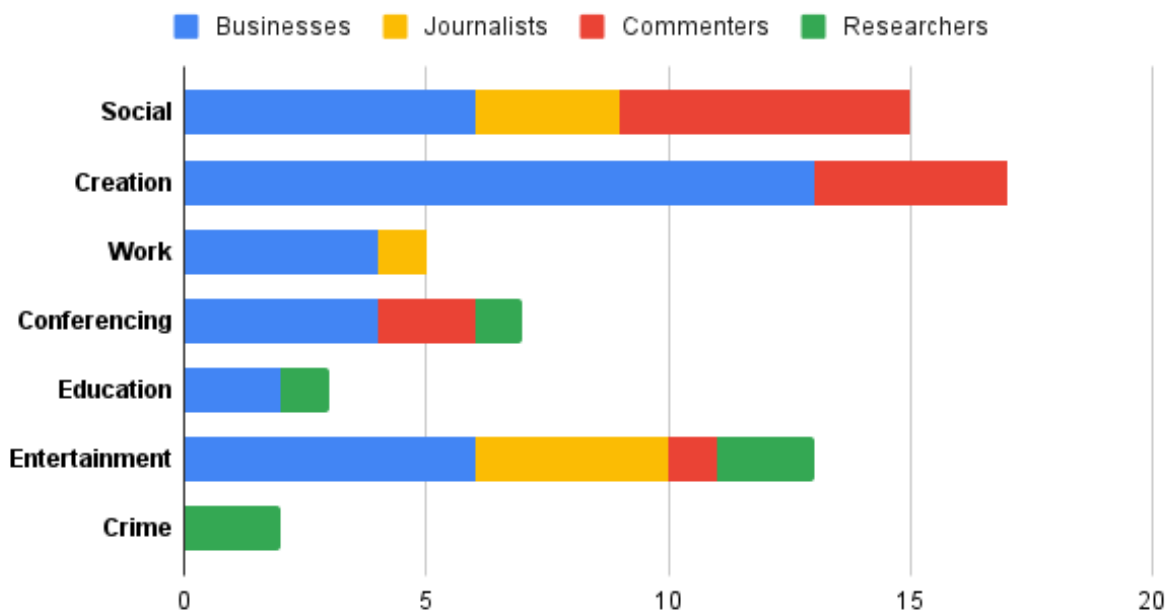
As seen in figure 4.2, some forum threads and articles claim that the Metaverse actually does not exist ("No Metaverse" -label). Critical commenters and journalists often critique the Metaverse as being just hype without an actual product. For example, Gian Volpicelli points out in his WIRED opinion, that Meta's examples of participating in a concert as a hologram or playing chess with a hologram of a friend in AR are not scenarios that would be possible with the current products [51]. If the Metaverse is defined as a hypergrid, then it is also true that the Metaverse does not currently exist. However, some commenters also hold the belief that there already are a lot of Metaverses (">1 Metaverses" -label). For example, a commenter in the Slashdot thread on Metaverse security [38] points out that there are different kinds of Metaverse applications already, which all have different security systems, like Second Life and Microsoft's demos.

### 4.3 Activities in the Metaverse

This section goes through the findings on what people are doing or plan to do in the Metaverse. To answer RQ3, the main activities that were mentioned in each source were documented into table A.3 in the appendix. The activities and the actor groups who are discussing them are visualized in figure 4.3. The activities have been classified in generalized categories to keep the chart readable.

When looking at Metaverse activities, forum threads are especially interesting to look at, as the commenters have the possibility to express in their own words, which activities they are interested in. The Slashdot threads from the data set were mostly discussing Metaverse companies, but the Reddit threads included activity-focused threads, which are mentioned in this section.

#### Activities by the Actor Groups that Discuss Them



**Figure 4.3:** The chart includes the identified activity categories and the colors show which actor groups are discussing them.

The "Social" -label in figure 4.3 refers to social interaction between the users in their free time. It is the 3D version of messaging with people on current social media applications. Meta is showing off the social aspect of their Metaverse plans with a section in their video where the users are hanging out in a spaceship environment and messaging and video



calling their friends via a Messenger screen inside the virtual environment [37]. Events and concerts are some specific examples of social activity in the Metaverse. Meta's video also includes a future vision of participating in a real life concert as a hologram [37]. However, what cannot be seen from the chart but is evident when analyzing the sources in more detail is that the commenters are only discussing a very narrow group of activities compared to what is being advertised by Meta. Namely, Metaverse concerts have gotten genuine interest from Reddit commenters who discussed their experiences on concerts that they have attended on VR [24]. Metaverse events have also gone wrong as seen in the Slashdot thread, where people were unable to enter Samsung's metaverse event on Decentraland [42].

As seen in figure 4.3, the most common activity type that occurred in the sources is creation. This refers to people creating NFT content into the Metaverse, either by using the creator tools provided by the Metaverse application or by using external 3D-modeling tools. Creative activities are discussed equally by large Metaverse businesses, individual Metaverse entrepreneurs and forum commenters [37][7][57]. NFT creation has been discussed for example in a Reddit thread, which was created by someone who wanted to know what skills are beneficial for making money in the Metaverse [57]. Mark Zuckerberg also points out that Metaverse has the potential for enabling new creative jobs, as some traditional jobs die out due to automation [37]. The CBS documentary introduces many Metaverse entrepreneurs, for example Jaiden Stipp, a 15-years-old NFT creator who has made over one million dollars by creating NFT artwork [7]. Any creative activity that is performed by businesses in the Metaverse is driven by customers who are interested into collecting and shopping NFTs.

The data set contains four sources that focus on Metaverse fashion [58][3][25][27]. In figure 4.3, fashion has been merged into the "Creation"-label, as it can be considered a subtype in this activity category. As people spend more time in virtual environments, the importance of digital clothing increases [29]. Metaverse fashion is created by businesses ranging from companies to entrepreneurs. Companies such as Gucci, Nike, Vans and Ralph Lauren are all involved in selling NFT clothes in the Metaverse [58]. In some cases, fashion houses may team up with Metaverse companies to produce a batch of related virtual and real life clothing, such as Balenciaga's limited edition clothing on Fortnite and real life [58]. Fashion entrepreneurs have also formed businesses and startups such as Dematerialized, which was introduced in the Bloomberg documentary [3]. In addition to being able to wear NFT outfits in the Metaverse, people can add their NFT clothes

on their social media pictures [3]. A skeptical thread was posted on Reddit on whether individual fashion designers could profit from the Metaverse, but some were also claiming to be in the business already [25].

Real estate business is a commonly discussed activity in the Metaverse. It is also a subtype of the "Creation"-label in figure 4.3, as it concerns creating NFTs. This can include creating buildings from scratch or buying land or property, and then either renting or selling it. A Reddit thread was started by an architect who was learning to create real estate into the Metaverse [26]. Both, individual entrepreneurs and companies, are investing in Metaverse real estate. CNET article [5] reports an entrepreneur "Clerkclirk" investing 92.000 dollars into 70 properties on Worldwide Webb Land. The same article also mentions Republic Realm, a digital real estate company that invested in 913.000 dollars worth of land in Decentraland.

Meta and especially Microsoft are discussing working in the Metaverse in videos that are included in the data set [37][20][22][11]. Horizon Workrooms is Meta's environment for having meetings with colleagues and for isolating oneself from a noisy environment to focus on work [37]. Doing computer work such as programming or writing emails in the Metaverse can be implemented by MR-glasses that show the virtual workroom and computer screen, while letting through the vision of the keyboard (and your own hands) from the physical environment, to make typing easier. As seen on Microsoft's video, the Metaverse can also be used in factory work and stores by utilizing AR-visualization and statistics on the work environment [11]. Figure 4.3 shows that working is discussed by the businesses, but the commenters neglect it completely. This could be an important sign of disinterest about working in the Metaverse by the commenters.

Conferencing in video meetings has become a cornerstone of working during the Covid pandemic and it is discussed by businesses and commenters as seen in figure 4.3. It can also be utilized on free time by sometimes meeting people immersively in the Metaverse instead of a message or a call. Mark Zuckerberg points out in Lex Fridman's interview, that meetings in the Metaverse are more advanced than on Zoom, as you can have side conversations with a smaller group, due to spatial audio [20]. In the Harvard Business interview, Microsoft's Satya Nadella talks about hybrid work, which has become the default way of working in many industries during the Covid pandemic [22]. Microsoft uses workrooms, where there is a webcam for each person, and people who join via Teams can see them in their own windows, with links to their work profiles for contacting. Microsoft also utilizes their AltSpace Metaverse platform for VR meetings and Accenture uses a

global workspace called Nth Floor in AltSpace, where people can meet their colleagues. The data set also includes a Reddit thread on whether people prefer conferencing in a Metaverse application instead of a video meeting and there were posts arguing for and against [23].

The Metaverse can be also used as a learning tool in education. Meta introduces use cases such as immersive learning experiences and practicing dangerous tasks in the Metaverse [37]. Educational institutes such as museums could also benefit from the Metaverse technology. For example, the Natural History Museum of Los Angeles has been working with the University of Southern California to create virtual models that could be used to visualize extinct ice age animals [2].

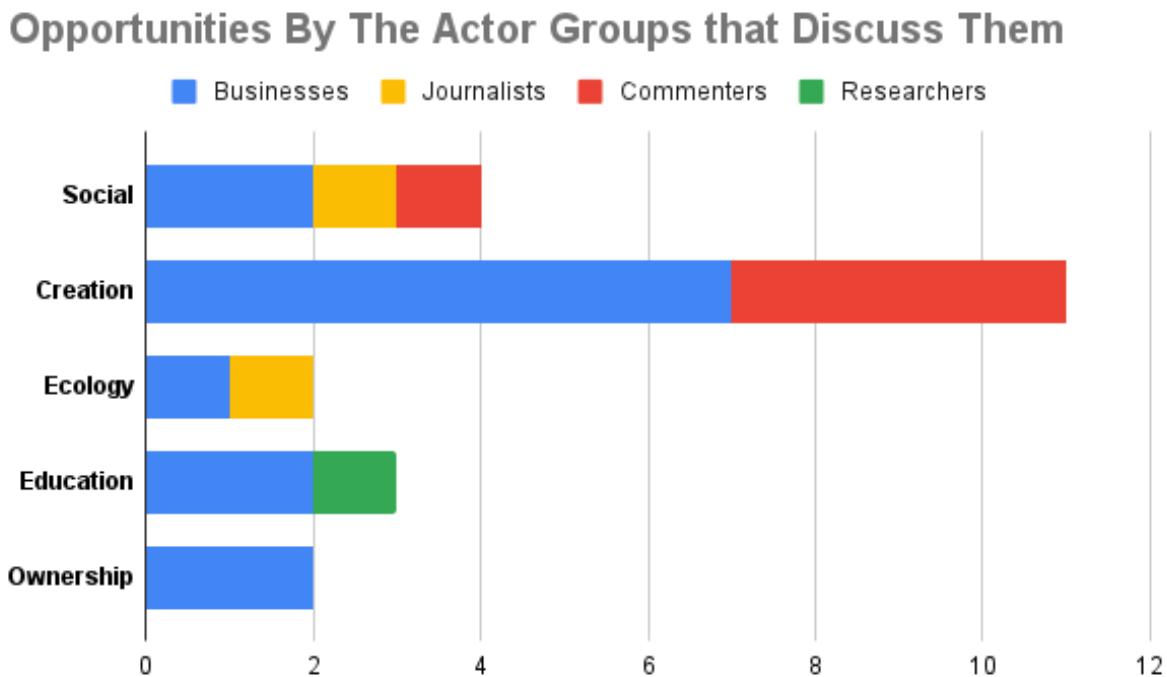
As can be told from figure 4.3, entertainment is being discussed a lot by businesses and journalists. In Lex Fridman's interview, Mark Zuckerberg points out that gaming has often been the driving force in paradigm shifts of computing [20]. Adrienne So describes in a WIRED opinion how her family, including kids, have benefited from Metaverse games while meeting friends was limited during the Covid pandemic [20]. However, the data set surprisingly does not contain much forum discussion on gaming, but perhaps VR-gaming threads could be found with other queries than "metaverse". Also the movie industry is interested in the Metaverse, as for example Disney plans to expand to the Metaverse, because it opens new immersive possibilities in storytelling [37].

Adult entertainment is a subtype of entertainment that can be found on many current Metaverse applications. BBC's researcher Jess Sherwood entered VRChat, pretending to be 13 years old, and still came across people who were performing cybersex as their avatars [12]. Adult content covers a vast amount of the Internet and it will be present in the Metaverse as well.

Like in Internet, crime is also present in the Metaverse. Some researchers are discussing cybercrime in the Metaverse as shown in figure 4.3. David Chalmers' opinion on WIRED concerns Metaverse criminality [8]. Harassment exists also in video games, but it is more harmful in the Metaverse, as the experiences are more immersive and realistic. Virtual theft, i.e. stealing someone's property in the Metaverse, is also a serious threat to consider [8]. As seen from examples such as real estate, Metaverse property can be expensive, so virtual theft can have serious financial impact on the victim.

## 4.4 Metaverse Opportunities and Problems

To get an overview of the sources' viewpoints, this section looks at opportunities and problems that were expressed in the sources. This section provides the results related to RQ4. The opportunities and problems that were identified have been listed by each article in table A.4 in the appendix. Figure 4.4 visualizes the opportunities and the actor groups who are discussing them, while figure 4.5 visualizes the problems in the same way.

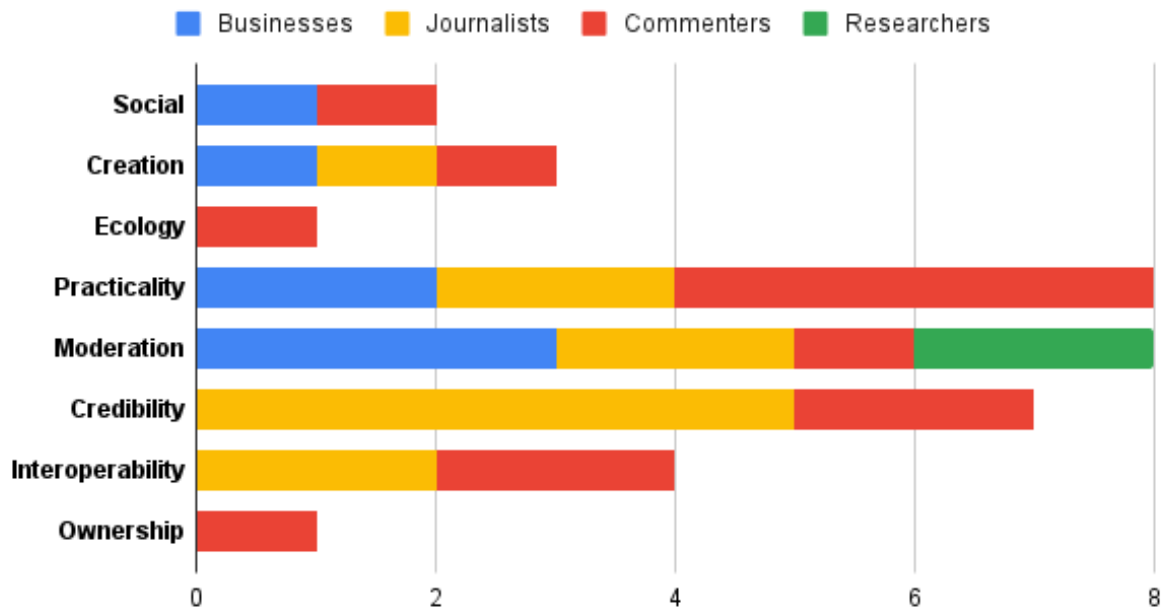


**Figure 4.4:** The chart lists the opportunities that were discussed in the articles and the colors show which actor groups were discussing them.

The Metaverse has gained momentum during the Covid pandemic, as people have been in quarantine. This correlates with figure 4.4, as the Metaverse is seen to have social opportunities by different types of actors. In a WIRED opinion, Adrienne So describes how using Metaverse technology has helped her kids to spend time during the pandemic [46]. CNET's article on the gaming industry in the Metaverse points out that scrolling on social media oftentimes feels lonely and the Metaverse has the opportunity to fix that [44]. However, the same article also states that Metaverses such as Second Life have been around as long as social media but have not become as popular. It is still a question mark how well people are going to adapt to the new immersive technology. Adaptation

problems are also pointed out in forum threads, for example, a Slashdot commenter states that people do not want to communicate as avatars [17]. Further, a Reddit commenter who works as a technical support person is skeptical on how non-technical people would learn to participate in Metaverse meetings, when they are already facing problems in video meetings [23].

### Problems by the Actor Groups that Discuss Them



**Figure 4.5:** The chart lists the problems that were discussed in the articles and the colors show which actor groups were discussing them.

As told in the previous chapter, the Metaverse has potential business opportunities for many sorts of entrepreneurs such as fashion designers, real estate investors, architects and artists [3][5][50][7]. This trend can be identified from figure 4.4 as the "Creation"-label is clearly the most commonly mentioned opportunity in the sources. However, as seen in figure 4.5, people are also seeing few problems that threaten the success of NFT businesses ("Creation" -label). In CBS's documentary, the downside of the Metaverse business was revealed as Ethereum's value dropped significantly, causing issues to Metaverse entrepreneurs [7]. A Reddit commenter also points out that cryptocurrency has been around for over 10 years, but it still cannot be used for most payments, which may indicate that people do not find it a trusted or convenient method for paying [26]. People may find NFTs a hoax with no real value in the long term, as NFT artwork can be saved by non-owners too [4]. Despite the critique on NFTs, they have sold over 25 billion dollars in 2021 [4].

Further, compared to real life the possibilities on what can be created are limitless. For example, fashion designers can design clothes that are able to change shape and color [58]. Likewise, architects can design buildings that would be against real life physics [50].

Figures 4.4 and 4.5 show that the data set includes few mentions of the Metaverse's effects on ecology. According to Mark Zuckerberg, work in the Metaverse is ecological due to eliminating commuting pollution [37]. A similar argument is presented in Bloomberg's documentary on Metaverse fashion, as it claims that producing digital garment emits 97% less CO<sub>2</sub> compared to real life fast fashion [3]. While businesses like Meta present the Metaverse as ecological, some commenters have an opposing view. For example, a Reddit thread on Walmart's plans to expand into the NFT business raises concerns about the energy consumption of the blockchain technology that powers NFTs [56].

The Metaverse could also create new possibilities in education. It is promoted by few examples expressed by businesses and one example expressed by researchers, like seen in figure 4.4. Brian Jung mentions in his TEDx talk that virtual universities could provide a more cost-efficient way of education, especially in countries where going into college has high annual fees [29]. Visualizing historical environments and animals in the Metaverse offers an immersive alternative to books [2][37]. It is also safer and more efficient to practice dangerous crafts, such as surgery, in the Metaverse when starting out, like mentioned in Meta's video [37].

Figure 4.5 reveals that many commenters, journalists and even some businesses see the impracticality of the current Metaverse devices as a problem. Even though HMDs have become affordable, it is unknown how much advanced Metaverse gear will cost in the future. In CNA's documentary, a VR gaming room's full body tracking gear is said to cost six digit dollars per one player [10]. Many people also find contemporary HMDs impractical in many ways. For example, in Wall Street Journal's video, Joanna Stern tried the Metaverse for 24 hours and reported motion sickness and poor battery life of the devices, as she had to constantly change into a charged HMD during the challenge [55]. Further, in a WIRED interview, Linden Labs' Philip Rosedale calls HMDs "actually terrible" as they are currently bad at capturing non-verbal expressions, such as nodding [16]. However, Mark Zuckerberg believes that avatar expressiveness and realism improves a lot in the near future [20][37]. Finally, a Slashdot commenter writes that HMDs and the Metaverse will be a niche market compared to social media apps for mobile phones, simply because it is impractical to enter the 3D world compared to taking the mobile phone out of your pocket, for example while commuting [59]. In other words, many people

are skeptical on whether HMDs or other similar Metaverse gear will be adopted by the mainstream like mobile phones, or not.

Zuckerberg admits that privacy and safety need to be built into the Metaverse from day one [37]. However, harassment is already a problem in existing Metaverse applications such as VRChat [12]. This raises the question of who will be in charge of moderating people's behavior in the Metaverse. These types of problems are shown next to the "Moderation" label in figure 4.5 which shows that they are discussed by each actor group. Facebook does not seem to be trusted by many for this responsibility, as for example, a Slashdot commenter accuses Facebook of using such moderation robots that censor content inaccurately [59]. Meta's business model with Facebook relies largely on advertisement and in WIRED's interview, Linden Labs' Philip Rosedale says that he finds it very bad, if the outcome of the Metaverse includes behavioral ad targeting by Meta [16]. A YouTube video on the channel Aperture says that the same technology that connects us is going to keep us apart [1]. The video predicts that the algorithms, which are keeping social media users hooked to the product by showing mostly content that the user agrees on, and which are targeting ads to the user, are going to be implemented in the Metaverse as well.

As observed in chapter 4.2 many people think that the Metaverse does not exist. Figure 4.5 reveals that the overall credibility of the Metaverse as a concept is questioned by journalists and commenters. Gian Volpicelli writes in his WIRED opinion that Metaverse is hype without a concrete product [51]. Likewise, Eric Ravenscraft critiques Meta for including various scenarios in their introductory video ([37]), such as participating in a live concert as a hologram, which simply do not exist at the moment [41]. Current Metaverse platforms sometimes struggle even with seemingly simple scenarios, for example commenters of a Slashdot thread gave critique to Metaverses as Samsung's event on Decentraland failed to let many people enter the conference [42].

Interoperability between Metaverse companies would be a requirement to achieve a Metaverse as a hypergrid. A CNET article by Steven Shankland argues that the Metaverse will remain a multi-platform environment instead of true interoperability for the same reason as why messages aren't sent between WhatsApp and iMessage [43]. A Reddit discussion has also been made on whether current technology even enables migrating NFT clothes and items between different styles of metaworlds, and answers have been sent for and against the possibility [49]. Figure 4.5 shows that interoperability is seen as a problem for the Metaverse by some journalists and commenters.

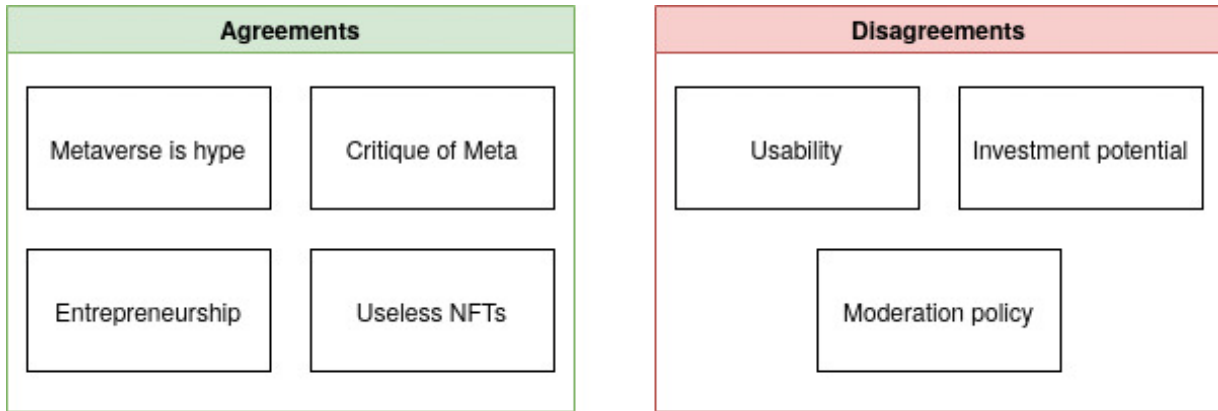
Finally, few sources mention opportunities or problems related to Metaverse ownership, as seen in figures 4.4 and 4.5. In his TedX talk, Metaverse entrepreneur Artur Sychov talks about the opportunity of people owning their virtual identities and property in an NFT-based Metaverse [48]. In traditional games, the items that the players buy are owned by a central authority, which is the game company and the items will be lost if the gaming company stops existing. Sychov argues that NFTs are different, because the NFT stays in the blockchain even if a Metaverse company stopped existing. In Sychov’s ideal Metaverse, we would own our virtual identities and social media companies would not have a chance to sell our data. At the same time the exact opposite seems to be happening, as most of the sources of the data set discuss Metaverse projects where the big tech is highly involved. Mark Zuckerberg says that we are going to make the Metaverse together and welcomes content creators to use their Metaverse platforms [37]. However, this might not happen without compromises, as for example Roblox taxes 30% of each transaction happening in their ecosystem [58]. Some commenters are worried that the Metaverse ecosystem will be owned by an oligopoly, i.e. a couple of large companies that have control over the market. For example, a Slashdot commenter thinks that the Metaverse will probably be run by a conglomerate of corporations, which may be exploitative [38].

## 4.5 Agreements and Disagreements in Forum Threads

To gain more insight from the 12 forum discussions that were included in the data set, this section presents the main points of agreement and disagreement between the commenters in the threads. The most important observations have been collected into table A.5 in the appendix, where each row includes the reference to the article, the main point of agreement and the main point of disagreement, if there were any. The main findings are visualized in figure 4.6.

Especially in the Slashdot threads, the general opinion seems to be that the Metaverse is hype and a bad idea overall. For example, in a Slashdot thread about a gaming veteran giving critique to Facebook’s Metaverse vision, a commenter says that they use VRChat already and cannot see Facebook’s Metaverse being more than just hype [17]. Big Metaverse companies, especially Meta, are often criticized and seem to be disliked. For example, a commenter says that they are not sad about seeing Facebook sinking as they do not like the platform, when discussing Meta spending 500 billion dollars into developing the Metaverse [59].





**Figure 4.6:** Visualization of the main points of agreements and disagreements in forum threads.

One interesting disagreement in the discussions is whether the Metaverse has good usability or not. In a Reddit thread on Metaverse conferencing, a comment with many upvotes states that Metaverse conferences are better than Zoom (a video conferencing application) [23]. However, a comment by a technical support specialist argues that Metaverse conferencing is going to be too complicated for users who sometimes cannot manage video calls either. In the case where Decentraland users could not enter Samsung’s event, Slashdot commenters disagreed on whether the journalist’s skills in using the Metaverse technology were lacking and thus part of the problem [42].

Opinions on Metaverse entrepreneurship were positive for the most part in related Reddit threads. Threads have been created for discussing the opportunities for architects, fashion designers and other creators [26][25][57]. The thread on fashion design gathered answers saying that there is room for fashion designers in the scene and that people are paying for VRChat skins i.e. outfits [25]. Also the thread on valuable Metaverse skills has received many comments telling that 3D asset design is valuable because the Metaverse needs products [57]. However, one commenter in the same thread points out that the gaming and Metaverse scene has a lot of entry level projects, so there is a lot of competition, but this comment was considered an outlier and entrepreneurship was added into the agreements-section in figure 4.6.

A Slashdot thread on Meta spending a lot of resources on Metaverse contained disagreement on whether the Metaverse has investment potential or not [59]. One commenter defends Meta by writing that social media trends come and go, so it makes sense for Meta to tune into the new trend before the previous one vanishes. Other commenters counter this by implying that VR technology has already been around and has not made a breakthrough, even though many large companies have tried to market their products.

The "Useless NFTs" label in figure 4.6 points to the fact that the commenters find certain NFTs useless. For example, the news on Walmart trying to get into the Metaverse business received negative feedback on Slashdot [56]. Some commenters find it impossible to justify the infrastructure's energy consumption just to exchange images. Further, one commenter finds it hard to imagine what Walmart could sell as an NFT.

In a Slashdot thread on Meta's problems, there was a sub-discussion on whether Meta has a proper moderation policy for censoring content [45]. Some commenters think that Meta is in a difficult position to act correctly as people will get angry when controversial posts are being censored and also when they are not censored. Some think that censoring is not something that Meta should be doing at all. One commenter also points out that Facebook is likely to show content that makes the user angry, in case they reply something into it. Censorship issues are likely going to be relevant in the Metaverse as well.

# 5 Discussion

To recap, the research aim of this thesis is to study people's viewpoints on the Metaverse from a variety of gray literature sources. RQ1 asks who are discussing the Metaverse. RQ2 is about finding out how different actors' definitions of the Metaverse differ from each other. Then, RQ3 asks which activities people are doing in the Metaverse. Finally, RQ4 relates to the opportunities and problems that people see in the Metaverse.

The analysis for RQ1 identified 4 distinct actor types that can be identified from the data set. The actor types include businesses, journalists, commenters and researchers. The results for RQ1 provide a broad framework on what types of people are discussing the Metaverse. However, the classification of the types is partly subjective. Some generalizations have to be made to keep the framework from becoming overly complicated. Like said in section 4.1, difficult design choices regarding the actor types included not differentiating between authors and discussed actors, and merging companies and entrepreneurs into the business-type. As there are many ways to classify the actors, they may need re-evaluation in future studies.

In hindsight, it would have been beneficial to spend more time on planning how to find sources that come directly from the people who are using the products. Forum threads were the representatives of the public opinion in this thesis, but it is possible that a large number of the commenters have never actually used Metaverse products but are still criticizing them. Further, even though businesses are the most referred actor group, they are mostly discussed on other sources than the companies' own artifacts, apart from the YouTube presentations published by Meta and Microsoft (one of each were included). For future research, it would be beneficial to consider carefully how to find more sources directly from businesses.

The data for RQ2 suggests that most people agree that Metaverse is an online 3D virtual world. Another finding is that many commenters and some journalists, do not see a difference between VR and the Metaverse and some even state that the Metaverse does not exist. As discussed already in the background, recent research papers such as [33] present a scientific definition for the Metaverse as an interconnected co-existence of the digital and the physical. However, the findings in this thesis suggest that peoples' definitions of the

concept might be significantly different from the scientific definitions. When studying the Metaverse as a phenomenon, this observation may be beneficial to future research.

The activity categories that were identified for RQ3 are socialization, NFT creation, entertainment, conferencing, work, education and crime. While the analysis on forum threads suggests that some people are genuinely interested in Metaverse concerts and NFT creation (in fashion and real estate), activities such as working seem to be promoted by Metaverse companies and neglected in the forum threads. As stated before, studying Metaverse activities has practical value to the Metaverse industry. The conducted research suggests that there are imbalances between what is being marketed and what people are interested in, but due to the small sample size of this research, these observations would need to be confirmed by a more thorough study. One topic for future research would be to only analyze informal discussion, such as forum threads, with a selection criteria that the sources must contain statements on what people are or are not interested in doing in the Metaverse.

Finally, the data for RQ4 suggests that the most prominent opportunity that people are seeing in the Metaverse is the possibility for Metaverse entrepreneurship in many areas such as fashion design and architecture. The main problems that people see in the Metaverse are the impracticality of the current gear and products, moderation regarding censorship and overall credibility of the concept. There were many more observations on the opportunities and problems in section 4.4 but due to the small scope of the study, certainly many more are left to find in gray literature. The observations would deserve being studied separately, for example thorough studies on Metaverse's effect on ecology or on the changing career landscape would be valuable to make. The problems that people expressed in the sources, such as people seeing Metaverse gear as impractical or people being skeptical about how the Big Tech companies are going to cooperate, could give the industry some points to think about and address in their work. After all, it should be worrisome to the Metaverse companies that so many of the forum commenters seem to think that the Metaverse is just hype or a bad idea, as explained in section 4.5 about the points of agreement in threads.

# 6 Conclusions

This chapter concludes the thesis by explicitly answering the research questions that were presented in the introduction. It also includes a brief evaluation on the limitations of the research and on how the results may be useful.

The existing research gap is that practically no research has been done on Metaverse-related gray literature. This thesis contributes to the field by conducting a gray literature review which includes 44 sources from 6 different websites. This research managed to make observations on how people's definitions of the Metaverse differ, which is valuable in understanding the phenomenon. The findings that this research made, which relate to Metaverse activities, opportunities and problems can be found valuable in product design in the Metaverse industry.

RQ1 asked who are discussing the Metaverse. The research suggests that there are four actor types discussing the Metaverse, which are businesses, journalists, commenters and researchers.

Then RQ2 was about how the different actors' definitions of the Metaverse differ from each other. This study found out that most sources define the Metaverse as an online 3D virtual world. However, the key finding related to RQ2 was that many commenters and some journalists held the belief that there is no difference between virtual reality and the Metaverse, or even that the Metaverse does not exist.

RQ3 was asked to find out which activities people are doing in the Metaverse. The results include the following activity types; socialization, NFT creation, entertainment, conferencing, work, education and crime. The key finding related to Metaverse activities was that while NFT creation and particular social applications like concerts were found interesting by commenters, activities such as work seem to be hyped mostly by businesses.

Finally, RQ4 raised the question on which opportunities and problems people see in the Metaverse. Few opportunities were identified, from which the most occurring was the opportunity for Metaverse entrepreneurship in subjects like architecture and fashion. Many problems have been raised in forum discussions and articles and the most crucial problem

is that commenters and many journalists do not seem to be interested in the Metaverse due to the clumsiness of the gear and impracticality of the current products.

The limitations of the study include a small scope and possible selection bias on the data set. Studying 44 articles may not be enough to generalize the findings, so they would need to be confirmed by similar studies with a larger volume. The scope of the study was restricted by a time limitation of a few months. Further, by selecting a different set of sites, the results may have differed. Therefore the conducted research can be seen as a proof of concept for studying Metaverse-related gray literature. Future studies could repeat the research similarly, but with a different set of questions, possibly coming from a specific angle, or including new types of sources.

The idea for the thesis came from the ongoing hype that followed Facebook's rebranding into Meta in October 2021, the fall of the previous year from writing the thesis. The purpose of the thesis is to gain insight to the trending topic now as it is more popular than before. It is interesting to see how the Metaverse evolves in the following years and decades and whether it will be popularized or forgotten.

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## Appendix A - Unprocessed Data Tables For Results

This appendix includes the unprocessed data tables that were formed while going through the articles to answer the research questions. The calculations for the figures on chapter 4 are based on counting rows with certain conditions from the unprocessed table. Admittedly, it is not straightforward to see how the figures were deduced from the unprocessed tables, as it requires assigning generalized labels to similar items and counting their instances, so adding clearer descriptions of the intermediate steps would be the first thing that would be added if there were no time restrictions for the thesis.

If multiple items that would have been suitable for a certain cell appeared in the source, all of them have not been included in the same table cell to keep the table readable, and instead "." after a cell value signals that there would have been more suitable items for that cell. The titles of the sources were left out from the unprocessed tables, as otherwise the tables would have been too wide to fit the page, but the references-column has links to all of the sources. The entries with value "X" should be interpreted as occurrences without a specification on what the item exactly is, and they are used for the anonymous commenters on the forum discussions.

**Table A.1:** Types of actors.

Ref	Businesses	Journalists	Commenters	Researchers
[53]	Heineken, Nike	Jane Wakefield		
[2]		BBC		Dr. Emily Lindsey
[54]	Meta	Jane Wakefield		
[12]	Meta, VR Chat	Angus Crawford		Jess Sherwood
[28]	Disney	Jonathan Josephs		
[52]	Roger McNamee	Jane Wakefield		
[44]	Meta..	Robert Rodriguez		
[5]	Republic Realm..	Daniel van Boom		
[4]	Yuga Labs	Daniel van Boom		
[58]	Gucci, Vans..	Queenie Wong		
[47]	Meta, Surreal..	Scott Stein		David Chalmers
[43]	Meta	Stephen Shankland		
[7]	Jaiden Stipp..	CBS		
[37]	Meta			
[1]			Aperture	
[22]	Microsoft			
[11]	Microsoft			
[48]	Artur Sychov			
[55]		Joanna Stern		
[3]	Dematerialized..	Bloomberg		
[10]	Vocktail	CNA		Ayesha Kanna..
[20]	Meta	Lex Fridman		
[50]	Everyrealm	Tomorrow's Build		
[29]	Brian Jung			
[38]	Microsoft		X	
[17]	Meta		X	
[59]	Meta		X	
[42]	Samsung		X	
[45]	Meta, Apple		X	
[56]	Walmart		X	
[26]			X	
[57]			X	
[49]			X	
[24]			X	
[23]			X	
[25]			X	
[36]	Meta	Lisa Messeri		
[16]	Linden Lab	Gilad Edelman		
[8]		David Chalmers		David Chalmers
[46]		Adrianne So		
[27]	The Fabricant..	Rosalind Jana		
[51]	Meta, Microsoft..	Gian Volpicelli		
[13]	Meta..	Cecilia D'Anastasio		
[41]	Meta, Microsoft..	Eric Ravenscraft		

**Table A.2:** Metaverse definitions.

Ref	Definition
[53]	Inter-connected virtual worlds, accessed via a VR headset
[2]	Future of the internet
[54]	Wide-ranging Metaverse - accessible via VR headsets -where people could work, play and chat
[12]	Games and experiences accessed by people wearing virtual reality headsets.
[28]	A metaverse is an online world where people can game, work and communicate in a virtual environment, often using VR headsets
[52]	Virtual reality successor to the internet
[44]	Shared, persistent digital space for meetings, games and socializing
[5]	Shared, persistent digital space for meetings, games and socializing
[4]	Metaverses provide a place for NFTs to be put to use
[58]	Virtual spaces where people can work, play and socialize
[47]	Many refer to it as a shared, persistent digital space for meetings, games and socializing
[43]	3D environments we'll occupy that'll include entirely digital zones we'll visit via VR or AR
[7]	A digital world where you can own the digital objects that you have in it
[37]	Embodied internet, where you're in the experience
[1]	Interoperable and immersive virtual universe with one identity per user
[22]	Embed computing into real world and embed real world into computing
[11]	New platform layer and new application type, including the infrastructure and mixed reality applications
[48]	Future iteration of the Internet, made up of persistent shared 3D virtual spaces, with economy
[55]	The virtual world that will usher the next phase of the Internet
[3]	The Internet evolving from 2D into 3D environment, convergence of digital and physical
[10]	Immersive 3D digital world
[20]	Embodied internet, where you're in the experience
[50]	A bunch of virtual worlds where people are represented as avatars and talk, play and trade things
[29]	Three dimensional world that has realistic avatars
[38]	There is no Metaverse / There are multiple Metaverses
[17]	Virtual Reality / Metaverses already exist
[59]	Virtual Reality / 3D online Universe
[42]	"Virtual Reality" has turned into "Metaverse" / Not "the Metaverse" as there already are many
[45]	VR technology
[56]	Environment for NFTs
[26]	3D worlds with user generated content / No Metaverse, just video games with crypto
[57]	A hyper-realistic, virtual environment where gamers and creators are rewarded
[49]	Multiple Metaverses with no interoperable NFT items
[24]	3D environment that enables social events
[23]	Platform for VR conferencing
[25]	Virtual Reality /There is no metaverse
[36]	The next frontier of computing, using many senses
[16]	An ever-present cyberspace in which people will work, hang out and shop as avatars
[8]	Virtual worlds that are part of our everyday lives
[46]	Virtual reality
[27]	3D worlds accessed by VR/AR-equipment
[51]	Does not exist, no one knows what it really will be or what it should look like
[13]	Does not exist yet, a persistent, social cyberspace that intersects with the IRL economy and integrates with other online platforms
[41]	Broad shift in how we interact with tech: VR/AR and digital economy

**Table A.3:** Metaverse activities.

Ref	Activities	Actor	Category
[53]	Shopping, collecting	Businesses	Creation
[2]	Education	Researchers	Education
[54]	Social (translation)	Businesses	Social
[12]	Adult entertainment	Researchers	Entertainment, crime
[28]	Movies	Businesses	Entertainment
[52]		Businesses	Creation
[44]	Gaming	Businesses	Entertainment
[5]	Real estate	Businesses	Creation
[4]	Art collection	Businesses	Creation
[58]	Shopping, Fashion	Businesses	Creation
[47]	Conferencing, games..	Researchers	Conferencing, entertainment
[43]	Gaming, sports..	Journalists	Entertainment
[7]	Creation, real estate	Businesses	Creation
[37]	Social, entertainment..	Businesses	Social, entertainment..
[1]	Social	Commenters	Social
[22]	Work, conference	Businesses	Work, conferencing
[11]	Work, social	Businesses	Work, conferencing
[48]	Socializing, creation	Businesses	Social, creation
[55]	Games, social..	Journalists	Entertainment, social
[3]	Creation, fashion	Businesses	Creation
[10]	Games, dating	Businesses	Entertainment
[20]	Games, social, work	Businesses	Social, entertainment, work..
[50]	Real Estate	Businesses	Creation
[29]	Fashion, work..	Businesses	Creation, work, education
[38]	Social	Commenters	Social
[17]	Games, social	Commenters	Social, entertainment
[59]	Social	Commenters	Social
[42]	Conferencing	Commenters	Conferencing
[45]	Social	Commenters	Social
[56]	Art, shopping	Commenters	Creation, collection
[26]	Creation	Commenters	Creation
[57]	Creation	Commenters	Creation
[49]	Collecting	Commenters	Collection
[24]	Concert	Commenters	Social
[23]	Meetings	Commenters	Conferencing
[25]	Fashion, creation	Commenters	Creation
[36]	Creation	Businesses	Creation
[16]	Shopping, events	Businesses	Social, creation
[8]	Crime	Researchers	Crime
[46]	Painting, games	Journalists	Entertainment
[27]	Fashion, events	Businesses	Entertainment, social
[51]	Work, socializing	Journalists	Work, social
[13]	Socializing, collecting	Journalists	Social, collection
[41]	Games	Journalists	Entertainment



**Table A.4:** Metaverse opportunities and problems.

Ref	Opportunities	Problems
[53]	Famous brands going Meta	Doesn't make sense for food products
[2]	Learning history in VR	
[54]	Universal speech translator	Metaverse moderation
[12]		Harrasment and children being shown adult content
[28]	Storytelling, new opportunity for movie brands	
[52]	Meetings in the Metaverse	Metaverse moderation
[44]	Internet feels less lonely, brands going Meta	
[5]	Real estate for entrepreneurs and companies	
[4]	25 billion spent on NFTs last year, and growing	People suspect NFTs are a hoax
[58]	Unrealistic design possibilities, opportunities for entrepreneurs	30% of NFT price taxed by platform
[47]	Metaverse could be accessed from browser w/o HMD	The concept of Metaverse is intangible
[43]		Interoperability of Metaverses by different companies
[7]	Entrepreneurs: Real estate, NFT, consultation for companies	Crypto volatility, market crashes
[37]	Socializing, gaming, fitness, work, entrepreneurs, education	Privacy and safety from day 1
[1]		Data collection and selling, opinion polarization, Neuralink
[22]	Hybrid work, whiteboarding	
[11]	AR in industry, consumer and enterprise utilization	
[48]	VR. user ownership (NFT) vs. authority, creative jobs	
[55]	Meditation, meetings and gaming	Motion sickness and poor battery life, and eyes hurt
[3]	Digital garment emits 97% less CO2, digital clothes Instagram	Potentially only a niche crowd
[10]	Virtual taste, authentic self expression	Gaming room full body tracking costs 6 digits per player
[20]	Spatial audio, hand gestures, biometric authentication	Avatars not expressive enough, privacy, security
[50]	Real estate, unrealistic designs, modelling for real world plans	
[29]	Human connection, bigger concerts, smaller education fees	Mental health, distorted reality, addiction
[38]		Metaverse will be owned by an oligopoly
[17]		People do not want to communicate as avatars
[59]	Social media companies have to invest into new trends	VR will not become mainstream
[42]		Metaverse still has technical difficulties
[45]	Quest 2 outselling Xbox Series X	Administration and censorship problems
[56]	Business opportunities for non-tech companies	Energy consumption of blockchain and NFTs
[26]	Architects can design buildings into the Metaverse	Technological and financial unstability of cryptocurrency
[57]	Opportunities to benefit from the Metaverse with the right skills	VR and game development have already been around
[49]		NFT interoperability between metaworlds
[24]	Metaverse enables bigger concerts and events	
[23]	Metaverse could replace video conferencing	Metaverse is too difficult for non-technical users
[25]	Opportunities for fashion designers	
[36]		Is Meta going to be a team player, Ideal of "final platform"
[16]	Ad targeting, NFT and blockchain not necessary	Subtle gestures and spatial audio work poorly, congestion
[8]		Virtual harrasment and crime
[46]	Gaming and socializing during lockdown, also for kids	
[27]	Sustainability issues fixed, digital showrooms for RL clothes	
[51]		Hype without a product, no one wants to work in Metaverse
[13]		Metaverse doesn't exist, games already have the features
[41]		Meta advertizes features that do not exist

**Table A.5:** Agreements and disagreements in forum threads.

Ref	Agreement	Disagreement
[38]	Metaverse doesn't exist and is a bad idea	
[17]	Metaverse is hype	Metaverses exist vs. not
[59]	Meta is facing problems	Metaverse is a good investment to Meta vs. not, Name affects stock vs. not
[42]	Metaverse equals VR	Metaverse is too difficult for regular users
[45]	No sympathy for Meta	Meta outsells Microsofts products vs. not, Censoring policy is ok vs. not
[56]	Walmart NFTs are not convincing	Walmart starting NFTs is green vs. not
[26]		Metaverse exists vs. not
[57]	3D asset creation is beneficial in Metaverse	Metaverse asset creation is a viable business for individuals vs. not
[49]		Carrying NFT items between metaworlds is viable vs. not
[24]	Wishes to attend Metaverse concerts	
[23]		Metaverse is better for meetings than Zoom
[25]	Being a Metaverse fashion designer will be beneficial	