

REVIEW

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Metaverse through the prism of power and addiction: what will happen when the virtual world becomes more attractive than reality?

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Abstract

New technologies are emerging at a fast pace without being properly analyzed in terms of their social impact or adequately regulated by societies. One of the biggest potentially disruptive technologies for the future is the metaverse, or the new Internet, which is being developed by leading tech companies. The idea is to create a virtual reality universe that would allow people to meet, socialize, work, play, entertain, and create.

Methods coming from future studies are used to analyze expectations and narrative building around the metaverse. Additionally, it is examined how metaverse could shape the future relations of power and levels of media addiction in the society.

Hype and disappointment dynamics created after the video presentation of meta's CEO Mark Zuckerberg have been found to affect the present, especially in terms of certainty and designability. This idea is supported by a variety of data, including search engine n-grams, trends in the diffusion of NFT technology, indications of investment interest, stock value statistics, and so on. It has been found that discourse in the mentioned presentation of the metaverse contains elements of optimism, epochalism, and inventibility, which corresponds to the concept of future essentialism.

On the other hand, power relations in society, inquired through the prism of classical theorists, indicate that current trends in the concentration of power among Big Tech could expand even more if the metaverse becomes mainstream. Technology deployed by the metaverse may create an attractive environment that would mimic direct reality and further stimulate media addiction in society.

It is proposed that future inquiries examine how virtual reality affects the psychology of individuals and groups, their creative capacity, and imagination. Also, virtual identity as a human right and recommender systems as a public good need to be considered in future theoretical and empirical endeavors.

Keywords: Metaverse, Emerging technologies, Media addiction, Virtual reality, Power

Introduction

Significant investments in the metaverse by leading tech companies, measured in billions of dollars, indicate that humanity's next emerging global trend is on the horizon [1]. Presented as the future of the Internet, the metaverse is a combination of different virtual spaces united in a 3D universe, empowering its users to work, meet, game, and

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socialize [2]. The new metaverse is intended to be a quantum leap toward virtual and augmented reality (VR and AR), supported by all existing technologies such as blockchain, 5G, and AI. Evolutionary progress of both hardware and software will offer a new experience that will be called “a progression of virtual worlds” as a replacement or substitution for direct reality, which is an ongoing trend [3–5]. Current and emerging technologies such as artificial intelligence and blockchain, represented by NFT (digital objects), sensory-rich environments, virtual reality headsets, and brain-computer interface (yet to be fully developed), are envisioned to be embedded in the foundations of the metaverse [2, 6–8].

Although virtual reality has been exploited as a concept throughout the 1980s as in technoscience and in literary works, the term “metaverse” was coined in the science fiction book *Snow Crash* [9]. The story depicted the interaction of humans through avatars on the street, which was space owned by a single corporation. After that point, there have been many stories, films, and other pieces of art and entertainment related to virtual worlds and the struggle between dystopian control of machines and human anarchist-survivalists.

Ongoing global wars, dreadful pandemics, ecological challenges, and economic regrouping may also be in line with the development of the metaverse, which could provide answers to some of these issues [10–12]. For example, decreasing public transportation and the use of personal vehicles can help deal with climate change. The same can be said for the spread of viruses, which are seen as a threat in the future as well [12].

The metaverse is intended to introduce the new economy and governance transcending countries and territories, thus fundamentally changing the world as it is known today [13]. The new emerging digital economy is represented by utility tokens, virtual collectibles (NFTs), and crypto wallets, such as Trust Wallet and MetaMask [1]. Apart from these economic-related concepts, blockchain technology is also envisioned to provide a basis for the system of global governance [14].

The essential AI technologies that will serve as the basis for the metaverse include visual perception, speech recognition, decision-making, and language translation. Through learning from humans and their digital footprints for the last 30 years, AI algorithms have acquired the knowledge needed for the metaverse to be set up. Examples of these are Google’s question-and-answer algorithm based on its search engine, as most human beings are unconscious volunteers through their trillions of searches [15]. After this, Facebook launched its social networking platform, which was also used to capture data useful for AI to learn more about people, their wants, desires, and the connections between them. One of the

pillars in the game of all-pervasive AI is GPT-3, which uses billions of textual inputs from different sources, making it possible to independently generate texts [16]. Earth’s surface has been analyzed through photo-imaging technology both from satellites and from the ground by companies such as Google [17].

Some platforms currently offer metaverse-like experiences, mainly in the realm of video games, which are combined with virtual economies (cryptocurrencies), enabling some of the users to make a living by taking part in these virtual reality experiences. Some current applications of virtual reality include Axie Infinity, a play-to-earn game, SecondLive, where users socialize, learn, and do business, and Decentraland, a digital world that merges social life with cryptocurrencies, NFTs, and virtual real estate [2].

The potential popularity of the metaverse can be envisioned by the number of people using VR games and apps that can be considered predecessors to the metaverse. For example, there are 150 million Roblox monthly active users [18]. A large portion of this is children, 2/3 of them aged 9–12 in the USA, and 1/3 of them under 16.

Developing the metaverse

This section discusses/describes central claims made about the metaverse. These are (1) richer ways of self-expression, (2) better immersion, (3) better socializing, (4) symmetric relation of physical and virtual spaces, (5) independent markets (via NFTs), (6) better user interfaces, and (7) high demands for regulation and governance.

In an announcement video, “The Metaverse and how we’ll build it together,” meta’s CEO Mark Zuckerberg said that, in his view, technology has given power to its users to express themselves [8]. According to Zuckerberg, the metaverse will be the next Internet that will provide new joyful ways of expressing oneself, making it appealing for people to participate [8].

The next platform is seen as even more immersive¹. Screens cannot convey realistic experiences, as much as the metaverse technology will be capable of doing. Metaverse will generate embodied technology in which the user is inside the experience, not just looking at it. The feeling of the presence is a major defining quality of the metaverse, according to Zuckerberg, because one will be able to really feel being there with other people through facial expressions, gestures, and photo-realistic visual experiences such as avatars [8].²

¹ “Virtual worlds are 3D immersive environments accessed through a computer” [19].

² Avatars in metaverse will be living 3D representations of metaverse users, which will be equal to profile pictures that are used in today’s social media and online apps.

When compared to smartphones, the metaverse is expected to enable better socializing. For example, when someone sends a photo, the recipient will feel physically present because of the virtual reality technology that enables such a realistic experience. When one plays a game with friends, the player will also feel the need to be present in the game and not alone in front of the computer. Also, socializing with friends will be felt realistically in the metaverse by making eye contact and having a shared sense of space.

Another crucial characteristic of the metaverse would be the symmetric relationship of physical and virtual space. According to different visions of the metaverse, digital objects will be created both for physical and virtual spaces [1, 2, 8]. For example, people's homes in the new virtual reality will be copies of living spaces from direct reality or completely new virtual spaces based on the creativity of virtual creators and the ideas of those who use the metaverse [8]. In a direct reality, digital objects will be portrayed through hologram technology [20]. At the same time, virtual reality will be present in both physical space (which is called augmented reality — AR) and the metaverse³. Digital objects will be used in different VR spaces throughout the metaverse by “teleporting,” which is equal to using links online to browse between web pages [8]. Taking avatars and digital items across digital worlds would be based on a standard of interoperability. The possibility to bring things from the physical world will also be an option, so instead of just indulging personally in virtual reality, anything from the physical will be recreated in the metaverse, such as photos, videos, art, movies, and books, just in a virtual sense. Thus, the possibility to take things from physical to virtual and vice versa will be a standard embedded in the metaverse [21].

Independent markets (via NFTs) are envisioned as important metaverse foundations. New kinds of art will be developed through AR but also an industry of digital objects that will employ digital creators and developers [8]. Of course, in such a realistic virtual world, avatars would need a wardrobe designed by digital creators, which would be important for the new self-sustainable digital economy [22]. This process will be supported by NFT (non-fungible tokens), which is a blockchain-based technology designed to provide exploitation of music, art, and other copyrighted objects in digital space [23]. Metaverse may benefit economic development through an increase in productivity, e-learning, interactivity,

e-commerce applications, and virtual real estate development [24].

Metaverse will provide better user interfaces when compared to existing communication technologies. Interacting with devices and people in the metaverse will also be more natural, so instead of tapping or typing, one will be able to interact by gestures with hand movements, through speech (saying a few words), and even thoughts. This means the new technology will have features and subtle ways of communicating that cannot be delivered by existing solutions, for example, smartphones.

Finally, as noted by various authors, the existence of the metaverse requires its own regulation and governance. This introduces the need to have firm rules of digital ownership, ecosystem building, norm setting, and new digital government [25]. Also, privacy and safety need to be built into the metaverse to prevent misuse, illegal activities, and unwanted communication, which means that, similar to current social networking sites, options such as blocking or connecting with someone will be available [26].

To sum up, basic characteristics of the metaverse, according to Zuckerberg, will be feeling of the presence, avatars, home space, teleporting, interoperability, privacy, safety, virtual goods, and natural interfaces, while the first metaverse platform will be called Horizons [8].

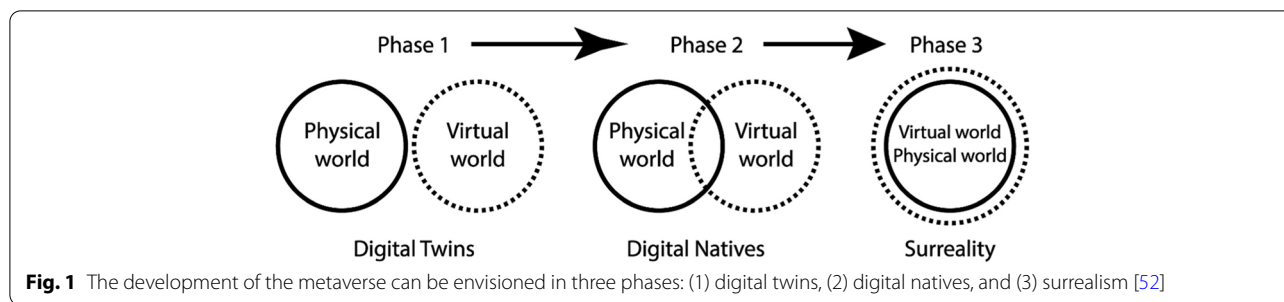
The issue of power in metaverse

The power of tech companies in today's world is exercised much beyond their financial assets, though products, content, and algorithms experienced by more than half of the world population, which represents active Internet users [3–5]. More precisely, content that is being recommended through recommender systems is influenced by the algorithms that are created by tech companies [27]. The fact that these online tools expose billions of people to content on an individual level indicates the magnitude of the influence tech companies have in today's world. Of course, the impact is exercised through different social media, online and offline tools, and apps that are used on a regular basis by online users across the globe.

When knowing how quickly emotions spread in the online sphere [28], it is found that these recommender systems (algorithms) are in fact polarizing societies [29], helping populist leaders grasp power [30] and affect the individual well-being of citizens [31]. While this is the case, the way recommender systems are set is known only to tech companies, as these pieces of software represent their intellectual property (IP).

Some prominent individuals from the tech community, including Aza Raskin, Tristan Harris, and Frances, have been warning of the impact and power tech companies have through recommender systems [32, 33]. Movies

³ So far, augmented reality (AR) is about merging photos and videos of persons (such as selfies) with visual add-ons in resulting photos or videos. This is used just for fun in various online apps.



such as social dilemma and individual whistleblowing acts have turned the public’s attention from the much less harmful issue of Cambridge Analytica to the fact that tech companies themselves control the most impactful media in today’s global world—recommender systems [34]. As a matter of fact, the business model of tech companies is based on continuous privacy invasions, which are not brought into question but actually “normalized” by those who oppose only covert data acquisitions, as in the case of Cambridge Analytica [35].

The other pair of gloves in terms of power is the tendency of some Big Tech companies to influence public opinion related to election outcomes, conduct what would potentially be considered acts of censorship, and make decisions on canceling someone’s virtual identity because of what they perceive as hate speech [36, 37]. These occurrences provoked an idea to create a new open-source social media platform that would adhere to the principles of free speech [38].

Previous notions indicate that Big Tech companies exercise incomparable influence and power when compared to regular multinational corporations from other fields. The idea of algorithmic, media, and platform impact will guide analysis of societal power in a novel context of virtual worlds—the metaverse.

Addiction as an important topic for metaverse

Some important cues indicate that addiction in the metaverse may be an alarming issue. Previous research indicates that the intensity of addiction to new media is greater than the intensity of addiction to old media [39–42]. Another inquiry has shown that the use of new media decreases capacity to use older media, which may be related to decreases in imagination and creativity [43]. More recent research has discovered that virtual reality gaming is more addictive than other forms of gaming [44]. On the other hand, an analysis of the AR game Pokemon Go discovered its addictive impact and repercussions in direct reality [45–47]. Noted previous examinations closely related to new media and their addictive capacity call for an analysis of the metaverse in terms of its envisioned and potentially addictive features.

All these questions are posed in the past, while they become even more important in the present, when the new virtual world of the metaverse is knocking on the door.

One of the metaverse goals is a full merger of the digital and physical worlds. Mystakidis [48] defines the metaverse as the post-reality universe while highlighting a multiuser environment that merges physical and virtual reality. Living in parallel virtual and direct realities will be a future course of humanity, a world in which digital will be integrated into physical reality so much that it will dominate it, and not vice versa [49–51]. The process is depicted in Fig. 1.

This possible trend raises issues of power and addiction, among others, as two of the most prominent and open concerns of the current Internet.

The noted issues impose two crucial questions that this inquiry aims to provide answers to:

- RQ1: How decisions inspired by fictional representations related to the metaverse influence the present?
- RQ2: How can the development of the metaverse affect the power of tech companies and media addiction in society?

Theory

Study of the future

The sociology of expectations and socio-technical imaginaries will be presented here in more detail. These two approaches are systematically chosen as adequate for further analysis of the metaverse. The variety of available stats on the stock market, public interest, and technology diffusion provide adequate ground for analysis of expectations, while the presentation of meta’s CEO [8] is appropriate for analysis of discourses, used in socio-technical imaginaries.

The sociology of expectations is one of the major directions in futures research. Introspection into expectations can provide insight into their impact on the present, especially in terms of legitimation, public interest, and

investments. Expectations based on imagination rather than logic proved critical in establishing new fields such as membrane technology, neural computing, gene therapy, pharmacogenomics, and nanotechnology [53].

Expectations have greater authority for the general public, which has less influence on what will actually happen, than actual actors in the creation of new technologies. Also, entrepreneurs express greater expectations in public than they do among their colleagues in companies.

Fictionality is a source of creativity in the economy [54]. Imagining a different world, which is not based on the past but rather on expectations, is a way to make decisions leading towards innovations. The role of fictional representations is to provide justification for decisions, and thus a sense of security to social actors, as well as to reduce disorientation. Although innovation starts from individuals, the involvement of social macrostructures makes imaginaries socially anchored. There is no technique that can determine whether innovation will actually happen. However, decisions inspired by fictional representations influence decisions in the present, which usually has distributional consequences in the markets, especially for macroeconomic development and the institutionalization of regulatory rules [54].

It is found that hype and disappointment dynamics play an important part in studies related to technological and scientific development [55]. Hype cycles have been shown to affect market behavior and technology diffusion [54]. For example, investor behavior and the stock market are influenced by expectations of other investors' behavior. Also, expectations are a significant aspect of strategy building. The dynamics of hype consist of a sharp increase as people start investing in expectations. After that, a crash occurs when the difference between real and artificially inflated values becomes inescapably obvious [53]. Expectations are, in fact, very useful for attracting the various actors of the innovation ecosystem and for defining joint roles, obligations, and agendas. While initial hype in expectations is required to mobilize stakeholders' attention and interest, including sponsors and political agenda setters, hopes are rarely proportionate to what will occur in the future. Expectations are used to provide a sort of "mandate" to innovators, which is essentially the trust in them to explore new capabilities and innovate with an obligation to deliver results [53]. A simplified graphical way to analyze rises and surges in expectations is Gartner consultancy's "hype cycle," which consists of a trigger, a peak in expectations, disillusionment, and finally multiple rises that represent more modest applications. Of course, what happens in reality usually differs from the perfect Gartner hype cycle.

On the other hand, ideas developed under the umbrella of socio-technical imaginaries offer broader but also

complex and interconnected introspective tools that rely on analysis of discursive strategies such as dialectics of pessimism and optimism, epochalism, and inevitability. Well-rooted in classical sociology, these methods are adapted for use in contemporary settings, such as in Schjølin's examination [56] of a recent imaginary—the Fourth Industrial Revolution.

The concept of sociotechnical imaginaries, as defined by Jasanoff [57], is "collectively held, institutionally stabilized, and publicly performed visions of desirable futures, animated by shared understandings of forms of social life and social order attainable through, and supportive of, advances in science and technology." The public narratives of actors typically offer a rigid imagination of the future, which is presented as inevitable, and both desired and feared at the same time.

An important aspect of future-oriented narratives is inevitability, which is different from technological determinism. Plans laid out act as some kind of action map are provided by various actors in their examination of the future [56]. These plans are presented as if they are required to be followed in order to build a desirable future. In his detailed inquiry, Winner [58] explains the purpose of inevitability as to calm the mind suffering from fear of the future.

Coined by Geertz [59] as a tool to create senses of belonging and identity, at its core, epochalism is the feeling that the current moment is an unparalleled point of historical importance. Epochalism creates a moral-political universe that acts as a driving force for social changes related to the future. The signs of epochalism appear in the superlative-ridden expressions used in the future-oriented narratives. An example of this is a statement by Schwab [60] in his description of the Fourth Industrial Revolution: "the transformation will be unlike anything humankind has experienced before."

Related to the above presented concepts of sociotechnical imaginaries, future essentialism is defined by Schjølin [56] as "discourses, narratives, or visions that, through different means and practices – from historical analyses to speculative estimates to hard statistics and calculation – produce and promote an imaginary of a fixed and scripted, indeed inevitable, future, and that can be desirable if harnessed in an appropriate and timely fashion, but is likewise dangerous if humanity fails to grasp its dynamics."

The video presentation of the metaverse, performed by Mark Zuckerberg in October of 2021 [8], will be used as a central point of analysis and as a potential hype generator, related to the idea of the metaverse. Furthermore, expectations will be noted together with statistics related to stock market and technology diffusion, in terms of the sociology of expectations. Zuckerberg's address will be

analyzed in terms of socio-technical imaginaries through the discourses of pessimism, optimism, epochalism, and inevitability, which all relate to future essentialism.

An inquiry into power

The matter of power is looked at through the lens of various established theories, such as those of Michael Mann, Niklas Luhmann, Max Weber, Jan-Felix Schrape, Ulrich Dolata, Michel Foucault, and Antonio Gramsci.

Mann bases his argument on the interaction of four sources of power in society: ideological, economic, military, and political [61]. Max Weber's basic idea about what constitutes power in a society is "the probability that one actor within a social relationship would be in a position to carry out his own will despite resistance, regardless of the basis on which this probability rests" [62]. Power relations between domination and consensus are examined by Antonio Gramsci in his take on hegemony as the cultural, moral, and ideological leadership of a group over other allied groups [63]. Michel Foucault's unique perspective of power refers to a combination of knowledge, scientific understanding, and "truth" [64, 65].

In contrast to these more classical approaches, Luhmann [66] considers trust and power in his innovative work, rising above the frames of traditional ideologically based social theory. Additionally, Jan-Felix Schrape's and Ulrich Dolata's take on collectivity and power on the internet provides a contextual perspective tightly related to this subject of inquiry, as it examines the role of technical infrastructures, the mobilization of social movements, the decision-making processes in open-source communities, and the concentration of significant economic, infrastructural, and rule-setting power in the hands of a few tech corporations [67].

The economic influences of big tech are visible as these corporations base their business models on the competition for human attention via extensive use of their apps and platforms in everyday life [68]. The following data speaks of the immense economic power tech companies have. First of all, 8 of the 10 biggest global corporations, amounting by market capitalization to 12.51 trillion, are from the tech sector [69]. Second, the combined financial assets of the five biggest tech companies were US \$631 billion in 2022 [70]. The top four technology corporations had each surpassed a US \$1 trillion market capitalization by 2020⁴. Based on financial superiority statistics,

technology multinationals stand firm on the economic foundation of global power [71].

As for Michael Mann [61], the first source of power is economic, which has already been elaborated upon, while the second one is ideology. Barbrook and Cameron noted, at one point early in the development of the mainstream Internet, as follows:

"Promoted in magazines, books, TV programmes, websites, newsgroups and Net conferences, the Californian Ideology promiscuously combines the free-wheeling spirit of the hippies and the entrepreneurial zeal of the yuppies. This amalgamation of opposites has been achieved through a profound faith in the emancipatory potential of the new information technologies. In the digital utopia, everybody will be both hip and rich" [72].

Modern technology companies base their strategies on well-marketed mission statements like "Making the world more open and connected" [73]. More importantly, artificial intelligence is seen as a modern ideology or, in other words, a "magic wand" for advancement of human kind [74]. Tech leaders, such as Elon Musk and Bill Gates, are considered important public figures that express ideas about the future and life on Earth and beyond. Examples of that can be seen in their public appearances, books, papers, and social media posts [75, 76]. Technology serves as a new ideology, while tech companies are celebrated as drivers of human progress in the 4th Industrial Revolution [77]. Therefore, technology has a strong ideological backing, which represents one source of power [61]. Trust in technology is a foundation of power in today's world, which aligns well with the ideas of Niklas Luhmann [66].

According to Mann [61], the other two poles of power are political and military. In the current technology-driven age, these powers are still under the formal control of society but are nevertheless strongly influenced by various lobbying practices [78].

Except ideology, setting standards of cultural and moral leadership is major sources of hegemony, according to Antonio Gramsci [63]. It can be clearly concluded that the content provided on social media, which is individually chosen by recommender systems at any point of social media use, is one of the drivers of culture and moral standards in global societies today [79–83].

The truth is determined and directed by tech companies through power to showcase content to social media users and do invisible automated or manual moderation, which is, in other words, censorship, also supporting Michel Foucault's idea of power [64, 65].

There are numerous instances that support the idea that tech leaders can carry out their own will despite

⁴ The ethical guidelines on the metaverse issued by South Korea's science ministry consist of three values: (1) safe enjoyment, (2) an intact self-identity, (3) sustainable prosperity, and eight principles for those who decide to participate in the metaverse ecosystem: (1) authenticity, (2) autonomy, (3) reciprocity, (4) privacy respect, (5) fairness, (6) data protection, (7) inclusion, and (8) responsibility.

the resistance, which is Max Weber's basic prerequisite for power [62]. For example, this can be seen through their interventions in politics and media sectors [36, 37, 84]. Additionally, tech leaders often enjoy public thrust and influence that enables them to carry out their own will. For example, this can be seen in the capability of Elon Musk to affect the value of the stock market with a single tweet [85], the power of Twitter to take down the social media profiles of then acting president Donald Trump [36], and the impact of Google and Facebook on Australian media regulations [84]. Social media are viewed as media companies by some researchers, although they somehow skip being affected by media laws [86]. It can be argued that technology companies have been successful in avoiding laws that can have a significant impact on them, such as those regulating recommender systems and virtual identities beyond their rules [78]. Of course, there are some exceptions in the past that speak differently, such as Mark Zuckerberg's attempt to impose a new blockchain-based currency called Libra [87]. Finally, tech companies have demonstrated their ability to implement their own will despite the opposition in society, which is compatible with Weber's idea of power [62].

Dolata and Schrape analyze the power of technological platforms as institutions. They focus on the economic power over resources, research, power over data of users, and infrastructural and rule-setting power within platforms, as the tech companies "structure the online experience of individual users and collectives and prescribe framework conditions for their activities, whereby they ultimately influence users' behavior and actions [67]."

To sum it up, power in the metaverse will be determined based on who gets to regulate this upcoming technology; as noted by Dolata and Schrape [67], additional important foundations of power are trust of public, which has its ideological backing, which is related to the theory of Michael Mann [61], and strong cultural and moral impact, which corresponds to ideas of Antonio Gramsci [63]. Development of metaverse will fuse the ideology of AI with its media power to influence content that is consumed by citizens, or in other words the truth, examined by Foucault [64]. Finally, one of the most important constituents of power in the metaverse will be complete control over the virtual identity of its users. That will be even more important as more and more work-related tasks and jobs themselves migrate to the metaverse [88].

All the above-noted elements of power are strongly dependent on who determines rules in the metaverse, which is one of the essential building blocks behind ideas by Dolata and Schrape [67] on power in contemporary tech-driven society.

Rule-setting as the main determinant of power in the metaverse

This chapter focuses on developments around the rule-setting power in the metaverse, an issue closely related to decisions on what users of the new VR-intensive technology will be exposed to (recommender systems). The one who determines the rules in the metaverse will strongly impact all other prerequisites of power examined in the previous chapter, such as the power over identity, ideology, trust, culture, morals, and the truth for metaverse users.

Tech-related laws and policies usually come too late after some technology is widely adopted [89]. It could be argued that new laws, such as GDPR, fail to address critical issues while serving as a formal justification for Big Tech companies to continue operating as usual. For example, a Deloitte survey has shown that 91% of people consent to legal terms and conditions without reading them, while for younger people, the rate is even higher [90].

Although South Korea is the only government to issue ethical guidelines [4] on the metaverse [91], there has not been a jurisdiction to adopt regulations for the metaverse. The following paragraphs elaborate on concerns about the power in the metaverse and the fact that it will be another form of data-intensive technology based on recommendations for its users. After this, the upcoming EU regulation of recommender systems, the Digital Services Act, is being analyzed. Finally, the UN's nonbinding resolution on the right to Internet access is assessed.

Various authors have issued warnings and concerns about who gets to regulate the metaverse and its users' virtual identities. Thomason [92] raises concerns related to ownership of the metaverse and digital spaces within it. Also, the author puts forward lots of unresolved issues and concerns, such as data security, privacy, and rights of metaverse users. Egliston and Carter [93] point to the fact that there is a lack of policies related to VR. The evolving concept of virtual worlds raises red flags about control in a space where rules are created by tech companies and not through democratic processes [94]. The most important issue in the metaverse, according to Lee et al. [95], is the imbalance in power. There is a need to democratize computational arts and establish standards of digital privacy and safety for metaverse artists. Also, digital artists would need to be recognized as owners of their digital artworks [95]. As with the Internet, the major risks of the metaverse include replication and magnification of issues from direct reality, such as racism, sexism [96, 97], hate speech, propaganda, echo chambers, psychological violence, and demoralization [24].

Having in mind that VR will be another data-intensive form of technology, the growing concern about the

metaverse is about who stands to benefit from it [93]. The metaverse will also deal with the digital footprint of its users, similarly to the Internet [93]. Additionally, new forms of data will be prevalent in the new virtual universe. There will be various kinds of data about the body and its interactions with hardware, which triggers a growing skepticism towards tech companies. For example, can companies be forced to say that they would foster users' freedoms and privacy over shareholders' interests? In that context, meta's CEO promised to unlink the company's VR platforms from their Facebook profiles [98].

This is especially important for underlying technology such as recommender systems, which choose content that is shown to social media users. Similar technology will be used in the metaverse because there must be an algorithm used to determine what is shown or offered to someone and in what order. It is problematic that the public has no idea how recommender systems are set and has no control of them. It is stated by an International Human Rights Organization Article 19 as follows:

“Recommender systems shape what people see online, with an alarming lack of transparency as to how and why. Concerns have repeatedly been raised about these systems’ tendency to promote clickbait, sensationalist, false or ‘extremist’ content, often pushing users down ‘rabbit holes’ of this type of content, without their knowledge or consent. They therefore have the power to shape ideas and discourse to some degree, although little data exists to confirm the extent of this influence” [99].

Although the issue is neglected for decades, there are some recent efforts to tackle the recommender systems by the regulators. For example, the approved draft of the upcoming EU Digital Services Act, which is expected to be adopted in September of 2022 by the European Parliament, introduces transparency requirements for online advertising and recommender systems [100]. Online platforms must note in their terms of service the main parameters used in their recommender systems and list options for users to alter those parameters. Transparency of recommender systems and user choice for access to information apply to both online platforms (OP) and very large online platforms (VLOP), while the user's choice not to have recommendations based on profiling will concern only the latter.

Finally, according to Article 19, the announced provisions in Article 29 of the proposed Digital Services Act do “not go far enough in tackling these problems and set an unacceptably low bar for platforms on transparency and information diversity” [99]. Of course, this is yet to be seen and discussed after the adoption of the Digital Services Act.

Therefore, the question is whether the metaverse will become mainstream without its essential building blocks being regulated in an adequate manner rather than just superficially. The choice of whether to personalize the experience or not is not enough, while fine-tuning control of more or less diverse content would provide a real difference to users of online platforms and tomorrow in the metaverse. Also, detailed and truthful information about how algorithms are set is needed. For example, this could be to increase engagement or use.

On the other hand, in the summer of 2016, the United Nations Human Rights Council adopted a resolution in which the intentional disruption of Internet access (the right to Internet access) by governments is condemned [101]. One of the concluding statements was that “the same rights people have offline must also be protected online.” Surprisingly, the nonbinding resolution was selective in that it excluded Big Tech.

The results of the abovementioned inquiries indicate that the main power-related issues will concern control of algorithms that choose the content to be displayed to metaverse users. These algorithms will impact the lives of metaverse users on multiple levels, which is strongly related to concepts such as ideology [61], truth [64], culture, and morals [63]. Finally, control of algorithms, as elaborated in this chapter, depends on who will be able to set the rules in the metaverse, either societies or tech companies. Unfortunately, recent examples of the upcoming EU regulation, which is referred to as the Digital Services Act, look like a superficial attempt to justify Big Tech and sort of “legalize” its control over recommender systems, while the UN's nonbinding resolution on the right to Internet access targets governments while not mentioning Big Tech at all.

An introduction to the metaverse addiction

The metaverse may be suitable for escapism from direct reality or what is commonly referred to as “the substitution of real life” [102]. Lee et al. [95] pose the question of whether the metaverse will advance media addiction to the next level because this kind of VR will provide a super-realistic experience that highly resembles the real world. Some authors have been researching addiction to platforms and online concepts that will be integrated into the metaverse, in one form or another, such as virtual reality gaming [103], augmented reality [104], smartphones [105], and social media [106].

This chapter explains why it is important to examine whether the metaverse is highly addictive, presents an introspection into VRChat and videogaming addiction as the most similar applications to the upcoming metaverse, lists relevant stats on addiction, and introduces typical motivations and signs of virtual reality addiction.

Assessment of VR warns that more research is needed to create adequate measures to combat potential addictions triggered by virtual reality [107]. Providers of technology and authorities share a responsibility to minimize harm based on evidence coming from research [108]. Measures to prevent the dangers and misuse of VR could be similar to those for other highly addictive products like tobacco or alcohol. Regulating the “supply” of product and issuing warnings and limitations are essential if multiple research studies show the high addictivity of virtual reality [103].

Lee et al. [95] point towards VRChat as the most similar application to the upcoming metaverse. Online virtual reality chat, often referred to as VR Chat or VRChat, is utilized through headsets, such as Oculus Quest, SteamVR, Windows Mixed Reality, and Oculus Rift [109]. Released in 2014, VRChat enables interaction with other users through the interplay of 3D avatars in differently designed VR environments [110].

Although the American Psychiatric Association manual has not yet added videogame addiction to its DSM-5, the World Health Organization did list it in the International Classification of Diseases as part of its Medical Reference Book in 2018 [111]. On the other hand, the DSM-5 lists signs of gaming disorder and possible treatments [112].

Recent statistics note that 60 million individuals were addicted to videogaming in the world in 2021, which is 3.05% of total players [113]. In order to call a person a gaming addict, it is necessary for an individual to meet both the high length of gaming and measure negative effects on other aspects of their life [114].

It is found that VRChat is much more addictive when compared to classic gaming [44]. One of the reasons mentioned by researchers is the longer time needed to achieve the gratification of advancing to the next level in VR games [115]. In other words, one needs more time to level up at higher levels of the game.

The common motivations for VR gaming could be validation and socializing [110]. Depending on other psychological conditions, VR addiction can be different for each individual [116]. It is not just the length of media use that makes someone an addict. However, the main sign of VR addiction is ignoring other aspects of life [44]. For children, indicators of addiction include how well they do with friends, in school, and in their relationship with parents [110].

An affected person needs to develop one or more of the typical addiction signs in order to be considered dependent on virtual reality. These signs include the following: (1) thinking about VR a lot of the time, (2) feeling unwell when unable to use VR, (3) needing more time spent on VR to feel gratification, (4) struggling to stop using VR,

(5) discontinuing previous (favored) activities because of VR use, (6) declining in academic or occupational performance as a result of VR use, (7) exhibiting emotional symptoms such as depression, restlessness, anger, loneliness, and tiredness when not using VR, and (8) exhibiting physical symptoms such as headaches, a lack of personal hygiene, and pain in parts of the body engaged through VR use [44, 114, 116]. Researchers of AR games, such as Pokemon Go, have found that these highly addictive applications could provoke high-spending behaviors and dangerous actions of groups or individuals in urban areas [45–47].

Methods

The first part of this study aims to present and analyze recent existing work on the metaverse to introduce its key aspects and explain how narrative hype and expectations related to it affect the present. The second part of this study presents an analysis of literature with the main goal of envisioning the possible impact of the metaverse on power and addictions, the notions that were introduced in the previous paragraphs.

A partially deployed method is systematic literature review (SLR), which is a means to gather reliable literature [117]. The strict procedure for selecting input papers is (1) search through a combination of targeted keywords, (2) collect scientific papers that include keywords in the title, and abstract, (3) removing papers that are unrelated to the main topic of the inquiry after an initial reading, (4) papers on clusters, (5) create a conceptual framework for further research based on clustering (i.e., addictions and power). Around 200 input points for analysis (scientific papers) were taken into account. After initial filtering, 120 of them were taken for further processing and content analysis.

Content analysis is imposed as a method of research to introduce relational and conceptual content analysis, thus extracting concepts in cited research and examining the relationships between different frameworks of thought and research results. This method will be deployed to get adequate answers to noted research questions.

Both literary review and content analysis are deployed in this paper. The conceptual framework related to future studies is combined with theoretical perspectives on power and previous findings on media addiction.

Results

The social shaping of the metaverse

In order to examine the social shaping of the metaverse, social and technical preconditions for an innovation need to be met. For example, Generation Z is presented as adequate for the proliferation of the metaverse. Second, required developing technologies are elaborated upon,



Fig. 2 Examples of VR deployment in everyday life, from communication, media use, and entertainment to fitness

seen as preconditions for the metaverse to become widespread among the global population.

Every innovation that aims to become mainstream needs a society ready for it. In the case of the metaverse, evolution was needed. Because of that, online apps that have appeared in the past, such as *Second Life*, have not been widely popular. The metaverse is envisioned to become mainstream, which means being used by a significant number of people, similar to the proliferation of smartphones and computers. The contributing factor that indicates the potential for widespread use of the metaverse is the social value of Generation Z, for which online and offline selves are not different [118]. Society is constantly evolving, and the new generations of people seem to be ready for different innovations, especially in terms of increasing media use and the proliferation of the indirect (virtual reality), which is exactly what the metaverse is about.

Lee et al. [119] identified eight key technologies for the development of the metaverse: extended reality, user interactivity, AI, blockchain, computer vision, IoT and robotics, edge and cloud computing, and future mobile networks (such as 5G). However, the most challenging work ahead includes metaverse hardware, creation of a 6D image of the Earth, developing the brain-machine interface technology, and establishing an engaged metaverse economy. These ongoing challenges will be presented in the following paragraphs.

Virtual reality headsets, depicted in Fig. 2, which are imagined to be used as the main hardware for the metaverse, suffer from some limitations in terms of mass market proliferation [24]. More expensive devices require extensive and unpractical hardware consisting of numerous sensors that are meant to be placed on different parts of the user's body. The question is whether this kind of complex device would be practical for daily use and if the price is adequate enough to secure mass use. On the other hand, there are cheaper VR headsets that would not provide a stimulating enough experience. The main

differences between devices are in the quality of graphics and mobility.

A step leading towards the metaverse would be the creation of a 6D image of the earth, an initiative that is led by Niantic Labs, but that would need to be assisted by users expected to upload photos of geophysical spaces to the web in three dimensions for the purpose of composing a digital twin of the earth [120]. This would enable metaverse users teleporting to any point on the planet as part of the virtual reality experience.

Another required technology for the development of the metaverse is the brain-machine interface (BMI), with the promise of solving some neurological issues but also serving as a tool to read minds, such as ideas, concepts, and thoughts [6]. These instances would be sent as messages or saved in some kind of memory. The technology would be facilitated through implant chips or as some kind of body (hardware) add-on.

The important challenge for the metaverse will be creating a digital economy that will be a complete and self-consistent chain of production and consumption [121]. The economy of the metaverse refers to digital items and their creation, exchange, and consumption in the metaverse [121]. Surrealistic cyberspace would necessitate its own architects and creators, as there would be numerous virtual spaces other than copies of direct reality and VR games [95].

The above presented instances relate to required social impulses and technologies for the development of the metaverse. The following text sums up stats around the metaverse on scientific publications, online search interest, and lists companies taking part in the development of the metaverse.

Narin [122] does content analysis to register an increase in metaverse-related scientific publications in 2020 and 2021. He found 12 articles published during those 2 years, while the same number was published from 2015 until 2019. The stats related to the number of publications per research area have shown that most of them

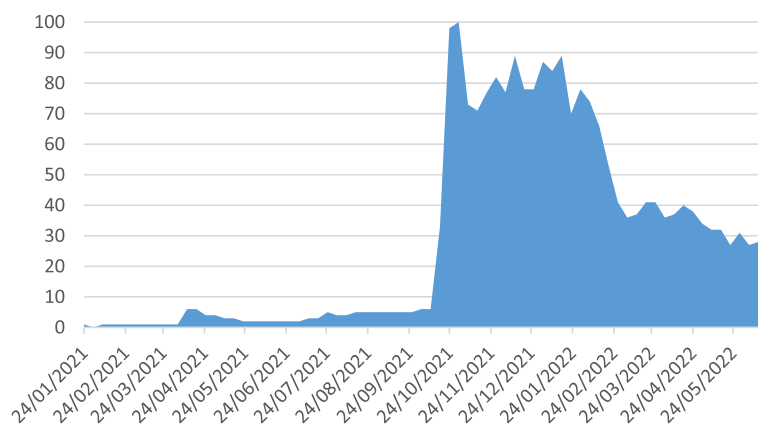


Fig. 3 Stats on worldwide Google Search interest of the metaverse, in percents [124]

have appeared in the computational sciences, chemistry, information sciences, and engineering [123]. Publications in education, business, and art followed with 15 articles. The third place belongs to scientific articles from the domain of social sciences and humanities. Just 10 of them are in specific areas such as linguistics, social science, philosophy, public administration, and communication.

On the other side, Google Trends show dramatic increase in searches from October 28th of 2021 when the peak was measured. Since then, interest has been decreasing but still preserved in much higher volume than before October 2021, as depicted on Fig. 3. The date of sharp increase matches publication of a video on metaverse by Mark Zuckerberg [8].

Numbers represent search interest from 0 to 100 percent (%), for the given region and time. A value of 100% is the peak popularity for the term. A value of 50% means that the term is half as popular. A score of 0% means there was not enough data for this term.

Companies taking part in the expansion of the metaverse are listed by Ning et al. [94]. The list consists of the majority of market players from the USA and includes Amazon, Roblox, Facebook, Epic Games, Disney, Snapchat, Nvidia, Microsoft, and Decentraland. Corporations from China, looking to do development of metaverse platforms, include major players such as Tencent, Alibaba, ByteDance, NetEase, Shenzhen, and Wondershare. On the other hand, Sony, GREE, and Avex are involved in the metaverse race from Japan. South Korea features Samsung, SK Telecom, Urbanbase, and Metaverse Alliance as companies trying to get a part of the metaverse market. Additionally, there are some companies from the UK, UAE, France, Germany, and Italy in the metaverse race.

According to above presented instances, it is possible to note the following: a significant amount of resources

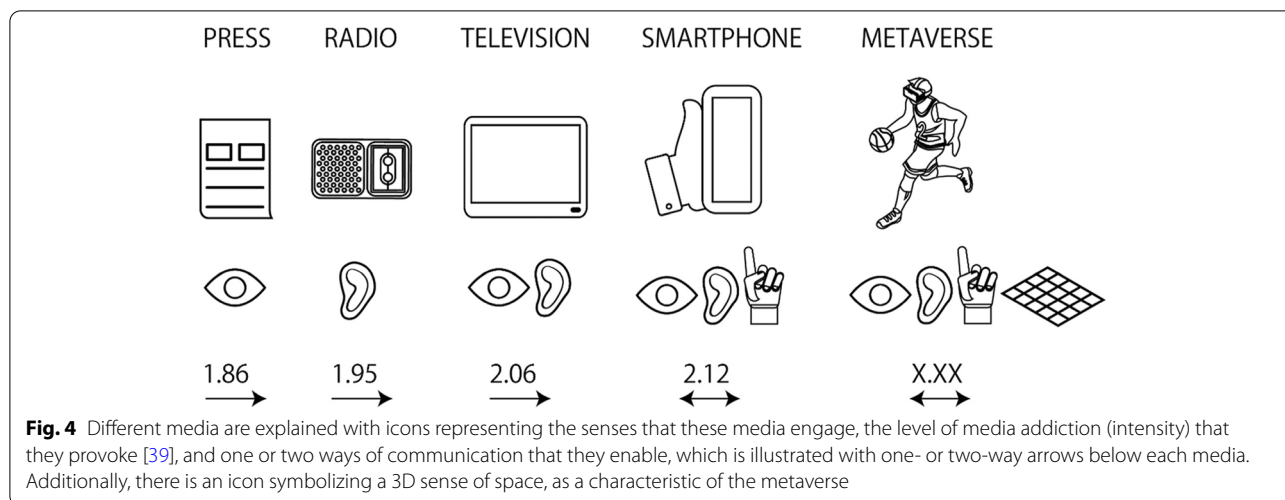
are being invested in the development of the metaverse [94]; general public interest towards metaverse has sharply increased since October of 2021 [69], partially as a consequence of marketing efforts [125]; and finally, interest of scientific community related to metaverse has been increasing in since 2020 [122]. Shaping of technology by above-noted visions of the metaverse, expressed in various publications, can have a major impact on the way the metaverse is developed and what it becomes, as noted by Pinch and Bijker [126].

The resources and dedication of tech companies indicate that the metaverse is a long-term project for them. Thus, it is likely to presume that the acceptance of the metaverse is envisioned by research and followed by intensive marketing efforts. For example, after the global metaverse hype had been created by a single video presentation [8], it was followed by offering concerts performed in what can be called the early stage metaverse [127].

The amount of assets invested in the development of the metaverse, the general public's interest, marketing efforts, and scientific interest all point to the intense social shaping of a new technology — the metaverse [94, 122, 125].

Addictions in the metaverse

Based on previous theoretical considerations, the metaverse will be placed in chronological order with its predecessors (smartphones, television, radio, and print) to compare the changing nature of media and how they provide more or less realistic experiences to their users. In that context, the following is examined: (1) senses engaged in media use, (2) virtual reality as an escape, (3) possible attractiveness of the metaverse, (4) envisioned digital twins, and (5) the impact of metaverse design on its users' psychology.



The metaverse will be based on the convergence of technologies that allow multisensory interactions with VR [48]. Of course, it would not be only about sensors that send inputs for further processing in the metaverse but also about vibrations and other stimuli that come from the VR equipment. Two-way communication, or the interaction of man with the machine, will be the dominant characteristic of the metaverse, as it is the case with the mainstream Internet.

The cognitive stimuli that can be experienced through the metaverse will largely depend on the equipment that is used. Through the process of technological evolution, VR headsets, add-ons, and gadgets will be updated and changed. So far, the senses that are stimulated by VR devices include auditory, visual, haptic (touch) feedback, and a 3D feeling of space.

Replicating reality is considered to be the most addictive feature of media [95]. Related to that, the progression of media through their changing nature is depicted in Fig. 4. The new media have additional features that replicate direct communication (physical world) better than the older ones. That may be because newer media are more addictive than older ones [40–42]. Furthermore, newer media has been found to cause greater levels of media addiction [39]. Metaverse will be the most realistic media so far and thus the most addictive, as it would include a sense of space as addition to sight, hearing, touch, and interactivity.

Han, Bergs, and Moorhouse [107] speak of virtual reality as an escape that enables individuals to spend hours in immersive environments. They see VR as an illusion of an alternative reality while concluding there is a lack of scientific research into the psychological, physical, and social impacts of such innovative

technologies. Chen [128] asks how much altered the new metaverse will be when compared to direct reality.

VR needs to mimic direct reality (what is referred to as “real life”) to be successful. When analyzing some of the current VR apps, authors conclude that although individuals can have a stable cyber life because they are able to distinguish between real life and virtual life, avatar design has emotional barriers that may make users feel rejection towards the avatar [118].

Some elements of VR appear to be better than direct reality, according to Park and Kim [129], such as mask effects that provide a better-than-realistic user engagement experience. On the other hand, some sensations are better experienced in real life, for example, sunlight, smell, stickiness, slipperiness, and wind [118].

The metaverse revolution may be all reaching, with transformative power that would touch each and every person in the world, as all objects in the physical world would have digital twins. The business imperative, and the fun feature at the same time, may be the capability to buy, visualize, and share everything in the metaverse. Even the wardrobe that people purchase will be equipped with sensors and thus useful both in direct and virtual realities [130]. Real-world movements are important for the metaverse, as this kind of reality-mimicking experience would be addictive.

The metaverse will present a significant challenge for designers and architects, who will need to understand cultural and psychological issues in order to create virtual worlds that are enjoyable, vernacular, and inclusive [131]. The notion that would need to be taken into account would be that people’s emotions are affected by their surroundings. Spaces may make people feel depressed, nostalgic, sad, or happy and energized [131]. Thus, metaverse

architects would be aware of human psychology and capable of translating this knowledge into functional and greatly designed virtual settings [131].

But what if these virtual worlds are so much better than reality, so that people do not want to come back?

The sociology of expectations and the metaverse

This section presents the public expectations that revolve around the metaverse and how they impact the present. Although various expectations are listed in the beginning, the focus is then placed on the development of the new self-sustainable metaverse economy. After this, the absence of involvement by social macrostructures is noted. Finally, the metaverse hype is analyzed and supported by the data from the stock market, statistics on the diffusion of the metaverse-related technologies, and the Google n-gram depicting the interest of the public.

The most notable public presentation of metaverse-related expectations for the future is delivered by meta's CEO Mark Zuckerberg in a YouTube video published by his company on October 28, 2021 [8]. The short introspection into expectations about the metaverse revolves around its envisioned features for its users, such as the feeling of the presence through facial expressions, gestures, and photo-realistic visual experiences such as avatars, enhanced interaction through gestures with hand movements, through speech (saying a few words), and even thoughts [8].

One of the notable expectations is that digital objects and digital spaces will be central pieces of the new metaverse economy. The impact on the present of these expectations can be seen in the development of hologram technology [132], NFTs [21], and augmented reality apps and content [133]. New kinds of virtual art are being developed in the expectation of the metaverse becoming mainstream.

The noted effect of these expectations on the present can be seen in the development of particular segments of the new self-sustaining digital economy related to the metaverse, such as the design of avatars, virtual homes and interior spaces, creation of virtual wardrobes, and all other objects, including furniture, and finally organizing concerts and other events in virtual reality settings that can be called an early metaverse [24].

An example of already developed blockchain-based technology is NFT (non-fungible tokens), enabling ownership of digital objects and their movement in the metaverse, between different platforms through a feature named teleportation, or in other words, linking in the metaverse. NFT is one of the prerequisites for the development of the metaverse, based on expectations of interoperability. That includes relations between physical and virtual as well. The metaverse narrative engages

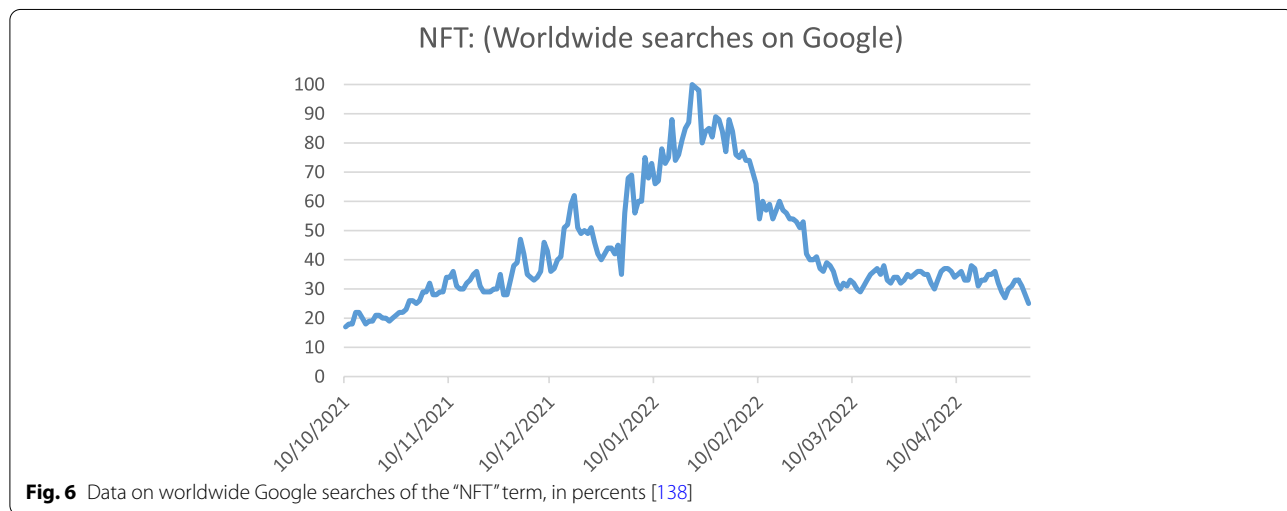
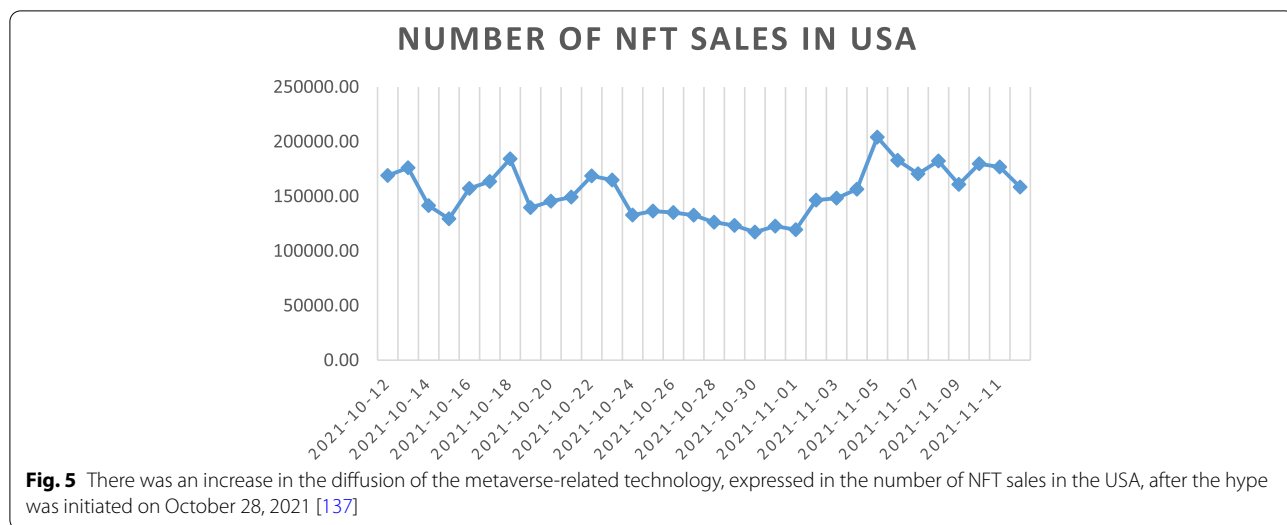
designers, artists, architects, software engineers, entrepreneurs, innovators, and various companies throughout the innovation ecosystem.

As for the impact of metaverse-related expectations on the economy, it can be seen that major tech companies have already made large investments to develop their own metaverse platforms [94]. Driven by expectations, all these stakeholders, which include individuals, groups, and small and large companies, tend to join "the spaceship metaverse," leading them towards a future that they believe in and providing them with a comparative advantage in the new virtual economy of tomorrow.

However, except in the case of the South Korean government [4, 91], the metaverse-related involvement of social macrostructures has not been noted. The reason might be that these organizations are slower in their nature and more reactive to tech-related changes in society after they occur. At this point, the metaverse is considered a matter of private initiative, much like any other tech-related business. Of course, there is nothing yet to be regulated, but state apparatuses could shift in the direction of being more pro-active towards envisioned tech innovations, to prepare for them, especially if they are expected to disrupt societies at large and could involve every citizen. Also, this opens up a question about whether power in society over virtual governance and virtual citizenship should be regulated by societies or private companies.

Although public institutions have not joined yet, the vast involvement of economic actors, such as tech companies, in the development of the metaverse makes it socially anchored [94].

As seen on Google n-gram (Fig. 3), a hype was initiated on October 28, 2021, after Zuckerberg's public video presentation about the metaverse. This was useful in generating considerable public interest and investments from economic stakeholders in the various metaverse-related technologies noted above. There are no statistics on how much investment in the metaverse increased after the hype was created. However, it was possible to register that the value of meta's shares on the Nasdaq stock market had increased by 33 points between October 28 and November 15 peak [134]. There are multiple media reports about investments being made by individuals not closely involved in the development of the metaverse. For example, in an article entitled "Investors are paying millions for virtual land in the metaverse" CNBC reported that virtual real estate is going for millions of dollars in some cases, while the most expensive spots are near where lots of users gravitate [135]. It was noted that the metaverse platform Sandbox was evaluated at US \$4 B on the stock market, and that it declared an intention to raise US \$400 M [136]. On the other hand, the increase



in diffusion of metaverse-related technology since that point in time can be seen by a sharp rise in NFT purchases after October 28 [137], depicted in Fig. 5 which corresponds with the similar trend in Google searches of NFT [138], which can be seen in Fig. 6.

Finally, statistics of online searches related to the metaverse, depicted in Fig. 3, are aligned with Gartner’s hype cycle [139]. If comparison is made, the trigger was noted in October 28, a peak in expectations in October 30, disillusionment in November 7, and finally, after that date, multiple rises could be seen. However, it is important to note that the predictive claim of the Gartner’s hype cycle is empirically questioned, such as in the paper by DedeHayir and Steinert [140].

The impact of the noted metaverse imaginaries can be seen in the legitimization of investment decisions by

various actors in the innovation ecosystem. These actors tend to believe in expectations expressed by promoters of the metaverse, which is a means of justifying their decisions. Additionally, the fictional representation of the metaverse appears to create a sense of public interest because of the statement that the metaverse is the next Internet [8], which will provide a richer and more immersive way for expression. These fictional representations foster a sense of security among social actors and decrease disorientation. The focus of analysis will turn to the metaverse discourse in the next section.

Analysis of the metaverse from the perspective of socio-technical imaginaries

Since this study is focused on a sociotechnical imaginary about the metaverse, the discursive analysis is performed

to examine expressions of pessimism and optimism, epochalism, and inevitability in a video announcement by meta's CEO published in October 2021 [8]. The video in question is 1 h, 15 min, and 54 s long. It has been played 6,811,486 times until August 31, 2022. It has the following parts: welcome (00:00), social connections (01:47), entertainment (12:46), gaming (16:13), fitness (23:58), working better and doing more (26:29), education (30:43), commerce (34:12), building the metaverse together (44:54), building responsibly (51:23), building the next devices to help unlock the metaverse (55:33), what will it take to make the metaverse feel real? (01:01:25), and the next chapter (01:10:40).

As noted before, this YouTube video is recognized as significant in generating hype related to the metaverse. Its role may be to publicly express how meta, as a leading tech organization, sees the future. In other words, the goal of the video is to make a significant number of people, potential users of the metaverse together with stakeholders in an innovation ecosystem, believe in this vision and perceive it as a desirable future.

Language used in the video frequently refers to the future, with "will" and "going to" rather than "could" and "would," as the metaverse is presented as something inevitable that will happen. It has not been said in a direct manner, but the whole narrative expressed in the video suggests inevitability related to the development and expansion of the metaverse.

The defining characteristic of the video is optimism. This is expressed in examples of the metaverse presented throughout the video. The following attributes were used in these examples: awesome, amazing, cool, stunning, love, brilliant, epic, nice, iconic, free, lucky, magical, meaningful, and beautiful. As stated by Zuckerberg in an optimistical manner, everything we do online today, connecting socially, entertainment, games, and work, is going to be more natural and vivid in the metaverse. Also, according to this vision, VR technology will enable everyone to express themselves in new, joyful, completely immersive ways. When describing the new virtual home, Zuckerberg said it would have an incredibly inspiring view of whatever the metaverse user finds most beautiful.

Some of the most optimistic statements expressed in this video presentation of the metaverse include expressions of the endless possibilities that will be generated by the new platform. Zuckerberg says, "I can't even begin to imagine how meaningful the metaverse will be, thanks to creators like you" [8]. He remembered sitting in middle-school classes, dreaming of feeling present with the people he cared about. He then said, "Isn't that the ultimate promise of technology? To be together with anyone, to be able to teleport anywhere, and to create and experience anything?" [8]. For Zuckerberg, the best possible version

of the future is the one in which, with just a pair of glasses, one will be able to break through the constraints of the physical world. Finally, at the end of the video, Zuckerberg concludes with expressions of optimism in a finishing remark:

"I'm proud of what we've built so far and excited about what comes next-as we move beyond what's possible today, beyond the constraints of screens, beyond the limits of distance and physics, and towards a future where everyone can be present with each other, create new opportunities, and experience new things" [8].

Epochalism is expressed through many statements in the video. For example, metaverse users will be able to "live life through metaverse," as the new VR platform will be applicable to all human activities, including spending time at home, socializing, work, entertainment, and fitness.

The epochalism was expressed in the way the metaverse was announced in the video presentation, as it would be the new immersive Internet where users are in the experience and not just looking at screens. The major difference from the previous Internet is the feeling of the presence. The VR platform is envisioned to enable entirely new activities that do not really fit how people think about media today. An announcement of the change in how people experience the world and interact with each other, which is the main characteristic of the metaverse, can be considered as an instance of epochalism. Avatars are envisioned to be living 3D representations of metaverse users and their expressions and gestures, which will make interactions much richer than anything possible online today. Teleportation would be another crucial feature of the metaverse. The teleportation feature would be like conventional links to other places online and, in the case of the metaverse, to other rooms, virtual worlds, and interoperable platforms. According to Zuckerberg, people will start inhabiting metaverse worlds that are as detailed and convincing as direct reality.

The special focus of Zuckerberg's video presentation is directed towards building ecosystems consisting of millions of creators and developers, all having a stake in the future, as they will be rewarded for their work. The new creator economy in the metaverse offers optimistic promises for everyone taking part in it, including artists, designers, software engineers, and other types of developers. Also, the metaverse economy, according to Zuckerberg, will be good for businesses as well, as it will remove physical constraints and make entirely new businesses possible. The video presentation of the metaverse expresses the optimistic idea that within the next decade, the community built around

the metaverse will reach “a billion people, host hundreds of billions of dollars of digital commerce, and support jobs for millions of creators and developers [8].”

Except for the economy, the video suggests that the metaverse will transform and improve other aspects of human life, such as fitness and education. Fitness is expected to take advantages of the full immersion and interactive training, which will make new fitness practices possible.

Teleportation, on the other hand, will enable students to travel through time, for example, visiting ancient Rome during historical classes, standing on the streets, hearing the sounds, and getting a sense of the rhythm of life many years ago.

The new creator’s economy, feeling of the presence, teleporting, and interoperability are significant building blocks of the metaverse that introduce the notion of epochalism into Zuckerberg’s presentation [8]. However, the noted features are related to other potential epochal breakthroughs in science, such as brain-computer interface (yet to be fully developed), which would enable metaverse users to send a text message just by thinking about it and moving their fingers. The other part of the equation will be the AI recommender system, which will understand context and provide a simple set of choices to metaverse users. These are all epochal promises implying that life will be a metaverse gamification.

When looking into epochality, it is important to note that Zuckerberg does not want to tackle any of the most important global issues, such as climate change, hunger, education, pandemics, or wars, but just tends to improve communication between people, as a value on its own. This relates to individual basic needs, such as affection, belongingness, and affiliation [141]. Also, it relates to the addiction process, in which a person substitutes direct with indirect communication [142]. Even more importantly, it was found that “close relationships are indeed related to happiness, although the extent of the association depends more on the quality than the quantity of relationships” [143]. The question of whether the metaverse can achieve the quality of face-to-face relationships is discussed in sections of this paper about addiction.

Discussion

This study inquires into the metaverse from the perspective of future studies and how these developments could change power relations in societies and affect levels of media addiction.

Changing relations of power under the influence of the metaverse

This section examines algorithmic control (human and nonhuman impact), analyzes the impact of recommender systems, lists major concerns related to the power of the metaverse, and sums up theoretical assessments of power from previous sections.

Among other aspects, power of Big Tech in metaverse is about the ability to choose which content metaverse users are exposed an individual level (recommender systems). The algorithmic decisions aimed at increasing engagement and online use have been found to create social polarization, echo chambers, hate speech, the proliferation of negative and fake news around the globe, the rise of populist leaders, and other processes that undermine democracy, as warned by whistleblower Frances Haugen [28–30, 32, 144]. The AI-driven recommender systems are under the control of tech companies, which makes them dominant organizations in today’s world. Although tech companies define the goals of algorithms, AI decides on how to achieve them, which makes nonhuman power, or technology itself, highly influential in today’s world.

Many actions by tech companies remain invisible. For example, minor changes in recommender systems in digital space that go unnoticed affect everyone. As a result, Big Tech companies in digital space can be compared to Virtual Gods. On the other hand, the technology created by tech companies is already independent to some extent, as most online activities are based on AI (artificial intelligence). Thus, the two main layers of impact that are currently present in the digital universe are tech companies and AI. These influences will transfer to the metaverse.

One of the important issues is whether the influence of AI will grow to surpass the power of tech companies [145]. The topic of AI dominance has been exploited in movies and popular culture, such as in Kubrick’s “2001: A Space Odyssey” [146]. However, with the proliferation of social media and recommender systems, the possibility of AI dominating the world has become more realistic [145].

Also, companies, societies, and individuals have demonstrated trust in algorithmic decisions, which are increasingly being used in society, such as determining whether someone will be released from jail [147] or whether a person will be granted a loan by a bank [148]. The tendency is seen as realistic in the metaverse as well. It means a transfer of power between tech companies and AI, which serves as a warning for the future.

As Pietro and Cresci [130] state, human kind is at the beginning of singularity, as the exponential progress of technology has produced miniaturized sensing devices

such as smartphones, with strong computing capabilities. Technology has spread to all aspects of human life.

Differentiating between human and nonhuman impact can be helpful for the real understanding of the duality of power in today's digital space. The latter power, AI, will be expanding at the cost of human impact. It is worrying that AI is put next to climate change as one of the most important challenges for humanity [149].

Development of the metaverse has been solely a private initiative, with little, if any, involvement of governments or regulators. This situation comes as a warning, especially because regulators have been late in the past when it comes to setting the rules for the use and proliferation of emerging technologies.

There have been indications of tech companies exercising individual interventions, and censorship acts in terms of the content that people were exposed to [33, 36, 37, 150]. These were situations in which freedom of speech, human rights, and democratic processes were seriously affected. The most significant issues, however, are the lack of transparency about how algorithms are set and the inability of society to control them, both of which would most likely replicate in the metaverse. Although the recent adoption of the Digital Services Act by the EU introduces some requirements on transparency and customizability of the recommender systems, it is to be seen whether this is going to be just another superficial solution providing legal backing to Big Tech [99, 100].

As for the literature, there are three major concerns related to power in metaverse: (1) domination of tech companies [92–95, 98, 130], (2) digital divide and algorithmic bias [24, 93], and (3) harassment and violence, including racism, sexism, and hate speech [24, 92, 95].

When looked through the theoretical prism, the main sources of power for tech companies in the metaverse will be ideology [61], truth [64], and culture and morals [63]. However, it is critical to determine who will have rule-making power in the metaverse [67]. The recommender systems, which expose metaverse users to content, are most likely to stay in the control of Big Tech. As elaborated by previous research studies, recommender systems already have an immense societal impact, but with the introduction of the metaverse, this is expected to grow.

A look into the future

People will freely choose to use the metaverse. Nobody will force them to do so. The key concept and reason why power is analyzed next to addictions in this paper are because soft power to make people addicted to the metaverse is and will be essential to new power relations. The recommender system is an underlying technology

that will make metaverse users addicted. That is why regulating this field is one of the keys to global future.

The following paragraphs examine the notions: (1) online users as neo-slaves, (2) recommender systems as public good, and (3) virtual identity as human right.

Technology is envisioned to occupy physical reality, not only with holograms and people's use of the metaverse but also with robots, automation, and self-driving vehicles [123, 129]. For that, technology would need a digital twin of Earth based on the wisdom of the crowd and uploads of Internet/metaverse users considered as both beneficiaries and neo-slaves in that process. Making use of people to provide data for Big Tech companies (digital footprint) while getting a virtual home (the presence on social media or in the metaverse) in return can be called modern slavery, as some form of techno-feudalism, a term coined by Varoufakis [151].

Regulating emerging technologies such as VR in advance needs to be done before it becomes mainstream, because of misuses in the past and the huge power some tech companies have, as they control multiple data-driven technologies, social media, and recommender systems that affect billions of people across the globe. Current domination in the VR world is exercised by Meta's Oculus company, with 61% of the global market share [93].

Ideas have emerged to declare social media as a public good [144, 152–154]. On the other hand, Bojic [155] considers recommender systems a public good. Similar ideas will be proposed for the metaverse as well, especially because the new technology will be an equivalent to the Internet, or to be more specific, a virtual copy of the whole universe. Should this amount of influence belong to any company or to a few of them?

Feeding the virtual world of the metaverse with as much real-time data as possible would be beneficial for tech companies that control the metaverse, giving them unprecedented control [156]. This process may be labeled as neo-slavery, as online users are lured into vicious data-driven business models in which they both work for tech companies and feed the algorithms, by providing their digital footprints for free of charge, while getting their virtual home in return (the presence on social media or in the metaverse) and getting exposed to content created by themselves and others in return. In that process, tech companies become the most powerful organizations on earth because they provide the online platform for interactions between people. Question whether this seems like a reasonable trade will be a prominent topic of some future research inquiries, especially because the issue of ownership, power, and digital slavery can get much bigger in the metaverse. So far, the concept of data colonialism, similar to neo-slavery, has been examined only

by Couldry and Mejias [157] in their book *The Costs of Connection*.

In a world configured by tech companies, in case they preserve control, it would not seem unrealistic to imagine situations in which some people become VR outcasts. Not being politically correct or aligned with the ideas and rules of new power holders may result in the expulsion of certain people or groups from the metaverse, can be considered as virtual assassination, or at the very least to expulsion from the country or Earth in the physical world. The power to ban someone virtually will be an existential threat in the future, as more jobs are done online and people increasingly depend on virtual spaces. How would one feel if they were ousted from the metaverse for saying something that was not politically correct according to the standards of a tech company that controls the metaverse? This question will be important for further research and will be significant for regulating both the metaverse and the Internet [150]. In that sense, declaring virtual identity as a human right and protecting it by law could be considered.

Conclusion

Socio-technical imaginaries

Through analysis of the YouTube video presentation of the metaverse [8], significant elements of optimism, epochalism, and some elements of inevitability are found in Zuckerberg's address. The analyzed narrative also corresponds to the concept of future essentialism, which is developed by Schiølin [56], as it promotes an imaginary of a scripted and desirable future, except that there are no warnings of negative consequences if humanity fails to grasp its dynamics.

The most notable events that followed the metaverse video presentation of Mark Zuckerberg were as follows: (1) the sharp increase in interest of the general public related to the metaverse [124]; (2) the increase in the diffusion of NFT, which is a metaverse-related technology [137]; (3) an increase in investment interest in NFT, which could be seen in some media reports [135]; (4) an increase in interest in NFT as such, which could be seen in Google n-graph presented on Fig. 6 [138]; (5) a rise in the value of meta's shares on the stock market from October 28 to November 15 [134]; and finally, (7) the high evaluation of sandbox, which is one of the leading companies developing early versions of the metaverse [136]. The noted developments are important for the metaverse because such large-scale projects need the participation of various stakeholders and the general public in order to be successful.

However, in order to make the picture complete, it is needed to point out a decrease in meta's stock value of more than a half, from 346 to 168 points during the

period from December 28, 2021, until August 25, 2022 [134]. Of course, it cannot be proven that both rises and falls in stock value are due to any development, including the ones related to the metaverse.

Therefore, to conclude an answer to the First Research Question (RQ1), hype and disappointment dynamics play a significant role in the case of the metaverse, especially in terms of certainty and designability.

Addictions in the metaverse

In contrast to extreme cases, light and mild addictions, which are connected to the use of products, services, apps, and devices, are invisible but highly impactful on individual wellbeing and democratic capacity [158]. However, it may be useful to keep in mind that even with the most latent kind of metaverse dependence, without any addiction, if an overwhelming number of people frequently use the metaverse, this state of things gives enormous power to organizations that own, operate, and set the rules in the metaverse.

Judging by length of average daily use and the number of users, apps run on smartphones by their users, are strongly interconnected with human beings, almost as an extension of their physical selves. This opens up the question of whether the connection between society and the metaverse will be even stronger, especially if the virtual world becomes dominant over reality, as presented in Fig. 1.

At the same time, it may be upsetting that the effects of existing technologies are both under-researched and under-regulated. Social networking sites expose billions of online users across the globe to online content on an individual level [159], which is actually done by AI-based recommender systems on an operational level. There will be no critical differences in applications provided by the metaverse when compared to the current Internet.

Some of metaverse-related applications are closely related to "real life" or direct reality, while others are stimulating an escape from it — substitution as an important step leading towards addiction [142]. Entertainment, business, education, information, communication, and many other applications will be present and evolve in the metaverse. The main difference will be that the metaverse will be much more similar to direct reality than when smartphones are used to access the Internet [95]. The illustration of the differences between newer and older media in terms of their reality-mimicking features is presented in Fig. 4.

The conclusion that the quality (intensity) and quantity (number of people affected) of media addiction could increase when the metaverse becomes mainstream comes from previous trends, such as a global increase in overall media use in the past decade [5], a

measured increase in addiction quantity [160, 161] and higher addiction intensity [39–42] measured towards newer media (smartphones and television), which are more similar to direct communication than the older media (radio and press).

The noted trends together with an analysis illustrated in Fig. 4 indicate that media use and addictions may further increase with the introduction of the metaverse, as the new medium of communication will have even more reality-mimicking features, such as a sense of space, which will be one of the metaverse's crucial characteristics [8, 48, 94, 122]. Therefore, the virtual world may advance even more at the expense of direct reality (the presumed process is depicted in Fig. 1).

Again, it is important to note that previously mentioned and understudied light and mild addictions may be more harmful to democracy and the individual well-being of citizens worldwide than easily detectable high-intensity addictions. The question is whether this kind of low-intensity addiction will increase with the metaverse and how this will shape democracy and individuals in the society of tomorrow.

Power and addictions are strongly interconnected in today's world. For example, the special power of tech companies is closely tied to addiction, as structuring the experience of online users influences their behavior and actions [67]. The capability to make people even slightly addicted to a product or service gives significant societal influence to a company that controls it. However, aside from financial assets, big tech companies also possess platform, media, and rule-setting powers. In the end, it is important to note that "media power" is much greater than before the appearance of the Internet and smartphones, as this new state of things means choosing not only news and entertainment for their users but also a merger of social media and other kinds of personal communication with AI algorithms capable of delivering individually effective recommendations.

Based on analysis of above-noted literature on societal power and media addictions, the answer to the second research question (RQ2) is that the wide proliferation of the metaverse in societies could cause both societal power of Big Tech and media addictions to increase.

Expanding research on metaverse

Ideas for further metaverse-related research and the limitations of this inquiry are presented in further text.

Park and Kim [118] note that scientific inquiries are needed in terms of social sciences and psychology to explore the VR community in which virtual representations of people live through masked avatars because this kind of constellation would be different from how societies currently operate.

The risks to the physical and psychological health of individuals and groups in the metaverse are unexplored. For example, research has shown that newer media may decrease the receptive and expressive capacity of their users to consume other media [43]. This may lead to an investigation into how the metaverse affects the imagination and creativity of its users.

Inspired by McLuhan⁵, two questions need to be raised. First of all, does the new emerging new medium carry the message that human kind is already alienated to a great extent, so that it is ready to accept the metaverse? Will the widespread use of the metaverse bring people closer together or divide them even more?

Aside from using methods from the realm of sociology of expectations and sociotechnical imaginaries, future studies offer a broad range of additional conceptual frameworks that can be used for analysis. Ones that can be taken into consideration for upcoming studies of the metaverse are social construction of technology and projective grammars. For example, the social construction of technology examines how human action shapes technology and not vice versa [126]. On the other hand, projective grammars argue that intensive public debate about concepts of possible futures, what Mische [163] calls "sites of hyperprojectivity," which is especially evident in attitudes, narratives, performance, and material forms, can be used to study the future [163].

Additionally, there are a number of issues and analyses to be considered related to the metaverse in the future [130]. A conceptualization and methodological framework for the metaverse needs to be established in order to set the stage for empirical inquiry into the new medium [129]. Proposed studies for the future of VR analysis include matters of self-indulgent escapism through VR experiences and ethical guidelines in the design of VR [107].

Pietro and Cresci [130] call for a holistic approach in the scientific exploration of the metaverse. The need for multidisciplinary research avenues emerges with the complexity, transformative value, and economic repercussions of the metaverse.

Also, the amount of interest in the metaverse coming from different cultural realms could constitute an important inquiry on its own. For example, further examination of online Google n-grams presented in Fig. 3 indicates much higher interest in the metaverse coming from China and other Asian countries when compared to Germany. This analysis could provide an interesting outlook on perceptions of the metaverse by Asian vs. Western cultures.

⁵ As McLuhan writes, the medium is the message [162].

Kim [129] suggests a structuralist approach to classifying characteristics of the message in the new environment, the nature of interaction between users and the message, types and formats of advertising, and finally the advantages and disadvantages of specific formats in terms of cognitive, affective, and behavioral effects. Attention, attitudes, credibility, memory, and recognition are all significant aspects of new advertising in the metaverse. Kim [129] introduces a functionalist approach to tackle the motives of consumer behavior and the information-processing aspects of it in order for companies to get a grasp of how target groups perceive and process ads.

Perhaps, neuroscience and economic research can provide useful perspectives in the analysis of the metaverse by delving into the innovative worlds of virtual goods, cryptocurrencies, and blockchain.

Based on the above-given insights, it would be possible to conclude that considerable funding is needed for scientific research in the metaverse. This is significant because of the potential societal changes that will occur as the metaverse expands, some of which are described in this paper, such as increases in addictions and power of tech companies.

The main limitation of this study is the lack of an experimental approach. It will be useful for further scientific investigations to focus on more specific issues related to the societal impact of the metaverse.

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Author's contributions

All the work related to conceptual framework of research, planning, analyzing, and writing of the manuscript was done by the author. The author(s) read and approved the final manuscript.

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References

- Pritchard C (2022) Top 10 companies investing in the metaverse. <https://www.parcl.co/blog/top-10-companies-investing-in-the-metaverse>. Accessed 31 July 2022
- Binance (2021) What is the metaverse? <https://academy.binance.com/en/articles/what-is-the-metaverse>. Accessed 5 Feb 2022
- Feezell JT (2018) Agenda setting through social media: the importance of incidental news exposure and social filtering in the digital era. *Polit Res Q* 71(2):482–494. <https://doi.org/10.1177/1065912917744895>
- Johnson J (2021) Worldwide digital population as of January 2021. <https://www.statista.com/statistics/617136/digital-population-worldwide/>. Accessed 1 Feb 2022
- Richter F (2020) The end of the TV era? <https://www.statista.com/chart/9761/daily-tv-and-internet-consumption-worldwide/>. Accessed 3 Feb 2022
- Musk E (2019) an integrated brain-machine interface platform with thousands of channels. *J Med Internet Res* 21(10):e16194. <https://doi.org/10.2196/16194>
- Niketeghad S, Pouratian N (2019) Brain machine interfaces for vision restoration: the current state of cortical visual prosthetics. *Neur* 16(1):134–143. <https://doi.org/10.1007/s13311-018-0660-1>
- Zuckerberg M (2021) The metaverse and how we will build it together -- Connect 2021. <https://www.youtube.com/watch?v=Uvufun6xer8>. Accessed 23 Feb 2022
- Stephenson N (1992) *Snow crash*. Bantam Books, New York <http://www.randomhousebooks.com/books/172832/>
- Saxon E, Baker B, Hargrove W, Hoffman F, Zganjar C (2004) Mapping environments at risk under different global climate change scenarios. *Ecol Lett* 8(1):53–60. <https://doi.org/10.1111/j.1461-0248.2004.00694.x>
- O'Neal A (2022) Russia, China, and the New Cold War. <https://www.wsj.com/articles/russia-china-and-the-new-cold-war-ukraine-xi-putin-bloc-dictators-alliance-invasion-11647623768>. Accessed 7 Feb 2022
- Smith J (2021) Q&A: future pandemics are inevitable, but we can reduce the risk. <https://ec.europa.eu/research-and-innovation/en/horizon-magazine/qa-future-pandemics-are-inevitable-we-can-reduce-risk>. Accessed 10 Feb 2022
- Jeon HJ, Youn HC, Ko SM, Kim TH (2022) Blockchain and AI meet in the metaverse. *Adv Convergen Blockchain Artif Intell* 73 <https://www.intechopen.com/chapters/77823>
- Mozumder MAI, Sheeraz MM, Athar A, Aich S, Kim HC (2022) Overview: technology roadmap of the future trend of metaverse based on IoT, blockchain, AI technique, and medical domain metaverse activity. In: 24th International Conference on Advanced Communication Technology (ICACT). <https://doi.org/10.23919/ICACT53585.2022.9728808>
- Soricut R, Brill E (2006) Automatic question answering using the web: beyond the factoid. *Inf Retr* 9(2):191–206. <https://doi.org/10.1007/s10791-006-7149-y>
- Floridi L, Chiriatti M (2020) GPT-3: its nature, scope, limits, and consequences. *Minds Mach* 30:681–694. <https://doi.org/10.1007/s11023-020-09548-1>
- Gorelick N, Hancher M, Dixon M, Ilyushchenko S, Thau D, Moore R (2017) Google Earth engine: planetary-scale geospatial analysis for everyone. *Remote Sens Environ* 202:18–27. <https://doi.org/10.1016/j.rse.2017.06.031>
- Meier C, Saorín J, de León AB, Cobos AG (2020) Using the Roblox video game engine for creating virtual tours and learning about the sculptural heritage. *Int J Emerg Technol Learn* 15(20):268–280. <https://doi.org/10.3991/ijet.v15i20.16535>
- Smith K (2013) Virtual reality, universal life. *Digit Outcomes*:157–188. <https://doi.org/10.1016/b978-0-12-404705-1.00007-8>
- Liangcai C, Zehao H, Kexuan L, Xiaomeng S (2022) Progress and challenges in dynamic holographic 3D display for the metaverse. *Infrared Laser Eng* 51(1):20210935. <https://doi.org/10.3788/IRLA20210935>
- Wang Q, Rujia L, Wang Q, Chen S (2021) Non-fungible token (NFT): overview, evaluation, opportunities and challenges. *ArXiv*. <https://doi.org/10.48550/arXiv.2105.07447>

22. Kappe F, Steurer M (2010) The Open Metaverse Currency (OMC) – a micropayment framework for open 3D virtual worlds. In: Buccafurri F, Semeraro G (eds) *E-commerce and web technologies. EC-Web 2010*. Lecture notes in business information processing, vol 61. Springer, Heidelberg. https://doi.org/10.1007/978-3-642-15208-5_9
23. Conti R, Schmidt J (2022) What is an NFT? Non-fungible tokens explained. <https://www.forbes.com/advisor/investing/nft-non-fungible-token/>. Accessed 16 Feb 2022
24. Chohan UW (2022) Metaverse or metacurse? SSRN. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4038770
25. Zwart M, Lindsay D (2010) Governance and the global metaverse. In: Riha D, Maj A (eds) *Emerging practices in cyberculture and social networking*. Brill, Leiden, p 63. https://doi.org/10.1163/9789042030831_005
26. Su Z, Zhang N, Liu D, Luan TH, Shen X (2022) A survey on metaverse: fundamentals, security, and privacy. TechRxiv https://www.techrxiv.org/articles/preprint/A_Survey_on_Metaverse_Fundamentals_Security_and_Privacy/19255058
27. Anandhan A, Shuib L, Ismail MA, Mujtaba G (2018) Social media recommender systems: review and open research issues. *IEEE Access* 6:15608–15628. <https://doi.org/10.1109/ACCESS.2018.2810062>
28. Ferrara E, Yang Z (2015) Measuring emotional contagion in social media. *PLoS One* 10(11):e0142390. <https://doi.org/10.1371/journal.pone.0142390>
29. Whittaker J, Looney S, Reed A, Votta F (2021) Recommender systems and the amplification of extremist content. *Internet Policy Rev* 10(2):1–29. <https://doi.org/10.14763/2021.2.1565>
30. Sbaraini Fontes G, Marques FPJ (2022) Defending democracy or amplifying populism? Journalistic coverage, Twitter, and users' engagement in Bolsonaro's Brazil. *Journalism*. <https://doi.org/10.1177/14648849221075429>
31. Brooks S (2015) Does personal social media usage affect efficiency and well-being? *Comput Hum Behav* 46:26–37. <https://doi.org/10.1016/j.chb.2014.12.053>
32. Spring M (2021) Frances Haugen says Facebook is "making hate worse". <https://www.bbc.com/news/technology-59038506>. Accessed 10 Jan 2022
33. Orlowski J (2020) The social dilemma. <https://www.imdb.com/title/tt11464826/>. Accessed 5 Jan 2022
34. Hinds J, Williams EJ, Joinson AN (2020) "It wouldn't happen to me": privacy concerns and perspectives following the Cambridge Analytica scandal. *Int J Hum Comput Stud* 143:102498. <https://doi.org/10.1016/j.ijhcs.2020.102498>
35. Manokha I (2018) Surveillance: the DNA of platform capital—the case of Cambridge Analytica put into perspective. *Theory Event* 21(4):891–913 <https://muse.jhu.edu/article/707015/pdf>
36. Naughton J (2021) Facebook's decision to uphold the ban on Donald Trump and its consequence in social media censorship regulations. *SSRN Electron J*. <https://doi.org/10.2139/ssrn.3843025>
37. Nunez M (2016) Former Facebook workers: we routinely suppressed conservative news. <https://gizmodo.com/former-facebook-workers-we-routinely-suppressed-conser-1775461006>. Accessed 4 Jan 2022
38. Shead S (2022) Elon Musk says he is considering building a new social media platform. <https://www.cnbc.com/2022/03/28/elon-musk-says-hes-considering-building-a-new-social-media-platform.html>. Accessed 28 Mar 2022
39. Bojic L, Marie JL (2017) Addiction to old versus new media. *Srp Polit Misao* 56(2):33–48. <https://doi.org/10.22182/spm.5622017.2>
40. Huisman A, Eijnden RVD, Garretsen H (2001) "Internet addiction" - a call for systematic research. *J Subst Use* 6(1):7–10. <https://doi.org/10.1080/146598901750132036>
41. Leung L, Lee PSN (2012) The influences of information literacy, Internet addiction and parenting styles on Internet risks. *New Med Soc* 14(1):117–136. <https://doi.org/10.1177/1461444811410406>
42. Stern SE (1999) Addiction to technologies: a social psychological perspective of Internet addiction. *Cyberpsychol Behav* 2(5):419–424. <https://doi.org/10.1089/cpb.1999.2.419>
43. Bojic L, Marie JL, Brankovic S (2013) Reception and expression capabilities of media addicts in Serbia. *Kult Polisa* 10(22):353–368 <http://rifdt.institfdt.bg.ac.rs/123456789/2342>
44. Segawa T, Baudry T, Bourla A, Blanc JV, Peretti CS, Mouchabac S, Ferreri F (2020) Virtual reality (VR) in assessment and treatment of addictive disorders: a systematic review. *Front Neurosci* 13. <https://doi.org/10.3389/fnins.2019.01409>
45. Tong X, Gupta A, Lo H, Choo A, Gromala D, Shaw CD (2017) Chasing lovely monsters in the wild, exploring players' motivation and play patterns of Pokémon Go. In: *ACM conference on computer supported cooperative work and social*. <https://doi.org/10.1145/3022198.3026331>
46. Wang AI (2021) Systematic literature review on health effects of playing Pokémon Go. *Entertain Comput* 38:100411. <https://doi.org/10.1016/j.entcom.2021.100411>
47. Zsila G, Orosz G (2019) Motives for playing Pokémon Go can predict healthy and problematic use. *Sci Trends*. <https://doi.org/10.31988/scitrends.48590>
48. Mystakidis S (2022) Metaverse. *Encyclopedia* 2:486–497. <https://doi.org/10.3390/encyclopedia2010031>
49. Kelly K (2010) *What technology wants*. Penguin Publishing Group, London <https://kk.org/books/what-technology-wants/>
50. Kelly K (2016) *The inevitable: understanding the 12 technological forces that will shape our future*. Penguin Publishing Group, London <https://www.goodreads.com/en/book/show/27209431-the-inevitable>
51. Kelly K (2019) AR will spark the next big tech platform—call it mirror-world. <https://www.wired.com/story/mirrorworld-ar-next-big-tech-platform/>. Accessed 18 Feb 2022
52. Wang Y, Su Z, Zhang N, Xing R, Liu D, Luan TH, Shen X (2022) A survey on metaverse: fundamentals, security, and privacy. TechRxiv. <https://doi.org/10.36227/techrxiv.19255058.v1>
53. Borup M, Brown N, Konrad K, van Lente H (2006) The sociology of expectations in science and technology. *Technol Anal Strateg Manag* 18(3–4):285–298. <https://doi.org/10.1080/09537320600777002>
54. Beckert J (2016) *Imagined futures*. Harvard University Press, Cambridge <https://www.hup.harvard.edu/catalog.php?isbn=9780674088825>
55. van Lente H (1993) *Promising technology. The dynamics of expectations in technological developments*. Dissertation, University of Twente [https://research.utwente.nl/en/publications/promising-technology-the-dynamics-of-expectations-in-technological-developments\(b6aacd2c-d4b2-4f84-8524-3662b365ac02\).html](https://research.utwente.nl/en/publications/promising-technology-the-dynamics-of-expectations-in-technological-developments(b6aacd2c-d4b2-4f84-8524-3662b365ac02).html)
56. Schiölin K (2020) Revolutionary dreams: future essentialism and the socio-technical imaginary of the Fourth Industrial Revolution in Denmark. *Soc Stud Sci* 50(4):542–566. <https://doi.org/10.1177/0306312719867768>
57. Jasanoff S (2015) Future imperfect: science, technology, and the imagination of modernity. In: Jasanoff S, Kim SH (eds) *Dreamscapes of modernity: sociotechnical imaginaries and the fabrication of power*. University of Chicago Press, Chicago, p 1. <https://doi.org/10.7208/chicago/9780226276663.001.0001>
58. Winner L (1998) Prophets of inevitability. *MIT Technol Rev* 101(2):62 <https://www.technologyreview.com/1998/03/01/237058/prophets-of-inevitability/>
59. Geertz C (1973) *The interpretation of cultures. Selected essays by Clifford Geertz*. Basic Books, New York <http://hdl.handle.net/2027/heb.01005.0001.001>
60. Schwab K (2016) *The fourth industrial revolution. What it means and how to respond*. In: Rose G (ed) *The fourth industrial revolution: a Davos eader*. Foreign Affairs, New York <https://www.weforum.org/about/the-fourth-industrial-revolution-by-klaus-schwab>
61. Mann M (1984) The autonomous power of the state: its origins, mechanisms and results. *Eur J Sociol* 25(2):185–213. <https://doi.org/10.1017/s0003975600004239>
62. Weber M (1978) *Economy and society: an outline of interpretive sociology*. University of California Press, Berkeley <https://www.worldcat.org/title/economy-and-society-an-outline-of-interpretive-sociology/oclc/448434>
63. Bates TR (1975) Gramsci and the theory of hegemony. *J Hist Ideas* 36(2):351–366. <https://doi.org/10.2307/2708933>
64. Foucault M (1982) The subject of power. *Crit Inq* 8(4). <https://doi.org/10.1086/448181>
65. Turkel G (1990) Michel Foucault: law, power, and knowledge. *J Law Soc* 17(2):170. <https://doi.org/10.2307/1410084>
66. Luhmann N (2017) *Trust and power*. Polity, Cambridge <https://www.wiley.com/en-us/Trust+and+Power-p-9781509519453>
67. Dolata U, Schrape J (2018) *Collectivity and power on the Internet: a sociological perspective*. Springer, Berlin <https://link.springer.com/book/10.1007/978-3-319-78414-4>
68. Bhargava V, Velasquez M (2021) Ethics of the attention economy: the problem of social media addiction. *Bus Ethics Q* 31(3):321–359. <https://doi.org/10.1017/beq.2020.32>

69. Johnston M (2022) Biggest companies in the world by market cap. <https://www.investopedia.com/biggest-companies-in-the-world-by-market-cap-5212784>. Accessed 15 Feb 2022
70. Fernandez R, Adriaans I, Klinge TJ, Hendrikse R (2021) How Big Tech is becoming the government. <https://www.somo.nl/how-big-tech-is-becoming-the-government/>. Accessed 5 Feb 2022
71. Ghosh D, Srinivasan R (2021) The future of platform power: reining in Big Tech. *J Democr* 32(3):163–167. <https://doi.org/10.1353/jod.2021.0042>
72. Barbrook R, Cameron A (1996) The Californian ideology. *Sci Cult* 6(1):44–72. <https://doi.org/10.1080/09505439609526455>
73. Hoffmann AL, Proferes N, Zimmer M (2018) “Making the world more open and connected”: Mark Zuckerberg and the discursive construction of Facebook and its users. *New Med Soc* 20(1):199–218. <https://doi.org/10.1177/1461444816660784>
74. Sias L (2021) The ideology of AI. *Philos Today* 65(3):505–522. <https://doi.org/10.5840/philtoday2021514405>
75. Gates B (1995) *The road ahead*. Viking Press, New York <https://www.penguinrandomhouse.ca/books/328320/the-road-ahead-by-bill-gates/9781598877113>
76. Musk E (2017) Making humans a multi-planetary species. *New Space* 5(2):46–61. <https://doi.org/10.1089/space.2017.29009.emu>
77. Skilton M, Hovsepian F (2018) *The 4th industrial revolution*. Springer Nature, Berlin <https://link.springer.com/book/10.1007/978-981-16-1614-3>
78. Popiel P (2018) The Tech Lobby: tracing the contours of new media elite lobbying power. *Commun Cult Crit* 11(4):566–585. <https://doi.org/10.1093/ccc/ty027>
79. Alshare F, Alkhaldeh AM, Eneizan BM (2019) Social media website’s impact on moral and social behavior of the students of university. *Int J Aca Res Bus Soc Sci* 9(3). <https://doi.org/10.6007/ijarbss/v9-i3/5646>
80. Amjad Y, Siddiqui DA (2019) Impact of organizational culture on effectiveness with the mediating role of innovativeness and knowledge management: evidence from Pakistan. *SSRN Electron J*. <https://doi.org/10.2139/ssrn.3510648>
81. Mortensen M, Trenz HJ (2016) Media morality and visual icons in the age of social media: Alan Kurdi and the emergence of an impromptu public of moral spectatorship. *Javnost-Public* 23(4):343–362. <https://doi.org/10.1080/13183222.2016.1247331>
82. Paciello M, D’Errico F, Saleri G, Lamponi E (2021) Online sexist meme and its effects on moral and emotional processes in social media. *Comput Hum Behav* 116:106655. <https://doi.org/10.1016/j.chb.2020.106655>
83. Shao P, Wang Y (2017) How does social media change Chinese political culture? The formation of fragmented public sphere. *Telemat Inform* 34(3):694–704. <https://doi.org/10.1016/j.tele.2016.05.018>
84. Bossio D, Flew T, Meese J, Leaver T, Barnett B (2022) Australia’s News Media Bargaining Code and the global turn towards platform regulation. *Policy Internet*:1–15. <https://doi.org/10.1002/poi3.284>
85. Fischer S (2022) How one Elon Musk tweet showed Twitter’s impact on the stock market. <https://www.axios.com/2022/05/14/elon-musk-tweet-twitter-tesla-stock-prices>. Accessed 14 May 2022
86. Spence EH (2020) The sixth estate: tech media corruption in the age of information. *J Inf Commun Ethics Soc* 18(4):553–573. <https://doi.org/10.1108/JICES-02-2020-0014>
87. Gerard D (2020) *Libra Shrugged: how Facebook tried to take over the money*. <https://davidgerard.co.uk/blockchain/libra/>. Accessed 8 Feb 2022
88. Courtney E. Remote work stats and trends: navigating work from home jobs. <https://www.flexjobs.com/blog/post/remote-work-statistics/>. Accessed 15 Feb 2022
89. Fukuyama F, Grotto A (2020) Comparative media regulation in the United States and Europe. In: Persily N, Tucker JA (eds) *Social media and democracy: the state of the field, prospects for reform*. Cambridge University Press, Cambridge, p 199 <https://www.cambridge.org/core/books/social-media-and-democracy/comparative-media-regulation-in-the-united-states-and-europe/0E4F255ADA3FC81BDC4365FF10DFDF3A>
90. Medine D, Murthy G (2019) Nobody reads privacy policies: why we need to go beyond consent to ensure data privacy. <https://nextbillion.net/beyond-consent-for-data-privacy/>. Accessed 8 Feb 2022
91. Park D (2022) S. Korea’s science ministry announces ethical principles for the metaverse. *Yahoo Finance* <https://finance.yahoo.com/news/korea-science-ministry-announces-ethical-044143407.html>. Accessed 22 Feb 2022
92. Thomason J (2021) MetaHealth - how will the metaverse change health care? *J Met* 1(1):13–16 <https://dergipark.org.tr/en/pub/jmw/issue/67581/1051379>
93. Egliston B, Carter M (2021) Critical questions for Facebook’s virtual reality: data, power and the metaverse. *Internet Policy Rev* 10(4). <https://doi.org/10.14763/2021.4.1610>
94. Ning H, Wang H, Lin Y, Wang W, Dhelim S, Farha F, Ding J, Daneshmand M (2021) A survey on metaverse: the state-of-the-art, technologies, applications, and challenges. *ArXiv*. <https://doi.org/10.48550/arXiv.2111.09673>
95. Lee LH, Braud T, Zhou P, Wang L, Xu D, Lin Z, Kumar A, Hui BC (2021) All one needs to know about metaverse: a complete survey on technological singularity, virtual ecosystem, and research agenda. *ArXiv*. <https://doi.org/10.48550/arXiv.2110.05352>
96. Euronews & Reuters (2022) Preventing another gang rape: is Facebook’s new tool enough to stop sexual assault in the metaverse? <https://www.euronews.com/next/2022/02/06/preventing-another-gang-rape-is-facebook-s-new-tool-enough-to-stop-sexual-assault-in-the-m>. Accessed 6 Feb 2022
97. Wakefield J (2022) Meta moves to tackle creepy behavior in virtual reality. <https://www.bbc.com/news/technology-60247542#:~:text=Meta%20has%20announced%20a%20new>. Accessed 4 Feb 2022
98. Saker M, Frith J (2022) Contiguous identities: the virtual self in the supposed metaverse. *First Monday* 27(3). <https://doi.org/10.5210/fm.v27i3.12471>
99. Stasi ML (2022) EU: regulation of recommender systems in the Digital Services Act. <https://www.article19.org/resources/eu-regulation-of-recommender-systems-in-the-digital-services-act/>. Accessed 14 May 2022
100. Mullins A, Hishon R, Rennie J, Powell P, Dumais M (2022) EU Digital Services Act to revolutionize legal landscape for online intermediaries. <https://www.whitecase.com/insight-alert/eu-digital-services-act-revolutionize-legal-landscape-online-intermediaries>. Accessed 6 July 2022
101. Vincent J (2016) UN condemns Internet access disruption as a human rights violation. <https://www.theverge.com/2016/7/4/12092740/un-resolution-condemns-disrupting-internet-access>. Accessed 8 Jan 2022
102. Holsapple CW, Wu J (2007) User acceptance of virtual worlds. *ACM SIGMIS Database* 38(4):86–89. <https://doi.org/10.1145/1314234.1314250>
103. Rajan AV, Nassiri N, Akre V, Ravikumar R, Nabeel A, Buti M, Salah F (2018) Virtual reality gaming addiction. In: *Fifth HCT Information Technology Trends (ITT)*. <https://doi.org/10.1109/ctit.2018.8649547>
104. Ertel R, Karakaş O, Dođru YB (2017) A qualitative research on the supportive components of Pokemon Go addiction. *AJIT-e* 8(30):271–289. <https://doi.org/10.5824/1309-1581.2017.5.012.x>
105. Mahran DG (2020) Smartphones addiction and its correlates among university students, Egypt. *Arch Neurol Neurosci* 8(5). <https://doi.org/10.33552/ann.2020.08.000698>
106. Yaqoob N, Mehnaz S, Saleem A (2020) Social media usage or addiction: social media addiction among late adolescence. *ATSK J Psychol* 1(1). <https://doi.org/10.55032/atskj.psychol.2020.1103>
107. Han DID, Bergs Y, Moorhouse N (2022) Virtual reality consumer experience escapes: preparing for the metaverse. *Virtual Real*. <https://doi.org/10.1007/s10055-022-00641-7>
108. Slater M, Gonzalez-Liencreas C, Haggard P, Vinkers C, Gregory-Clarke R, Jolley S, Watson Z, Breen G, Schwarz R, Steptoe W, Szostak D, Halan S, Fox D, Silver J (2020) The ethics of realism in virtual and augmented reality. *Front Virtual Rea* 1. <https://doi.org/10.3389/frvir.2020.00001>
109. VRChat (2022). *VRChat*. <https://hello.vrchat.com/>. Accessed 25 May 2022
110. Idle, M. (2022). Understanding VRChat addiction. <https://www.worldsbestrehab/vrchat-addiction/>. Accessed 7 May 2022
111. WHO (2021). *International classification of diseases, eleventh revision (ICD-11)*. Available via WHO. <https://icd.who.int/>. Accessed 15 Feb 2022.
112. American Psychiatric Association (2013) *Diagnostic and statistical manual of mental disorders, 5th edn*. <https://doi.org/10.1176/appi.books.9780890425596> Available via PSYCHIATRY ONLINE. Accessed 15 Jan 2022
113. Adair C (2021) Video Game Addiction Statistics 2022—how many addicted gamers are there? <https://gamequitters.com/video-game-addiction-statistics/>. Accessed 15 Apr 2022
114. Jeong EJ, Kim DJ, Lee DM (2016) Why do some people become addicted to digital games more easily? A study of digital game addiction from a psychosocial health perspective. *Int J Hum Comput Interact*:199–214. <https://doi.org/10.1080/10447318.2016.1232908>

115. Belk R (2016) Extended self and the digital world. *Curr Opin Psychol* 10:50–54. <https://doi.org/10.1016/j.copsyc.2015.11.003>
116. Tyminski R (2018) Addiction to cyberspace: virtual reality gives analysts pause for the modern psyche. *Int J Jungian Stud* 10(2):91–102. <https://doi.org/10.1080/19409052.2017.1390483>
117. Campbell A, Taylor B, Bates J, O'Connor-Bones U (2018) Developing and applying a protocol for a systematic review in the social sciences. *New Rev Acad Libr* 24(1):1–22. <https://doi.org/10.1080/13614533.2017.1281827>
118. Park SM, Kim YG (2022) A metaverse: taxonomy, components, applications, and open challenges. *IEEE Access* 10:4209–4251. <https://doi.org/10.1109/ACCESS.2021.3140175>
119. Lee LH, Lin Z, Hu R, Gong Z, Kumar A, Li T, Li S, Hui P (2021) When creators meet the metaverse: a survey on computational arts. *ArXiv*. <https://doi.org/10.48550/arXiv.2111.13486>
120. Smart J, Jamais C, Paffendorf J (2008) Metaverse roadmap: pathways to the 3D web. <https://www.w3.org/2008/WebVideo/Annotations/wiki/images/1/19/MetaverseRoadmapOverview.pdf>. Accessed 9 Feb 2022
121. Yang Q, Zhao Y, Huang H, Xiong Z, Kang J, Zheng Z (2022) Fusing blockchain and AI with metaverse: a survey. *ArXiv*. <https://doi.org/10.48550/arXiv.2201.03201>
122. Narin NG (2021) A content analysis of the metaverse articles. *J Met* 1(1):17–24. <https://dergipark.org.tr/en/pub/jmw/issue/67581/1051382>
123. Cronin I, Scoble R (2020) The infinite retina: spatial computing, augmented reality, and how a collision of new technologies are bringing about the next tech revolution. Packt Publishing, Birmingham https://uosc.primo.exlibrisgroup.com/permalink/01USC_INST/273cgt/cdi_proquest_ebookcentral_EBC6193911
124. Google (2022) Metaverse. https://trends.google.com/trends/explore?date=2020-05-27%202022-06-27&q=%2Fm%2F054_cb. Accessed 25 May 2022
125. Kraus S, Kanbach D, Krysta P, Steinhoff M, Tomini N (2022) Facebook and the creation of the metaverse: radical business model innovation or incremental transformation? *Int J Entrep Behav Res* https://www.researchgate.net/publication/357635338_Facebook_and_the_creation_of_the_Metaverse_Radical_business_model_innovation_or_incremental_transformation
126. Pinch TJ, Bijker WE (1984) The social construction of facts and artefacts: or how the Sociology of Science and the Sociology of Technology might benefit each other. *Soc Stud Sci* 14(3):399–441. <https://doi.org/10.1177/030631284014003004>
127. Hetler A (2022) Top 8 metaverse events in 2022. <https://www.techtarget.com/whatis/feature/Top-metaverse-events>. Accessed 2 May 2022
128. Chen R (2022) Ready, communicators: communications and public relations in the metaverse. *McMaster J Commun* 13(1):1–6. <https://doi.org/10.15173/mjc.v13i1.3054>
129. Kim J (2021) Advertising in the metaverse: research agenda. *J Interact Advert* 21(3):141–144. <https://doi.org/10.1080/15252019.2021.2001273>
130. Pietro R, Cresci S (2021) Metaverse: security and privacy issues. In: *The Third IEEE International Conference on Trust, Privacy and Security in Intelligent Systems, and Applications (IEEE TPS'21)* https://www.researchgate.net/publication/357116743_Metaverse_Security_and_Privacy_Issues
131. Ramesh UV, Harini A, Gowri CSD, Durga KV, Druvitha P, Kumar KS (2022) Metaverse: future of the internet. *Int J Res Publ Rev* 3(2):93–97. <https://ijrpr.com/uploads/V3ISSUE2/ijrpr2593-metaverse-future-of-the-internet.pdf>
132. Lee G, Sung J, Lee B (2019) Recent advances in metasurface hologram technologies (invited paper). *ETRI J* 41(1):10–22. <https://doi.org/10.4218/etrij.2018-0532>
133. Bottani E, Vignali G (2019) Augmented reality technology in the manufacturing industry: a review of the last decade. *IIEE Trans* 51(3):284–310. <https://doi.org/10.1080/24725854.2018.1493244>
134. TradingView (2022) Meta. <https://www.tradingview.com/symbols/NASDAQ-META/>. Accessed 26 July 2022.
135. DiLella C, Day A (2022). Investors are paying millions for virtual land in the metaverse. <https://www.cnbc.com/2022/01/12/investors-are-paying-millions-for-virtual-land-in-the-metaverse.html>. Accessed 20 Jan 2022
136. CoinDesk (2022) The Sandbox Looks to raise US \$400 M at US \$4 B valuation: report. <https://www.coindesk.com/business/2022/04/19/metaverse-startup-the-sandbox-looks-to-raise-400m-at-4b-valuation-report/>. Accessed 26 July 2022
137. NonFungible (2022) Screen the latest market trends of collectible in no time with in-depth analysis and data visualization in our quarterly and yearly NFT market reports. <https://nonfungible.com/market-tracker?days=365>. Accessed 26 July 2022
138. Google2 (2022) NFT. <https://trends.google.com/trends/explore?date=2021-10-10%202022-05-01&q=NFT>. Accessed 25 May 2022
139. Fenn J, Raskino M (2008) Mastering the hype cycle: how to choose the right innovation at the right time (Gartner). Harvard Business Review Press, Brighton <https://www.amazon.com/Mastering-Hype-Cycle-Innovation-Gartner/dp/1422121100>
140. Dedehayir O, Steinert M (2016) The hype cycle model: a review and future directions. *Technol Forecast Soc Change* 108:28–41. <https://doi.org/10.1016/j.techfore.2016.04.005>
141. Kenrick DT, Griskevicius V, Neuberg SL, Schaller M (2010) Renovating the pyramid of needs. *Perspect Psychol Sci* 5(3):292–314. <https://doi.org/10.1177/1745691610369469>
142. Mittal VA, Dean DJ, Pelletier A (2012) Internet addiction, reality substitution and longitudinal changes in psychotic-like experiences in young adults. *Early Interv Psychiatry* 7(3):261–269. <https://doi.org/10.1111/j.1751-7893.2012.00390.x>
143. Saphire-Bernstein S, Taylor SE (2013) In: Boniwell I, David SA, Ayers AC (eds) *Close relationships and happiness*. Oxford Handbooks Online, Oxford, p 821. <https://doi.org/10.1093/oxfordhb/9780199557257.013.0060>
144. Ferguson N (2018) What is to be done? Safeguarding democratic governance in the age of network platforms. <https://www.hoover.org/research/what-be-done-safeguarding-democratic-governance-age-network-platforms>. Accessed 8 Jan 2022
145. Agrawal A, Gans JS, Goldfarb A (2018) Exploring the impact of artificial intelligence: prediction versus judgment. *SSRN Ele J*. <https://doi.org/10.2139/ssrn.3177467>
146. Kubrick S (1968) 2001: a space Odyssey [film]. Stanley Kubrick Productions, London
147. Elyounes DA (2019) Bail or jail? Judicial versus algorithmic decision-making in the pretrial system. *Colum Sci Tech Law Rev* 21:376. <https://heinonline.org/HOL/LandingPage?handle=hein.journals/cstr121&div=12&id=&page=>
148. Sachan S, Yang JB, Xu DL, Benavides DE, Li Y (2020) An explainable AI decision-support-system to automate loan underwriting. *Expert Syst Appl* 144:113100. <https://doi.org/10.1016/j.eswa.2019.113100>
149. Kissinger HA, Schmidt E, Huttenlocher D (2021) *The age of AI: and our human future*. Little, Brown and Company, New York <https://ageofaibook.com/>
150. Hooker MP (2019) Censorship, free speech & Facebook: applying the first amendment to social media platforms via the public function exception. *Wash JL Tech Arts* 15(1):36. <https://digitalcommons.law.uw.edu/wjlta/vol15/iss1/3>
151. Varoufakis Y (2021) Techno-feudalism is taking over. <https://diem25.org/techno-feudalism-taking-over/>. Accessed 7 Jan 2022
152. Zuckerman E (2009) Twitter.org? And building models for social media. <https://ethanzuckerman.com/2009/09/28/twitter-org-and-building-models-for-social-media/>. Accessed 15 Jan 2022
153. Dhar V (2021) Nationalize Facebook and Twitter as public goods. <https://thehill.com/opinion/technology/534458-nationalize-facebook-and-twitter-as-public-goods>. Accessed 8 Jan 2022
154. UNESCO (2021) WPF2021 – concept note — Word Press Freedom Day 2021: information as a public good - 30 years of the Windhoek Declaration. https://en.unesco.org/sites/default/files/wpf2021_concept_note_en.pdf. Accessed 19 Jan 2022
155. Bojic L (2022) Culture organism or techno-feudalism: how growing addictions and artificial intelligence shape contemporary society. *Institute for Philosophy and Social Theory, Belgrade* <https://ifdt.bg.ac.rs/index.php/2022/04/11/culture-organism-or-techno-feudalism/?lang=en>
156. Ye Y (2022) Analysis on the control of data collection, privacy, and usage. In: *2021 international conference on social development and media communication*. Atlantis Press, Amsterdam, p 997. <https://www.atlantispress.com/article/125968512.pdf>
157. Couldry N, Mejias UA (2019) *The costs of connection: how data is colonizing human life and appropriating it for capitalism*. Stanford University Press, Stanford <https://www.sup.org/books/title/?id=28816>
158. Bojic L, Marie JL (2013) Media addiction by universal indicators. *Srp Polit Misao* 41(3):183–197. <https://doi.org/10.22182/spm.4132013.9>
159. Chaffey D (2022) Global social media statistics research summary 2022. <https://www.smartinsights.com/social-media-marketing/social-media-strategy/new-global-social-media-research/>. Accessed 27 Jan 2022

160. Cheng C, Li AYL (2014) Internet addiction prevalence and quality of (real) life: a meta-analysis of 31 nations across seven world regions. *Cyberpsychol Behav Soc Netw* 17(12):755–760. <https://doi.org/10.1089/cyber.2014.0317>
161. Chi X, Hong X, Chen X (2020) Profiles and sociodemographic correlates of Internet addiction in early adolescents in southern China. *Addict Behav* 106:106385. <https://doi.org/10.1016/j.addbeh.2020.106385>
162. McLuhan M (1964) *Understanding media: the extensions of man*. McGraw-Hill, London <https://web.mit.edu/allanmc/www/mcluhan.mediummessage.pdf>
163. Mische A (2014) Measuring futures in action: projective grammars in the Rio + 20 debates. *Theory Soc* 43:437–464. <https://doi.org/10.1007/s11186-014-9226-3>

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