Regulation of the Metaverse: A Roadmap

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The risks and regulatory solutions for largescale consumer platforms.

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Over the last thirty years, the immersive technologies of virtual reality (VR) and augmented reality (AR) have steadily advanced, enabling high fidelity experiences at consumer prices. Over the same period, networking speeds have increased dramatically, culminating in the deployment of 5G cellular networks. Combined, these advancements have greatly increased the prospects for widespread adoption of VR and AR worlds. Recently branded "the metaverse" by Facebook (now Meta) and other platform providers, major corporations have begun investing billions of dollars to deploy immersive environments aimed at mainstream activities from socializing and shopping to education and business. With the likelihood rising that metaverse platforms greatly impact society over the next decade, it is prudent to consider the risks and plan for meaningful regulation. This is especially true in light of the negative impacts that social media has had on society in recent years. The dangers of the metaverse are outlined herein along with proposals for regulation.

Keywords and Phrases: Metaverse, Extended Reality (XR), Mixed Reality (MR), Virtual Reality (VR), Augmented Reality (AR), Regulation, Technology Policy

1 INTRODUCTION

Over the last 18 months, public interest in the metaverse has surged along with a significant rise in corporate investment. Facebook alone spent over $10B in 2021 to develop metaverse technologies and indicated it would ramp up investment going forward [1]. Research firm, Gartner Corporation, currently predicts that 25% of consumers will spend at least one hour per day in the metaverse by 2026 and that 30% of organizations in the world will have products and services ready for the metaverse in that same time frame [2]. Clearly, we are in a period of rapid development and adoption of metaverse related platforms and business models.

To provide a legal and philosophical basis for regulating the metaverse, it is helpful to first consider the arguments made for regulating social media, as the metaverse can be viewed as an evolutionary expansion of similar industries. To study the negative impacts of social media, the Aspen Institute formed a *Commission on Information Disorder*. For a period of six months in 2021, a diverse group of experts from across academia, government, and industry explored the issue and published an 80 page report in November of 2021. They found that social media contributes greatly to misinformation and disinformation which have become a "force multiplier for exacerbating our worst problems as a society," calling it a crisis that exacerbates all other crises [3]. To address the problems, the Aspen commission recommended increased transparency of social media platforms and greater protections for consumers with the goal of rebuilding trust and reducing harms.

While there are many paths for addressing the damage caused by social media, regulatory action may be required. Assessing the justification of social media regulation, Yale Law professor Jack Balkin describes social media companies as "key institutions in the twenty-first century digital public sphere," and explains that the public sphere "doesn't work properly without trusted and trustworthy institutions." He further argues the public sphere created by social media companies is a successor to the public sphere created by print and broadcast

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media, which has been regulated by industry norms and government oversight [4]. At the same time, Balkin and other scholars express caution about government overreach, as aggressive regulation could be damaging to free speech and other rights, with some experts pushing for industrywide self-regulation as a means of reducing the level of necessary government oversight [5,6].

As we look beyond current social media to immersive environments such as virtual reality and augmented reality, similar principals apply. In fact, Facebook CEO, Mark Zuckerberg, wrote in October 2021 that "in the metaverse, you'll be able to do almost anything you can imagine — get together with friends and family, work, learn, play, shop, create." Clearly the metaverse aims to take on the role of "a public sphere" as much if not more than today's social media [7]. This transition may happen quickly, as Facebook's stated goal is "within the next decade, 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." And Facebook is not the only major corporation aggressively pursuing this vision – Apple, Microsoft, Google, Sony, and Snap are just a few of the major players that have announced significant efforts [8,9].

With the world's largest technology companies investing hundreds of billions of dollars in VR and AR products and services, it is reasonable to predict that the metaverse will impact the lives of billions of people within the next ten years, driving a global transition from flat media to immersive media as the primary means by which users access digital content [10]. This will greatly impact the public sphere, giving even more control to platform providers than current social media technologies. With the industry heading in this direction, it is prudent to assess the potential dangers and propose any necessary regulatory solutions [11].

2 DEFINING THE METAVERSE

It is not the technology of the metaverse that is potentially dangerous to consumers, but the fact that commercial platforms are likely to be administered by large corporations that may implement similar aggressive business tactics to those used in social media. Before describing the potential dangers of corporate-controlled metaverse platforms, it's worth providing a working definition of the word "Metaverse" as it means different things to different people, along with definitions for Virtual Reality (VR) and Augmented Reality (AR):

> *A **Metaverse** is a persistent and immersive simulated world that is experienced in the first person by large groups of simultaneous users who share a strong sense of mutual presence. It can be a fully virtual environment (i.e. a Virtual Metaverse) or it can exist as layers of virtual content overlaid on the real world with convincing spatial registration (i.e. an Augmented Metaverse)* [12].
>
> ***Virtual Reality** (VR) is an immersive and interactive simulated environment that is experienced in the first person and provides a strong sense of presence to the user* [13].
>
> ***Augmented Reality** (AR) is an immersive and interactive environment in which virtual content is spatially registered to the real world and experienced in the first person, providing a strong sense of presence in a combined real / virtual space* [13].

It's worth noting that Mixed Reality (MR) is often used as a synonym for augmented reality and that Extended Reality (XR) is often used to refer to the superset of VR and AR technologies.

With these definitions in place, we can anticipate that a *virtual metaverse* will be a fully simulated world in which users are represented by graphical avatars (see Fig 1). Conversely, in an *augmented metaverse* the human participants are not avatar-based but can be embellished with virtual content, as can all aspects of the physical world around them (see Fig 2).

Figure 1: Virtual Metaverse example – The Nth Floor (Accenture)

Figure 2: Augmented Metaverse example - (Keiichi Matsuda)

Some say a metaverse must also include rules of conduct and a fully functional economy, but that is still open for debate [14]. In addition, some say that a metaverse must also be interoperable, enabling virtual items and monetary transactions to be exchanged among multiple virtual worlds. While it is likely that many virtual and augmented worlds will enable such interoperability, the definition of metaverse should allow for self-contained worlds, as it is likely some platforms will be implemented as such.

However you define the metaverse, it is not the technology that poses a risk to society, but the fact that the technical infrastructure that is required to enable both virtual and augmented worlds will give powerful corporations the ability to mediate all aspects of our lives, from what products, services, and information we are exposed to, to what people we encounter, befriend, and socialize with. On the surface, this may sound similar to the impact of today's social media, which also mediates our daily experiences and interactions, but in the metaverse the prospect of corporate intrusion becomes far more intimate [10].

The Three M's of the Metaverse: the key dangers can be categorized as the ability of metaverse platforms to (i) Monitor users, (ii) Manipulate users, and (iii) Monetize users [15]. These dangers are outlined as follows:

2.1 Monitoring Users in the Metaverse

Over the last two decades, technology companies have made a science of tracking and characterizing users on their platforms, as it enables the sale of targeted advertising. [16] Such targeting has been a boon for advertisers and a windfall for media platforms, resulting in some of the most valuable corporations in human history. Unfortunately, such targeting has exploited consumers, reduced personal privacy, and has made social media a polarizing force by allowing third-parties to deploy customize messaging that is skillfully aimed at specific demographic groups. This tactic has had the widespread effect of amplifying existing biases and preconceptions in populations, radicalizing political views and spreading misinformation [17].

In the metaverse, these problems are likely to get significantly worse [18]. That's because the technology will not just track where each user clicks, but where they go, what they do, what they look at, even how long their gaze lingers. Tracking will also include real-time monitoring of user gait (especially in augmented worlds), assessing when users slow down to browse products or services, or when they speed up to pass locations, they are not interested in. Metaverse platforms will even monitor manual reach, assessing when users grab for objects (both real and virtual) and tracking how long they hold the objects to investigate. This will be true even in augmented reality, which will monitor as users reach for real objects in the real world, for example when shopping in physical stores that are augmented with virtual content. This may sound extreme, but real-time tracking of manual interactions with real objects goes back to the first interactive augmented reality system developed at Air Force Research Laboratory in 1992 (see Fig 3) [10, 27].

Immersive platforms will also track facial expressions, vocal inflections, and vital signs, while intelligent algorithms use such data to predict each person's real-time emotional state [19-21]. This means the platform providers controlling the metaverse will not just know how their users physically act and interact, but how they emotionally react as they traverse real and virtual spaces, profiling their responses at far deeper levels than has been possible in traditional media platforms. Of course, the danger is not merely that these personal parameters can be monitored in real-time, but that advertisers and other paying third parties can use such invasive data to manipulate the wants and needs of consumers more effectively than ever before.

Figure 3: Augmented Reality Research, US Air Force - (Virtual Fixtures Platform, 1992)

2.2 Manipulating Users in the Metaverse

From the early days of radio and television, advertisers have skillfully influenced public opinion on a broad scale as well as driven personal wants and needs on a micro scale. With the advent of social media, targeted messaging has greatly increased the persuasive ability of advertisers to influence the public, both broadly and personally [22,23]. In the metaverse, such targeting will get far more personal and the content will get much harder to resist [24]. That's because in today's flat media environments like Facebook and Twitter consumers are generally aware when they are being targeted by an advertisement and can muster a healthy dose of skepticism [25]. But in the metaverse, consumers won't be targeted with simple pop-up ads or promo-videos that are obviously advertisements. Instead, consumers will be targeted by simulated people, products, and activities that seem just as real as everything else around us.

For example, *virtual product placements* are likely to become a powerful targeted-advertising vehicle within both virtual and augmented worlds. Imagine walking down the street in the metaverse, either a fully simulated street in a *virtual metaverse* or an embellished real-world street in the *augmented metaverse*. In both cases, the platform provider will track where you are in real-time, how quickly you are moving, and what your gaze is aimed at. The platform provider will also have access to a database about your hobbies and interests, your values and affiliations, and most likely your shopping history. In social media, this personal information would be used to target you with videos and other forms of traditional advertising. In the metaverse, platform providers will be able to manipulate your actual experience. This will include injecting virtual products into your world that you will encounter in what feels like a serendipitous interaction. This might include seeing particular cars on the virtual streets, particular brands in store windows, or even include simulated people drinking a particular soft drink as they walk past you on the sidewalk. You might assume that everyone around you is having that same experience on that particular street, but that is not the case – all of these experiences could have been manufactured *just for you* by the platform provider on behalf of a paying third party.

In the metaverse you will also meet people who look and act like any other user but are computer generated personas that are programmed to engage you in conversation, reading your facial expressions and vocal inflections so they can pitch you more skillfully than any used-car salesman [26]. These agenda-driven *conversational agents*, powered by AI algorithms, will be extremely persuasive, armed with a database of your beliefs and interests, tendencies and inclinations, plus a history of your previous interactions with similar artificial agents. Even the manner in which these simulated personas (sometimes called *SimGens*) visually appear to you will be crafted for maximum persuasion — their gender, hair color, eye color, clothing style, voice and mannerisms — will be custom generated by algorithms that predict which sets of features are most likely to influence *you* personally (see Fig 4.) [15, 29]. In fact, a recently published study from Lancaster University demonstrated that when using the latest generative adversarial networks (GANs) to generate virtual humans, (i) the resulting faces can look indistinguishable from real humans to average consumers, and (ii) they can also be generated such that they are perceived as "more trustworthy" than real people [28]. This suggests that in the not so distant future, advertisers will prefer artificial humans as their promotional mouthpiece.

2.3 Monetizing Users in the Metaverse

It's worth stating upfront that platform providers are not charities — they are commercial entities that require business models that generate substantial revenue to support the interests of their employees and shareholders. And because the public has resisted paying subscriptions for access to their products and services, the industry has adopted free access in exchange for widespread advertising. This is why so much effort goes into tracking and profiling the behaviors and interests of users on current social media platforms. We the public have chosen to be the product that is bought and sold in the social media industry rather than the customer who is paying the bills. This is important because one possible way to reduce the potential social problems within the metaverse is for consumers to significantly change their mindset, being willing to pay for access to metaverse platforms rather than selling access to themselves to third-party advertisers [15].

Figure 4: Virtual Human used in Social Trust research (2019)

3 METAVERSE: NON-REGULATORY SOLUTIONS

As described in Section 2.3 above, shifting from advertising-based to subscription-based business models could be a powerful solution for metaverse platforms, eliminating much of the motivation that providers have to monitor and manipulate their userbase. Unfortunately, this is only a viable solution if consumers are willing to pay subscription fees for platform access. While it is impossible to predict if consumers will choose this path on a large scale, it is likely that at least a small percentage of users will be willing to pay for a safer metaverse. This would inspire entrepreneurs to create subscription-based platforms that are free from many of the dangers described above.

Of course, we can't assume that this approach will become widespread anytime soon. We also can't assume that the industry will adopt trusted norms that eliminate abuses without government oversight. Certainly this could happen, and there are industry groups looking at self-regulation, but even with significant pressure from consumers demanding a safe metaverse, we can't assume that self-regulation will be meaningful in the near

future. In addition, the history of social media suggests that self-regulation, while often espoused by large and powerful corporations, may not be effective when implemented [3].

We also can't expect consumers to simply opt-out of the metaverse to avoid violations of their privacy and other abuses. After all, metaverse platforms could easily be one of our primary access points to digital content. Similar to how consumers can no longer opt out of using the internet or mobile phones, opting out of the metaverse will likely mean missing out on critical information in our world [15].

4 METAVERSE: REGULATORY SOLUTIONS

Assuming the risks to consumers are not solved by either (i) establishing *strong industry norms* among platform providers or (ii) by enacting major changes in *platform business models* from ad-based to subscription-based services, we likely will need to rely on some level of government regulation to prevent exploitation of users within the metaverse. Of course, this leads to the critical question – what specifically needs to be regulated? A number of ideas are presented below for consideration.

4.1 Restrict Monitoring of Metaverse Users

As described above, platform providers will have access to everything that their users do, see, touch and say inside the metaverse. In fact, it may be impossible to prevent this level of monitoring, as real-time tracking is needed to simulate realistic virtual interactions. That said, platform providers should not be allowed to store this low-level data for more than the short periods of time required to mediate whatever virtual experience is being generated. This would greatly reduce the degree to which providers can profile user behaviors over time. In addition, providers should be required to inform the public as to what is being tracked inside their metaverse platform and how long it is being retained. For example, if a platform is monitoring the direction and duration of your gaze as you walk through a virtual or augmented world, you should be overtly notified of this fact.

4.2 Restrict Emotional Analysis of Metaverse Users

As outlined above, the metaverse will likely use advertising algorithms that monitor real-time personal traits and affectations such as facial expressions, vocal inflections, posture, and even vital signs, including heart rate, respiration rate, pupil dilation, and galvanic skin response (as captured through smart-watches and other wearable devices). Unless regulated, these very invasive emotional reactions and physiological responses will be used to fine-tune marketing messages, adapting its strategy to influence us in real time. Regulation should be crafted to limit the scope of such *emotion-responsive advertising*. In addition, users should be overtly informed whenever these very personal qualities are being tracked and used for promotional purposes.

4.3 Restrict Virtual Product Placements within the Metaverse

As described above, advertisers in the metaverse will move away from traditional marketing methods like pop-up ads and promotional videos, instead leveraging the immersive features of the technology. This will include targeting users with promotional artifacts and activities injected into their day in ways that seem authentic. Such experiences, which may be indistinguishable from non-promotional encounters, can powerfully influence users, consciously or subconsciously, especially if noticed many times throughout the day. Users could easily believe

that virtual product placements are serendipitous encounters, when really, they were purposefully targeted advertisements, injected into the world specifically for them at the paid request of an unknown third-party.

In addition, this type of targeted-manipulation of virtual experiences can extend beyond the promotion of consumer products and services to controversial political messaging, disinformation, and other socially destabilizing forms of promotion. And because it may be impossible to distinguish between authentic and manufactured encounters in the metaverse, user perception can be easily distorted.

Regulation may be the only effective solution to prevent such abuses. At a minimum, platform providers should be required to inform users of all product placements in virtual or augmented worlds, ensuring that targeted promotional content is not misinterpreted as natural serendipitous encounters. This could be achieved by requiring a visual cue associated with all virtual product placements to indicate it was injected at the request of a paying advertiser. In addition, users should be informed as to the identity of the advertising party.

4.4 Restrict Simulated Personas within the Metaverse

As described above, the most manipulative form of persuasion in the metaverse may be through agenda-driven artificial agents that engage users in real-time promotional conversation. These virtual personas will look and sound like any other user in the metaverse [18, 26], whether that virtual world uses cartoon avatars to represent people, as they do today, or if the technology advances to employ photorealistic human representations. Regardless of form or fidelity, if consumers can't clearly distinguish between avatars that represent other users and avatars that are artificial agents, they can easily be misled into believing they are having a natural encounter when really, it's a targeted promotional interaction.

To protect consumers, platform providers should be required to overtly inform users when they are approached by conversational agents controlled by intelligent algorithms, especially when the agents have a promotional agenda. This becomes even more important when the AI agents have access to user reactions in real-time, for example assessing emotions through facial features, vocal affect, and vital signs. This type of "conversational manipulation" through artificial agents and real-time emotion monitoring should be highly regulated to protect consumers. At a minimum, platforms should be required to identify, through overt visual and audio cues, when a user is interacting with an artificial agent and further indicate (a) if that agent has a promotional agenda and (b) if that agent has access to real-time emotional analysis.

5 CONCLUSIONS AND RECOMMENDATIONS

Despite good intentions and positive aspirations, the widespread adoption of social media has contributed to significant social and political problems across populations. We are now on the verge of another major transition as the world shifts from flat media, like today's social platforms, to immersive media, like tomorrow's metaverse environments. And because the core technologies of the metaverse are specifically designed to fool the senses, deliberately blurring the boundary between authentic and manufactured experiences, we can expect the deceptive abuses of social media to be significantly amplified.

This begs the question – *is the metaverse even worth it?* Despite the risks, the immersive technologies of virtual and augmented reality have the potential to make our lives magical, unleashing creativity like never before, even expanding what it means to be human. But to avoid the potential problems, government and industry actors must consider meaningful and aggressive regulation. In addition, such regulation should be

considered promptly, before the problems are adopted so deeply into the infrastructure and business models of the metaverse, they become difficult or impossible to unwind.

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