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Review Article

A Comprehensive Study on Metaverse and Its Impacts on Humans

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Virtual Reality (VR) and Augmented Reality (AR) have revolutionized technology and taken the world by storm. They established the foundation for numerous future innovations. Virtual and augmented reality are now widely employed to improve user experiences in various areas. Over time, more and more companies and businesses have begun to use this cutting-edge technology to improve their products and services. Recently, the attention to VR and AR has exploded with the concept "Metaverse" surfacing in mainstream media. Many major companies have already set their goals in motion and are working on building the core of their metaverses. This review paper focuses on explaining the concept of the metaverse, its history, and its associated benefits. Through a survey, it helps understand people's concerns with the metaverse and how it can impact and affect humans mentally, physically, and psychologically. The analysis of this paper can help humans prepare themselves for what the new technologies have to offer, in addition to assisting companies in building a flawless metaverse.

1. Introduction

A Metaverse is a virtual world that strings our imagination to real life. It uses many existing technologies to create a morphed universe where people can live a new experience with their virtual character. The word "Metaverse" combines the prefix "meta-" (implying transcending) with the word "universe." It describes a hypothetical synthetic environment linked to the physical world [1] that can be accessed using a virtual reality headset, or an augmented reality goggle, enabling one to visualize a virtual environment and create an enthralling experience.

More recently, it has sparked great interest worldwide, with many companies adopting a new narrative to build their metaverse and provide their consumers with an enticing experience. It is an exciting tool for not only ordinary people to revamp their virtual interactions with their loved ones but also to help companies and enterprises provide an interactive service to their consumers. It redefines communication in the virtual sphere and creates a surreal experience allowing people to have conferences, play games, travel, go on adventures, and much more! However, it raises an important question. How far are we from adopting metaverse? Do we clearly understand its physical and mental implications on our personal lives?

The forthcoming sections of this research paper will focus on explaining the conceptual idea behind metaverses and also help understand its physical, mental, and psychological consequences for people. The outcomes of this research will help us better understand the metaverse from a consumer's standpoint and clarify the perceptions of the metaverse and the threats it poses. Companies can use this information to understand these challenges and solve the obstacles to establish a flawless metaverse.

2. Literature Survey

2.1. The Metaverse. Since the invention of the World Wide Web (www) [2] by Tim Berners-Lee [3] in 1989, the Internet

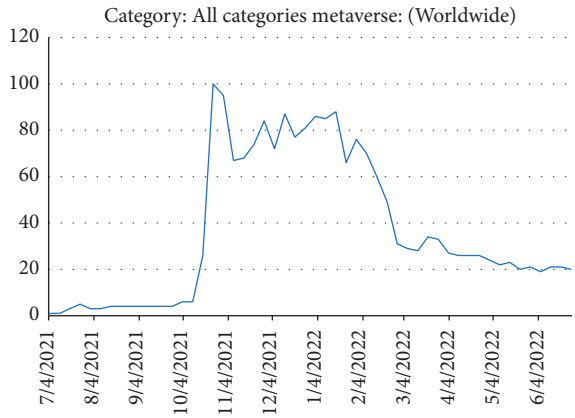

Figure 1: Graph depicting the number of "Metaverse" searches performed on Google in the last 12 months. This data has been obtained from Google Trends Data and can be found in [15]. The rapid increase in the searches can be seen in October following Facebook's and Microsoft's press releases.

has evolved by leaps and bounds. A more recent innovation utilizing the Internet is the "Metaverse." It was first brought to light in 1992 by Neal Stephenson [4], an author, in his science fiction novel *Snow Crash* [5], [p. 26]. In his book, Stephenson used "metaverse" to describe a computer-generated 3D universe visualized through goggles [5], [p. 31]. The word "Metaverse" combines the prefix 'meta' (implying transcending) with the word "universe."

In 2003, Phillip Rosedale and his team at Liden Lab designed and created the first online virtual world—Second Life [6]. Since then, developments in the virtual space have continued to evolve. After Blockchain Technology [7] was invented in 2009, Decentraland [8] used the technology to create a decentralized online virtual world platform in 2015. The following year, in 2016, Niantic, in collaboration with Nintendo and The Pokémon Company, launched Pokémon Go for mobile devices globally, placing a virtual environment over a real-life setting [9]. The debut of Epic Games' Fortnite [10] marked the next big step on the metaverse's journey to fame and laid the groundwork for virtual concerts and tours, paving the way for endless possibilities in the metaverse. Due to the worldwide pandemic of COVID-19 [11], all countries enforced lockdowns to curb the spread of the virus [12]. As a result, all activities, including classes, meetings, conferences, consultations, and more, moved into the virtual sphere. This, in turn, provided a strong drive for researchers to investigate the virtual environment and test the effectiveness of virtual communications. Hence, virtual platforms with a small active userbase exploded in demand, prompting extensive research in virtual and augmented reality and exploring the scope for metaverses.

The recent press release by Mark Zuckerberg reflecting on the change of Facebook's parent company to "Meta" [13] created a significant buzz in the media. Microsoft Corporation had also expressed its ambitions to adopt VR and AR to make collaboration personal and fun with the introduction of Microsoft Mesh [14]. Following the two press releases, metaverse witnessed an enormous increase in interest. Figure 1 depicts the sudden increase in searches related to metaverse as retrieved from Google Trends Data [15]. Numerous other companies, including Nvidia, Unity, Roblox, Tencent, and many more, have also expressed interest in creating and developing their metaverse.

The information available on metaverses found in the above sources focuses on describing metaverses and their benefits, but there is no adequate information on how the overuse of metaverses can harm humans mentally and physically. As a result, there was an increasing need for this research since it is crucial to understand the drawbacks of metaverses before humans begin adopting them. Figure 2 depicts the timeline of events that led to the metaverse with inspiration from [16].

2.2. Virtual Reality (VR). VR is a graphical user interface designed to allow users to interact with a simulated virtual environment with the help of various VR devices. It uses the concepts of the 3D graph, multisensory interaction technology [17], and high-resolution display technology [18] to generate a simulative 3D virtual environment [19]. The virtual environment that a user interacts with, is so immersive that it creates a surreal experience, making users believe that they are physically present in the virtual environment and that all the interactions taking place in the simulated world are happening in real time. VR technology uses specially designed input devices, including VR headsets, 360 VR Treadmill, wand, wired gloves, body suits, and motion trackers, to simulate users' actions in the virtual environment. Since its introduction, the gaming industry has used VR technology extensively to create thrilling games, such as Half-Life: Alyx [20], Batman: Arkham VR [21], Second Life [6], and many more. After proving their success in the gaming community, these technologies are slowly being introduced to assist in the field of military, sports, mental health therapy, medical training, and education, as can be seen in [22–25] and [26], respectively. Figure 3 below portrays a concept sketch of the VR headset, a device required to visualize and interact with the virtual environment.

2.3. Augmented Reality (AR). Unlike VR, which simulates a virtual environment, AR enhances real-world objects and brings them to life through computer-generated graphics and creates an interactive user experience. The most popular usage of Augmented Reality in recent times is the advent of Pokémon Go [9], an AR game produced by Niantic [27]. It allowed users to travel around their city to capture virtual creatures known as Pokémon, which spawn virtually in their physical environment. AR enables people to visualize natural objects coming to life in a holographic way through a display. Objects can be scanned and viewed through a smartphone or even specially designed AR smart glasses [28, 29]. These tools allow the user to interact with the real-world object as if it came to life. Once viewed, the user receives all the information about the object they see, as depicted in Figures 4 and 5.

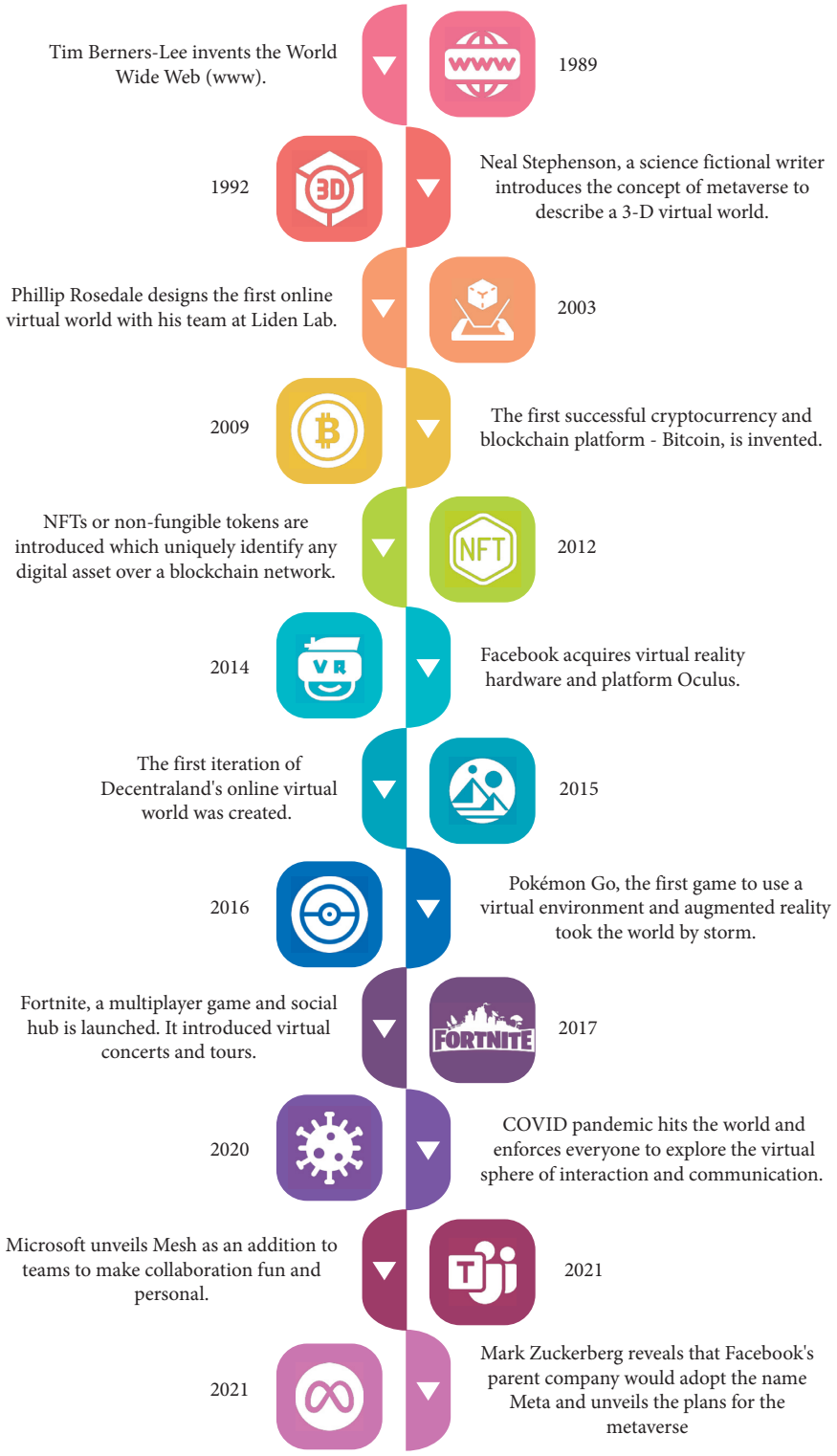

Figure 2: Historical events that led to the emergence of the metaverse.

3. Benefits of Metaverse

3.1. Experienced Virtual Tours. Over the years, computer graphics have advanced significantly and at such a rapid pace of today, it enables the simulation of objects and characters through 3D graph technology in the virtual environment. These virtually simulated objects have appealing characteristics that make them look so close to reality. Often, these simulated objects can be compared with those in real life. Using this sophisticated technology, people in the metaverse can experience a Google Earth-like-virtual world [32], allowing them to travel to essentially any location in the world, including the Taj Mahal, Disney Land, Venice, Paris, London, and much more. People can virtually tour any

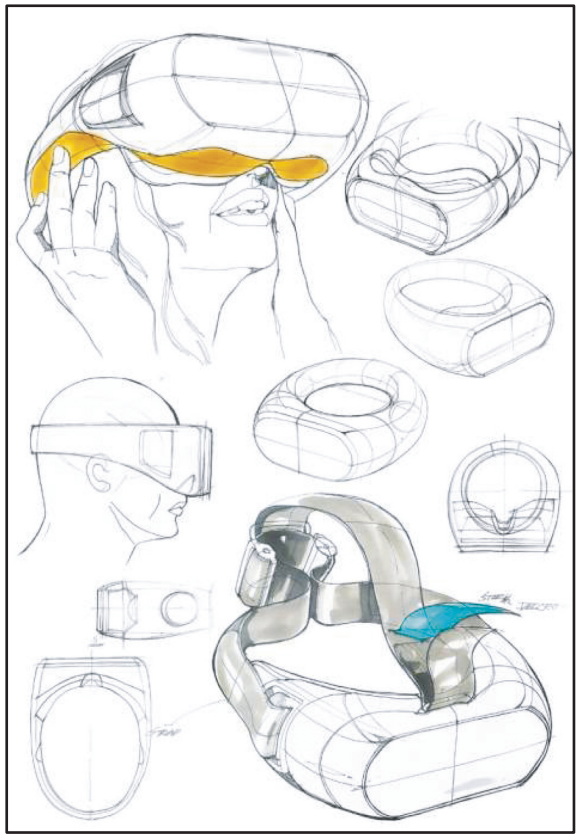

Figure 3: A concept sketch of virtual reality (VR) goggles [28].

Figure 4: Depiction of how AR technology brings objects in the real world to life to give more information about them to the users [30].

location and witness its beauty and magnificence without even leaving their homes [33], as seen in Figure 6. Virtual excursions with friends could be a new fun activity in the metaverse, allowing one to experience breathtaking views of places around the world virtually with friends.

3.2. Meetings and Conferences. As discussed in the previous section, the extreme conditions of COVID-19 isolation across the world forced companies to explore the virtual realm of collaboration. Schools, colleges, organizations, and other institutions resorted to working remotely to continue their regular tasks or scheduled work. While existing online

Figure 5: The AR technology can give more information on any real-world object, such as the different parts inside a car. This can be an innovative way for people learning to drive a car for the first time to understand the different parts. With the help of AR, people can also scan statues, monuments, paintings, and much more to receive more information about them [31].

conferencing platforms only allow audio and video collaboration, the metaverse can open doors to exclusive interaction.

Microsoft Corporation kick-started its journey to metaverse with a new feature called Mesh for Microsoft Teams, which allows users to construct their virtual avatars as shown in Figure 7 taken from [34], and participate in conferences online [14]. Metaverse offers an attractive solution to institutions seeking to organize engaging and interactive meetings or conferences remotely with clients and colleagues. This innovation can also change the entire landscape of virtual communication and collaboration.

3.3. Workout and Exercise. As discussed previously, with the help of virtual technology, any environment can be simulated in a metaverse, enabling the user to experience a morphed reality. This simulation of vivid experiences can help health-conscious individuals enjoy their workout routines virtually without stepping out, including in parks, along the seashore, and in a virtual gym. This exciting workout experience can be seen depicted in Figure 8. Virtual workout experiences offer a perfect fit for one's workout and exercise routine and motivate them to fulfil their goals. Even in an unfortunate circumstance like a pandemic requiring people to isolate themselves at home, one could still enjoy a scenic workout or exercise. People could even choose a location in metaverse to enjoy a fun virtual workout with family and friends.

With the help of artificial intelligence embedded into a metaverse, users can be assisted by a virtual trainer assigned to them in a virtual gym. The AI trainer can better understand every individual's strength and capacity and plan their routines accordingly. It is an exciting concept that could attract many gym-goers and health enthusiasts to explore the virtual realm and its infinite possibilities.

3.4. Education: Making Learning a Fun Experience. Education techniques and methodologies have been slowly evolving over the years, from the traditional blackboard

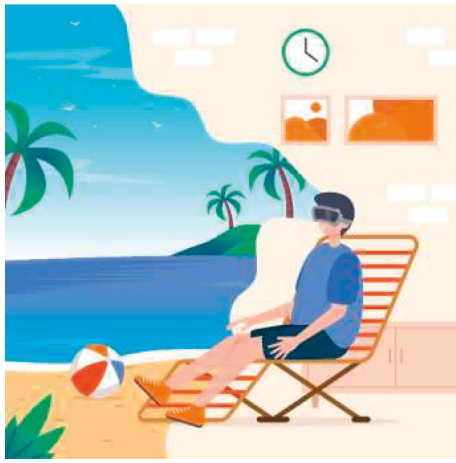

Figure 6: Concept of virtual tours using virtual reality within a metaverse that can be incorporated into a metaverse [33].

Figure 7: Representation of a virtual character in Microsoft Mesh as demonstrated by the team during Microsoft Ignite Fall Edition 2021. It presents how every person can curate their personal character and use it during meetings and conferences to add a personal touch.

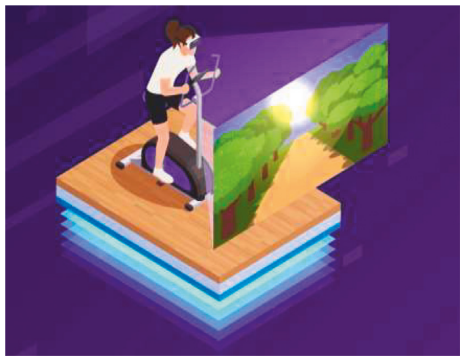

Figure 8: Depiction of workout experience using Metaverse [35].

teaching method to using presentations and visuals to help students understand all concepts. More and more inclusion of technology in the field of education has assisted in making learning effective and a fun experience. Virtual reality in education can create a spark for the development of meta classrooms and take the classroom experience to a whole

Figure 9: Virtual reality can help simulate any kind of virtual environment in the metaverse [36].

different universe. It could be the latest revolution in education. Students would no longer need to imagine how tides are formed in the oceans or cram the stories of dinosaurs, the Stone Age, and the prehistoric era. These concepts could be simulated in the virtual environment of a meta classroom and allow students to experience history and scientific phenomena firsthand [36] as shown in Figure 9. Classrooms can be transformed into a world of imagination and allow teachers to demonstrate to students how the cavemen and nomads lived interactively.

3.5. Training: A New way to Experience. As presented in [37], with the help of VR, surgical trainees and neurologists can visualize the human brain in a virtual environment and help better understand the critical parts and essential concepts involved in neurology. Numerous technological breakthroughs in different fields of training have come to the limelight showcasing how virtual reality has been integrated to assist in training. For example, [23] presents the use of virtual reality for training in the military.

Metaverses have the potential to completely revolutionize how professionals in the fields of medicine, engineering, emergency services, military, warfare, and many more, receive skilled training.

A situation can be simulated in a metaverse requiring specific skills to solve it, and a team of trainees can be logged into the metaverse where their skills can be evaluated based on their ability to solve the situation. All of this can be done within the simulated environment. Doctors can operate on virtual humans to develop and enhance their medicinal skills. Armed forces can also be tested within the virtual space and experience real-like battles as a part of their training. This unique training experience can help them prepare for emergencies and the call of duty. Using the metaverse could drastically boost research and development through virtual experimentations and documentation. It can be a safe and interactive way to train people for challenges and help them acquire skills quickly.

3.6. E-Commerce and Trade of Digital Assets. The metaverse provides e-commerce enterprises with a new avenue to explore and provide consumers with a distinctive buying experience. Several businesses have already jumped into the AR game, allowing buyers to sample things visually before purchasing. Customers may try on their eyewear using augmented reality on Lenskart, for example, and find the best fit [35, 38].

Additionally, users can bring any form of digital assets or media that can be represented digitally, including photos, videos, music, artwork, and much more, into the metaverse. With the help of cryptocurrencies, these digital assets may be traded with one another, and each transaction can be correctly validated, thanks to blockchain technology. The cryptocurrency obtained through trading can be transferred to fiat cash anytime when required.

4. Materials and Methods

Metaverse is a technological revolution that has the potential to reshape human experiences. It is a huge technological breakthrough, bringing to reality something that people could only dream of in the past. The Metaverse allows you to enter a virtual world with limitless possibilities! Within the four walls of their room, people may collaborate, go on adventures, explore the world, and do a plethora of other things. The previous section explains all the incredible benefits that a metaverse has the potential to offer. In addition to understanding how metaverses can help humans, this study also examines the challenges concerning ordinary people. Developers need to evaluate and address these challenges in order to present a flawless metaverse.

To further study the impacts that a metaverse could have on human beings, multiple health professionals, such as psychologists, therapists, neurologists, general physicians, and more, were consulted to obtain their opinion on the metaverse in order to gain a better knowledge of how it might alter people's minds and leave a lasting impression. Following the consultation with health professionals, an online survey was conducted to gain a better understanding of people's views on the metaverse and how they think a metaverse could affect their lives. The survey asked the following seven questions:

(i) Q1. What age group do you belong to?

(ii) Q2. Do you know what the metaverse is?

(iii) Q3. Do you think a Metaverse or a Virtual World excites you?

(iv) Q4. Do you think a Metaverse could create a physical communication gap between humans, and also cause hindrance in physical relationships?

(v) Q5. Do you think the virtual sphere including the existing social media platforms give rise to abuse and harassment?

(vi) Q6. Do you think a metaverse could reduce physical activities in humans?

(vii) Q7. Are you concerned about your data and privacy and feel unsafe about a Metaverse?

The survey garnered over 250 responses with most respondents belonging to the 15–26 years age group. After the scrutiny of the survey, the results help paint a strong picture of the different impacts a metaverse could truly have on people, which also companies working on developing metaverses for people must address to make their metaverses and the future of technology flawless.

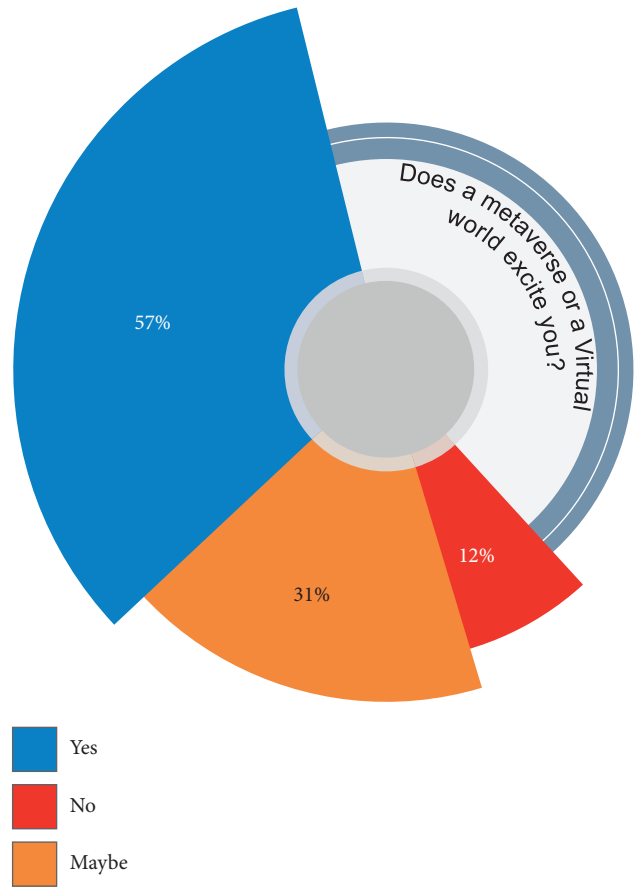

Figure 10: Summarization of the responses when people were asked if they were excited about the metaverse concept.

5. Results

5.1. Research Outcomes

5.1.1. Excitement about the Metaverse. During the survey, the respondents were asked if they were excited about the concept of the metaverse. As depicted in Figure 10, 57% of people, a majority of the responses, were inclined towards being excited about exploring a virtual universe. The reasons for this could be many. In addition to this, 31% of the 250 responses were unsure if it did excite them. A small portion of the people (12%) felt that a metaverse does not excite them, implying that they either have a concern regarding the concept or did understand it.

Moreover, it was also found that about 53% of the 250 people did not know what a metaverse is and had to be given an idea about a metaverse before attempting the survey. Since metaverse is a new innovation, people are still unaware of it. This leaves a great uncertainty about its success when companies begin releasing their virtual worlds. Companies need to focus more on advertising metaverses and making people aware of them. This will help in creating a buzz and exciting them about all the benefits that are associated with metaverses.

5.1.2. Communication Gap and Reduced Human Interactions. It can be seen in Figure 11 that 47% of people who participated in the survey believed that a metaverse

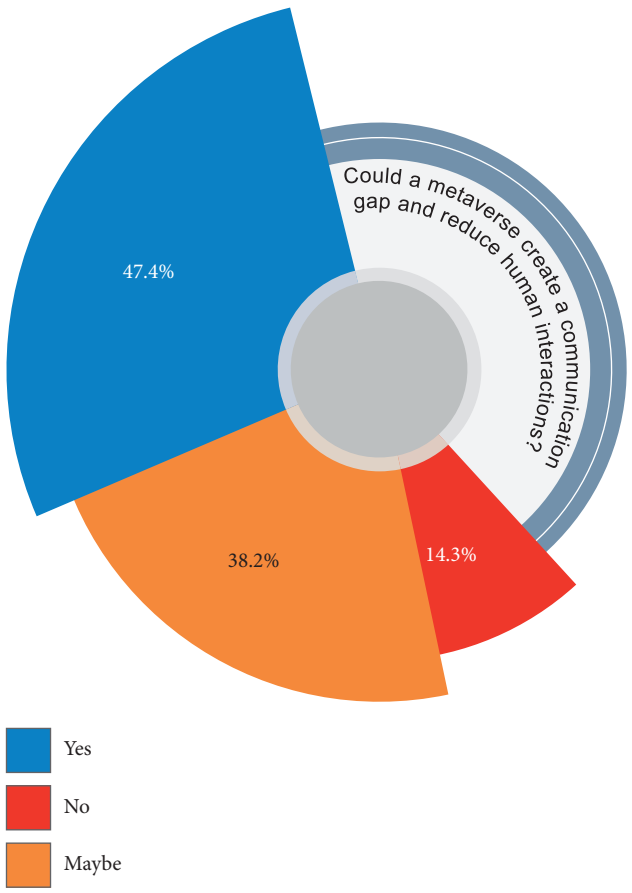

Figure 11: Summarization of the responses when people were asked if a metaverse would create a communication gap and reduce human interactions.

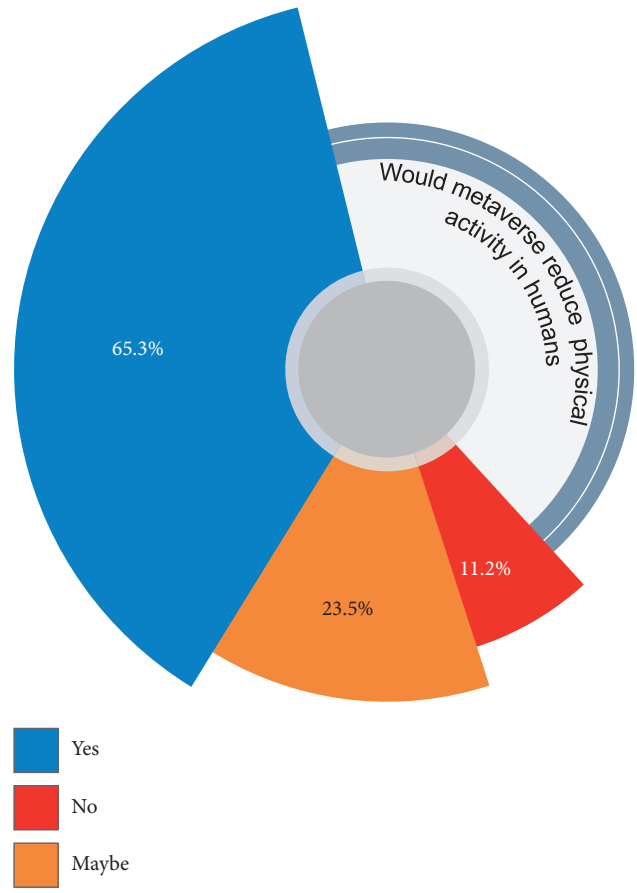

Figure 12: Summarization of the responses when people were asked if a metaverse would reduce physical activity in humans.

could indeed reduce physical human interactions. This is an important concern as people may develop a dual personality as they are immersed in the virtual realm. This could strongly affect how people behave in person in portraying themselves and carrying out conversations. This effect can be observed within the existing social media platforms, which although help people connect and socialize virtually, but as some believe, also makes people antisocial. People are more comfortable having virtual conversations online but fail to communicate as effectively in person.

In addition to the 47% of people, about 38.2% of individuals felt it may be possible for a metaverse to harm human interactions. Only a small amount of people (14.3%) who gave the survey believed that there would be no effect of metaverse on human interaction.

5.1.3. Reduced Physical Activity in Humans. Since a metaverse is associated with a virtual universe that allows you to experience different places and various activities without having to physically go out in the real world, there is a strong possibility that it could affect the physical activity of people. People would be more confined to their rooms or homes, making them less prone to physically experiencing things, such as an evening walk in the real world.

When asked during the survey, a massive portion of people (65.3%) agreed that a metaverse would, indeed, reduce the physical activity in humans (Figure 12). It raises an important issue regarding health as the lack of physical activity can be very harmful to people in the long run. Companies creating metaverses need to responsibly take measures to avoid this effect. People consuming it must also pay attention to their time spent on a metaverse and keep a track of their health. A thin line is required to be drawn between the two worlds for enabling a healthy lifestyle for people.

5.1.4. Would Metaverse Give Rise to More Abuse and Harassment? Online bullying and harassment have always been a major concern since the early introduction of social media. Abusers always find their way back to these platforms no matter how much companies have tried to curb the issue. This again puts forward the question of how companies plan to monitor these issues in the metaverse where people would indeed spend a large amount of time and feel things more personally in the virtual universe. On being asked during the survey if people feel that a metaverse would be a new breeding ground for abusers and increase abuse and harassment over the Internet, we received an unexpected response with only 36.3% of people agreeing that it would add

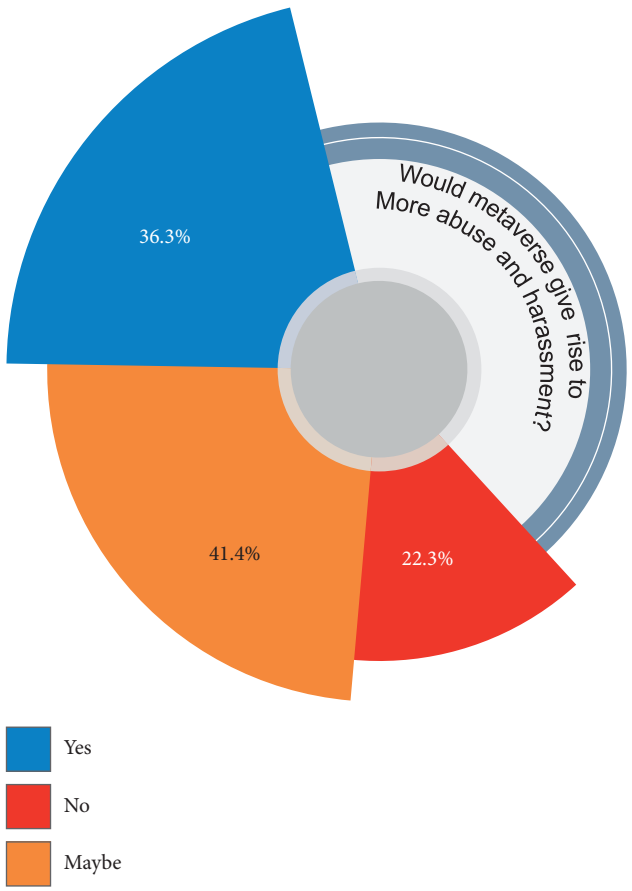

Figure 13: Summarization of the responses when people were asked if a metaverse would aggravate the problem of online abuse and harassment.

to the issue. 41.4% of people feel that this may be a possibility and aggravate online crimes. 22.3% of people who responded to the survey denied this idea (Figure 13).

With the uncertainty due to the lack of data available for this new innovation, it is unclear whether metaverses will be a safe platform for individuals of different age groups. But it is important for metaverse developers to address the masses on this important concern and take steps in preventing crimes and making metaverse a safe place for everyone.

5.2. Negative Impacts of Metaverse. After closely examining the survey findings, it was clear that while a metaverse has numerous applications it is far from ideal. Consumers have many concerns regarding the effects that metaverses might have on their lives. These concerns were also validated by health professionals who provided a broader and deeper understanding of how these concerns were relevant and matter greatly for the health and wellness of people. The following section explains the different challenges posed by metaverses and their negative impacts on humans. These obstacles need to be overcome by metaverse developers who must also address these concerns and incorporate a healthy solution to create a flawless metaverse. The problems that follow in this section will help us comprehend the influence that a metaverse might have on people's lives.

5.2.1. Lack of In Person Communication. As previously discussed, during the COVID-19 pandemic, people were confined to a small vicinity of their own homes or rooms and were also obligated to work, learn, and communicate within a virtual sphere, without any physical contact with one another. People adopted virtual means of interaction through video conferencing platforms, like Google Meet, Zoom, Microsoft Teams, Cisco WebEx, and so on.

The exposure of humans to the virtual sphere during the pandemic and their confinement to virtual communication has already created a large communication gap between humans. It has distanced people from in person communication, which may have harmful implications in the future. People are now more open to having pseudo-interactions within the virtual world but are not prone to initiate or continue physical interactions. A metaverse may offer a more attractive solution to virtual communication, but this comes at the cost of physical interactions. Long exposure to a metaverse would result in people losing touch with physical human interactions, resulting in serious mental health conditions. The loss of human-human interactions poses a great threat to our future generations, who would be more inclined toward their virtual bubble and aggravate mental health conditions.

5.2.2. Dependency on the Virtual World. As the well-known proverb goes, "necessity is the mother of all inventions," humans are prone to adopting new technologies that bring a new solution to their problems or introduce a more effective way of doing something. This tendency to adopt new ways and incorporate them into their daily lives has changed the way humans function over the years. To paint a clearer picture, let us take smartphones as an example. People have grown largely dependent on smartphones for several different reasons. The same smartphones were at one point in time a luxury. Today, this dependency on smartphones has grown significantly to an extent that they have become a basic requirement for most people. A similar trend can be observed in many smart devices available in the market. Although smartphones are very helpful for humans, the overdependency on anything is concerning. The same problem could soon imply for metaverses.

Since a metaverse could be an open world with endless possibilities, another oncoming problem could be people adopting the morphed reality as their new home. There are great chances that people might develop a dual or pseudo-personality. Sometimes, the bridge between the real and the virtual world could seem to be very contrasting. For example, if one suffers from any kind of sorrow in the real world, but has a world filled with positivity in the virtual space, the contrast between the two worlds could have strong repercussions on the human mind. Hence, it is important to either avoid the risk of this dependency or channel it in a way that would not harm the human mind.

5.2.3. Lack of Physical Activity. Through the advanced technology of virtual reality, metaverses, as shown in Figure 14, could enable users to experience any form of activity

Figure 14: The activities that Metaverse allows in the virtual sphere without having to leave one's home [39].

within the virtual environment itself. These activities may include a virtual game of cricket, a boxing match with the legend Mike Tyson, or even a long evening walk with friends. This immersive revolution [39] would attract more people who would prefer spending more time in the virtual environment than in the physical environment. A good example could be mobile phones, which have already reduced physical activities in children. Children in this era of technology prefer playing mobile games over physically playing in a park. This is extremely harmful to their health and could have long-term effects.

Metaverse also brings together the concept of virtually travelling to any part of the world without even having to leave the comfort of their own room. Metaverse technology offers an interactive and enticing experience, but this comes at the cost of users experiencing everything within the confinement of a small area. This might create a virtual bubble around its users, resulting in the lack of physical activity.

5.2.4. Abuse, Harassment, and Cybercrime. Over the years, social media has helped connect millions of people with one another. Despite all its great benefits, it has infamously come to be known as a breeding ground for abuse and harassment. This is because of a few miscreants who spoil the entire social experience of its users. The crime rate in the online sphere has risen to an extent that the need for creating a whole new department of crime was felt. Any technology that aims to bring people together is bound to have abuse and harassment. Since a metaverse is envisioned to be an immersive technology with a surreal experience, abuse and harassment would also be intensified.

The metaverse could also be a new venture for cyber criminals to harass and abuse individuals. Unless stringent measures are taken to curb cybercrime, metaverses could prove to be lethal for people and also invoke or aggravate mental health conditions in people.

5.2.5. Data and Privacy. With Internet users across the world becoming more and more concerned about their personal data and privacy, companies working on their metaverse face another challenge of establishing trust within users. This is a big challenge as this is an important factor that brings social media into the bad books of many people across the globe. Although companies promise the safety of their users' data, there have been many instances when it has been compromised.

User data has been compromised on numerous different occasions intentionally or by accident. Some companies even use this data to make profits for themselves. This

further adds to the concern over what approach they would take to build their newest technology of metaverse. Since metaverses use virtual reality and augmented reality, users would become the data centre for the virtual environment. Their every action, activity, interest, and even their location would be tracked constantly to provide them with a thrilling social experience as promised to users. With this vast degree of tracking done on the users, there would only be pseudo-privacy and it is uncertain how companies would use this data.

6. Discussion

It is noteworthy that humanity has advanced so much today that a phrase once used by an author to describe a scene in his science fiction novel now shapes the future of our technology. We have seen all the incredible features potentially offered by metaverses for businesses and their consumers. Since it is a relatively newer concept, people eventually have concerns about its operation and how it can affect them. The survey revealed people's concerns regarding metaverse and its effect on the human mind and body. Health professionals who participated in our interview during the study also validated the concerns.

The research, however, was limited by the lack of data available on metaverses since fully developed metaverses have not yet reached the consumer market properly. Therefore, the research could only be based on the people's survey and the speculative opinion of health professionals. It was also noticed that there is a lack of awareness among people on metaverses. About half of the people who participated in the survey were unaware of the technology. A separate section was included in the survey explaining the concept.

A clearer picture of the impacts that metaverses could have on humans could be drawn once the development of metaverses reaches the consumer market and people begin using them. A full-fledged study can be performed with appropriate data and more clarity among people. However, metaverses seem to be an inevitable technology with the current pace of work.

7. Conclusion

Metaverse is a recent innovation that combines technologies like virtual reality, augmented reality, blockchain, artificial intelligence, Internet of Things, telecommunication, and many more to create a sophisticated tool. It promises users an immersive and personal experience, prompting businesses to develop their metaverse and reimagine their customers' experiences. However, as established by the survey and opinions from health professionals, extensive use of a metaverse could damage the human mind and body.

It also can be argued that metaverses are a relatively new technological revolution. At one point, even cars and mobile phones faced criticism but ultimately resulted in great success. It goes to say that every new offering requires time for people to understand it and learn its core values. Likewise, metaverses might eventually become a great tool with their promising nature of transforming virtual communication. Every scientific idea has weaknesses, and metaverses are no exception.

Nonetheless, metaverses are a cutting-edge technology with a lot to offer humanity. Another factor that could speed up the growth process for metaverses is the blazing competition. Several leading companies have already shown great interest in the concept and expressed their goals for a metaverse. This healthy competition for a perfect metaverse could entitle companies to take a more careful approach to avoid errors in creating their virtual universes. As we have already seen, despite all its positive features, companies must work carefully and cautiously towards addressing the different concerns discussed earlier to dissolve any doubts in users. Given the growth of blockchain, decentralization, and the introduction of Web 3.0, it will be interesting to see which course the development of metaverses goes on in the future.

Data Availability

The survey data will be provided from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest regarding the publication of this paper.

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