Media Ecological Study on Adaptation of Metaverse in Post-Digital Society: A Systematic Review

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Abstract

The virtual world has the potential to influence many societal spheres and the recent developments in the Metaverse have evolved the technologies of the next generation, whose definite definition is yet to be provided. However, it is an extension of the physical world, a virtual reality of any world imaginable to man such as gaming, training, marketing and education platforms. With the researched and proven potential of the Metaverse in many societal aspects present study aimed to assess virtual world and its influences on important spheres, including the global economy, education, and social Life. We conducted a systematic review of studies identified and narrowed down from ACM Digital Library, IEEE Xplore Digital Library, Scopus, Google Scholar, and the Learning and Technology Library databases. The inclusion criteria included studies published in English between January 2010 till March 2023 that explored or investigated the adoption of the Metaverse and its social, economic and academic effects on societies. The search yielded a total of 998 studies that were narrowed down to 8 studies after the screening according to guidelines about the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA), . Eight studies are included in the current review to report the effects of the Metaverse mainly on Education, Economy and society along with the ethical considerations. The studies that have analyzed the economic impacts of the Metaverse are through tourism, retail and consumer behavior. The developments in the Metaverse benefit the global economy by improving marketing strategies, customer shopping experiences and the perceived rise in the GDP. Similarly some studies analyzed the psychological impacts such as mental health, quality of life, and social interactions. According to them, there will be rise in the quality of life expected from using the Metaverse thus creating better social interactions and improved mental status and quality. The

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Education sector was analyzed through implementation of 5G/6G into learning ad classroom experiences. It will also increase the access to educational opportunities was also reported by the reviewed studies to improve since the virtual worlds can be accessed from any part of the world with the required internet connection. The student's academic performance is also expected to improve, as reported by the studies. Current Metaverse has the potential to improve all the domains of the global society, including the economic and social sectors. Additional research and improvements in the virtual world's development are required to achieve a stable and safe electronic environment for all users.

Keywords: *Metaverse, social impacts, psychological Impacts, Systematic Review, Economy, Education, Society, Ecology.*

Introduction

Digital Acculturation of Societies in the Metaverse Era

Societies will revolutionize because of the implementation of the Metaverse, there will a new world of reality based on virtual reality. It will be sooner rather than later, the Metaverse will be a part of our daily lives. Technologists are creating more and more ways to take advantage of this new reality. The infusion of more data coming through Metaverse content into the human lives will be influential not only as a part of a virtual reality but also in their real-life experiences. This concern is creating a trend of severe speculations on the future of XR (Chan, 2022). Contrary to this, there are proponents of the Metaverse, who all argue that an immersive virtual world has the promise to benefit our society across several aspects and sectors, namely education, gaming, healthcare, arts, civic and social life, and entertainment (Chrétien-Ichikawa, 2022). However, irrespective of the school of thought, the expert thoughts are divided on the timeline within which this virtual world will be a reality, a part of human lives. Some say it will take around 10 years while others say more or less of 20 years. However, the consensus is that by 2040, everything about the Metaverse will become increasingly refined and contribute to our daily lives (Atske, 2022).

Anticipating 2040 as the mark for starting of the new revolutionary era of Metaverse, all the countries around the globe are preparing themselves for the new horizons of reality. For example, in China, the fashion industry is taking new development quickly, embracing the possibility of a

future virtual fashion world. Companies such as Balenciaga are unveiling digital shows to take advantage of this new trend and position themselves as the pioneers of the Metaverse experience (Chrétien-Ichikawa, 2022). Such strategies attempt to sway more people to develop an interest in the topic, gradually resulting in a shift in views and culture towards accepting it (Chan, 2022). Moreover, anticipation of profit is also the motivation of companies as highlighted by Atske (2022), who stated that it is important to acknowledge that the investment in the Metaverse is largely pushed by the profit motives of large companies seeking to have a hand in future human experiences. This motive coupled with the significant financial input, is slowly shifting people towards acceptance and acculturating with the concept of the immersive universe (Atske, 2022).

Patterns of Digital Transformation and Acculturation

Technological advancements have often been prompted by first-world countries having their resources and the capability to be the engine of advancements. These countries are shifting most of their investments in the Metaverses , like NFTs, bit coins, etc. The rising investment in the Metaverse by the developed world, while the third-world countries mostly looking and unable to chip in (Chaowei, 2022). However, the potential impacts of industrializations and developments such as global warming, directly affect third-world countries residents who have little input into the sector of Metaverse. Similar to other areas of development, third-world countries have been marginalized by their first-world counterparts who believe that it is within their every right to pursue their goals and ambitions, sometimes at the expense of the rest of global society (Kişi, 2022). The digital transformation patterns create a separation between the developed and the less developed world, and a separation that is because of the investment by both worlds into the technology of the Metaverse. If left unabated, the sector will likely be a paradise for the developed world, away from the less developed world, whose input has largely been ignored (Chaowei, 2022).

On the contrary, the second world countries have little contribution to this sector. They are gradually embracing their first-world counterparts, rapidly encouraging the embrace of newer technologies and investments in other areas that the first-world countries are already in. The net effect of these disparities and marginalization patterns is that the developing countries will remain behind and stay poor, and have little control and input in the Metaverse. In contrast, the rich countries enjoy all the benefits and promise the virtual world will offer or is already offering,

because of the access of technology is smooth (Kişi, 2022). It is slowly opening up and laying bare how an imbalance in global power and control can also have a severe marginalization in the Metaverse.

Metaverse Adaptation in First, Second and Third world countries

The infiltration of the digital world into different aspects of our lives has shown that the digital virtual world has more sway over our actions and habits than anything else because being a dominating and a powerful medium. The digital world has already dominated all the spheres of life even our personal and interpersonal lives from an infant to old age. We create a telepresence of our existence to do the actions, as we seek to tailor them to meet those aspects we share in the digital world, (Chan, 2022). The human brain has undergone may transitions because of the infusion of digital technologies from one aspect of civilization to the next, and the digital age has come with the most significant changes, like the major transitions of analog to the digital to now into immersive technologies. In a bid to fit into the virtual world, we are likely to lose so many aspects of our normal selves while in quest of who we are from the digital perspective (Chan, 2022). Even social media alone has sufficiently blurred the boundaries that previously existed among people, and a shift to different realities in the virtual era is more than just a likely occurrence. The shift to different realities and embrace of different self-identities owing to the deep delve into the Metaverse is not a certainty. However, these adaptations will depend on the society, as it will be different from first to second and ultimately in the third world (Seielstad, 2012). Similar to the social media wave nearly fifteen years ago, the Metaverse wave is likely to start by capturing the imaginations of the people in the first world countries whose proximity to the technology will work to their advantage. The changes in human brains, self-identities and shifts to different realities will therefore begin in the developed world and slowly find their way into the second world before capturing the attention of people in the third world (Chengoden et al., 2022). It is likely, to begin with, a wave in the first world, sweeping everything in its wake before ultimately sweeping over the second world out of people's curiosity and ultimately the third world out of the need to fit in and not be left behind (Seielstad, 2012).

Metaverse implementation in the diverse society

In this research we have analyzed some segments of Education, Economy, and Entertainment within the Ecological Framework of the Metaverse. The potential contribution of the Metaverse to the educational sector, especially in the medical field, is immense. The use of augmented reality

in medical education, for instance, augmented reality T-shirts that give learners the capability to examine the contents within the human body as an anatomy lab, is a promise that, if realized, will be a step in the right direction, and a shift from today's understanding of medical education. Such discoveries are likely to be accompanied by significant changes in the detection and treatment of diseases and potentially in the field of research in preventive medicine (Kye et al., 2021). The Metaverse has the potential to develop a new educational environment with significant space for social communication and an increased degree of freedom for creating and sharing content. The interconnection that is likely to arise among different people from different parts of the world is likely to create more connection in the way people do things and lead to removing obstacles to education that exist today (Allam et al., 2022). As far as the economy is involved, the Metaverse is likely to bring an entirely new area of interest for investment, given the way companies are scrambling to have a hold of various aspects of the Metaverse. It is the new digital era, whose promise nobody can quite quantify at the moment, but a huge promise nonetheless (Tlili et al., 2022).

Finally, the entertainment world that has benefitted massively from virtual reality technology will grow and improve (Du et al., 2022). Video games will allow users or players to be more immersed in the playing experience, and the growth of more games that capture the abilities and imagination of the player will also be a consequence, like Roblox, etc. kind of 3D gamming.

Impacts of New Media Ecology on Perception

The media has grown into a tool used to influence society's perception of a range of ideas and control how the consumers of the information react to several things, for instance New media, and its components like social media has become an integral part of everyday life, and consumption patterns of goods and services, trends in fashion, entertainment and even education are created by social media platforms (Chen et al., 2019). Social media have changed human perception in ways that could not be imagined, possibly via mainstream media (Oliver et al., 2020). The reason for the massive reach is down to the reach of these social media platforms, always reaching a global audience when others focus their attention on a small minority and its importance to them. The media is changing our perception of things, and reality for that matter, as issues initially considered taboo have grown to be embraced and accepted by society today in massive proportions (Chen et

al., 2019). It shows that the media has greatly influenced the human perception of certain topics while changing their perception and acceptance of others for several reasons.

Research Questions

This study was conducted to answer following research questions:

a) What are the current and perceived impacts of the increasing use of the Metaverse on the society from social and economic perspective?

b) How is the modern world adapting to the Metaverse era?

Methods and Materials

Protocol and Study Design

To answer above research questions current systematic review was conducted in line with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines that were followed in all the methodological steps as well as discussion of results to ascertain the reliability of the findings. For current systematic review we used the PRISMA extension published in the Cochrane Handbook for Systematic Reviews and Interventions-Chapter 4[4] by Higgins et al.

Search Strategy

Literature was searched from six databases: ACM Digital Library, IEEE Xplore Digital Library, Scopus, Google Scholar, and the Learning and Technology Library. These six sources were selected considering their popularity and depth of materials in each library in line with the topic of interest. The search was conducted on March 2023 by two investigators. Two more reviewers further confirmed the search results before submission for the inclusion and exclusion process. Initial database searches were conducted electronically using search queries developed using the building block technique. To maximize the search strategy results, the systematic review incorporated two techniques to create search queries: keywords, Boolean operators (AND/OR), and truncations (Asterix). The literature search was conducted according to the following search strings:

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[4] https://training.cochrane.org/handbook/current/chapter-04

The keywords employed in this search included Metaverse, Metaverse era, and digital acculturation. In this domain, we used the keywords "Societies*" AND "Metaverse Era*," OR "Societies*" AND "Digitally Acculturating*" OR "Digitally Acculturating*" AND "Metaverse Era*, "Integration*" AND "Marginalization Pattern*" OR "Assimilation*" AND "Marginalization Pattern*" OR "Separation *" AND "Marginalization Pattern*" OR "Integration*" AND "Digital Transformation*" OR "Assimilation*" AND "Digital Transformation*" OR "Separation*" AND "Digital Transformation*." Moreover, we also used "Integration*" AND "Marginalisation Patterns of Digital Transformation*" OR "Assimilation*" AND "Marginalisation Patterns of Digital Transformation*" OR "Separation*" AND "Marginalisation Patterns of Digital Transformation*, "Education*" AND "Metaverse*," OR "Economy*" AND "Metaverse*" OR "Entertainment*" AND "Metaverse*" OR "Ecological*" AND "Education*" OR "Ecological*" AND "Economy*" OR "Ecological*" AND "Entertainment*, "Media*" AND "Ecological*," OR "Media*" AND "Patterns*" OR "Media*" AND "Human*" OR "Ecological*" AND "Human*."

Inclusion and Exclusion Criteria

Inclusion Criteria

The identified studies were assessed by two independent reviewers using predetermined criteria, which was as follows:

1. Studies assessing the ways through which Societies Are Digitally Acculturating in the Metaverse Era,
2. Studies assessing the impacts of the Metaverse era and challenges in its adoption,
3. Studies analyzing the Education, Economy, and Entertainment in an Ecological Framework in the Metaverse.

And finally a time cap was placed on the publications such that studies published only in English were considered for inclusion. I think it should be number 4 or 5 criteria. Additionally, the studies had to be published between January 2010 and March 2023. The previously engaged independent investigators conducted a full-text analysis to ascertain that the objectives of the chosen studies and the outcome measures were in tandem with this systematic review. The independent results of the eligibility assessment were brought together and amended by the consultation of a third party.

Exclusion Criteria

We excluded studies published before 2010 and those published in other languages without a corresponding translation in English.

Data Extraction

Before extracting the data, the included studies were assessed for the risk of bias according to the methodological standards outlined in the Cochrane Handbook of Systematic Reviews of Interventions. Data were extracted into an standardized excel sheet by two reviewers working independently. The extracted data included the first author (year), study design, the additional methodologies/ phases used, study subjects (if provided) and important data as specified by the studies, i.e., gender (% female), age (mean, median or range), the exposure characteristics of the participants (VR, interviews, questionnaires, e.tc.) the economic impacts of the Metaverse, the societal and educational impacts, and the ethical implications.

Result Analysis Strategy

We adopted a single form of analysis for this investigation that is qualitative analysis. Literal analysis was used for conducting the systematic review of the evidence provided by the included studies.

Study Selection

From the literature search, we found 998 studies published on the ecological subsistence, digital acculturation, and ecological frameworks of the Metaverse in first, second, and third-world countries. Each selected study followed an array of thematic approaches that were created and defined before the study commenced. Of all the identified articles, 92 were eliminated by EndNote automation tools on account of duplicity and other reasons for ineligibility employed through filtering. As a result only 906 studies were brought forth for the title and abstract screening, where 814 were eliminated due irrelevance to the inclusion criteria, leaving 92 The full-text screening on the 92 studies eliminated 82 studies due to major methodological reasons such as reporting different outcomes, not being the eligible study design, reporting redundant findings, or containing incomplete or retracted results. Pilot studies, study protocols, diagnoses, systematic reviews, and meta-analyses were also eliminated. Finally, the present systematic review included 8 studies.

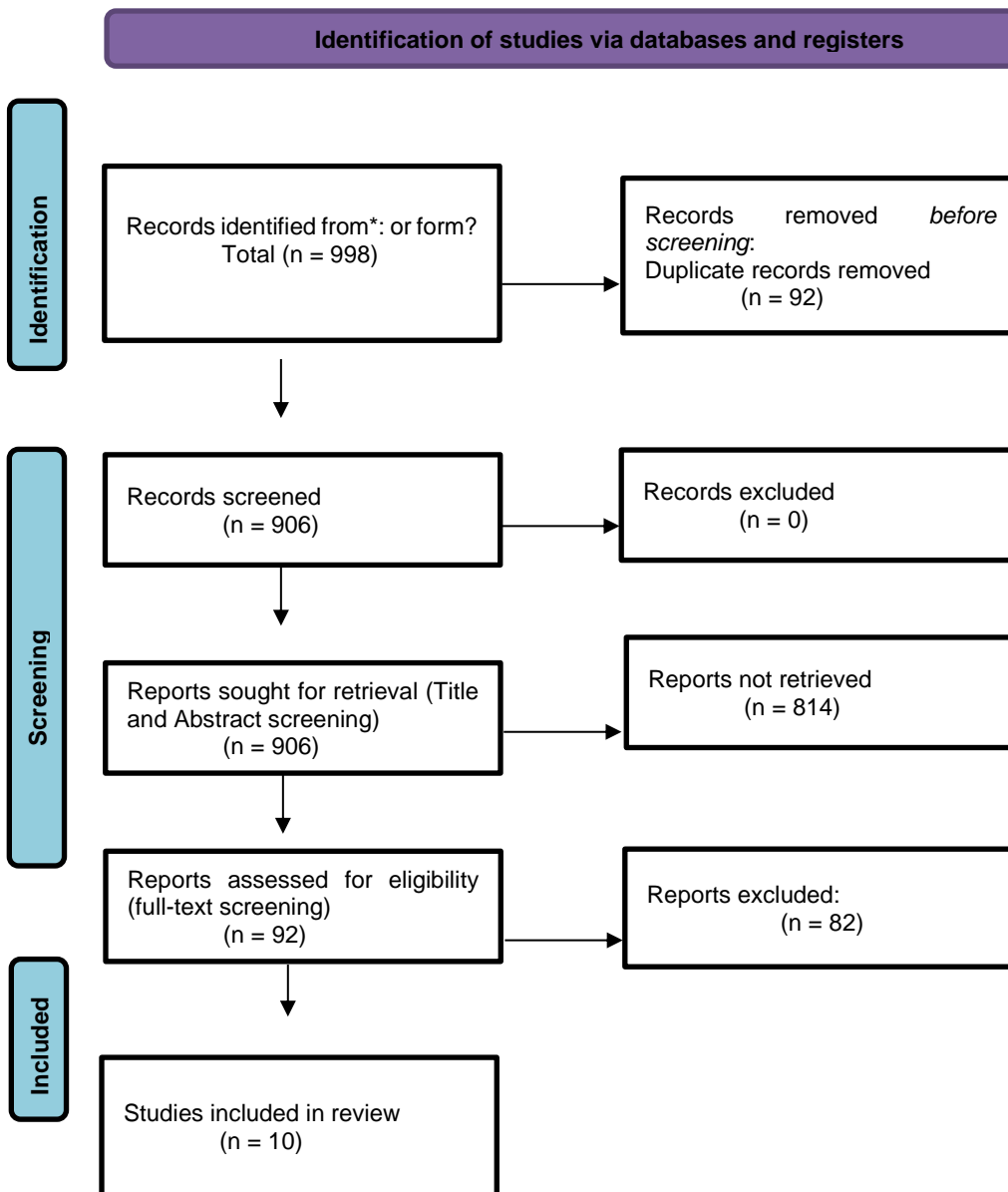Figure 1 below represents a PRISMA 2020 flow diagram that shows the study selection process.

Figure 1: PRISMA flow diagram detailing the study selection process

Author	Primary Study Design/ Method	Supplementary study designs/methods	Study Participants and characteristics (if provided)	Exposures	Economical outcomes	Societal Impacts	Educational Impacts	Ethical Issues
(Filipova, 2023),	Systemic structural method	Formal-logical method Legal Modelling Forecasting			Expected multifold growth of the economy for various stakeholders in the industries. Metaverse current stage corresponds with the current ongoing digital transformation from -Industry 4.0 to 5.0 characterized by the: a. development of more smart ecosystems b. Improved AI systems c. Elimination of the spatial, and temporal hindrances to resource acquisition d. Possible development of new products, and services through innovative business models. Virtual space economy expected to surpass the real world economy in ≤ 10 years (i.e. make up 2.8% of the global GDP). Expected that the Metaverse market space will be well worth over 13 trillion dollars by 2030.	Societal development will be improved with the prospects brought along with Metaverse implementation. a. With many companies seeking to develop their own versions of the Metaverse, it is expected that there will be multiple virtual spaces/worlds. b. Increased collaboration within the spaces will be expected in the new version of the Internet. c. Decline of the traditional social fiber concept is expected and in place, the switch towards a digital format of life. d. Social identity transformation into a digital identity with online identification, communications, both socially and professionally, expected to increase.	Educational practices will be revolutionized I the global society a. Positive use of the Metaverse as an educational tool is expected to rise as seen from the current increased used on online platforms for education from any corner of the world. b. Expected change from the 5G to 6G generation of mobile communication will also bring about the holographic technology. c. However, the Filipova's findings also indicate the lagging behind of education in the current digital feats in the metaverse.	There are certain ethical concerns related to the Metaverse implementation a. While current digital information on global citizenship? primarily has information regarding their official information, it is expected that the Metaverse technologies will include more detailed and private information. b. The possible issue regarding the type of information about individuals that should be included in their profiles, and the requirements to access these data is a dilemma c. Requirements such as civil and administrative laws are necessary in all stages of data input and handling for citizen profiling and to protect the citizens.
(Afifi., et. al., 2022)	Longitudinal study		Twenty one (21) elderly persons Age= Mean = 83.10, SD = 9.76	Three (03) weekly sessions of virtual reality		a. Participants reported improved quality of life after using the VRs (t −2.17 p = .04) characterized by reduced stress levels (t = 2.13, p = .04), and other mental issues (t = >−.59 , p = .56). b. Improved relationship with other family members and better relationship satisfaction (t = > −2.78, p = .01)		
(Baker., et. al., 2019)	Experimental study		237 online shoppers Female = 38.8% Age= 18 -16 yrs.	Purchasing items from specified sites		Following hypotheses, were supported a. H1: Increasing levels of perceived social presence will have a positive impact on the perceived usefulness of online shopping. b. H3: Increasing levels of perceived ease of use will have a positive impact on the perceived usefulness of online shopping. c. H4: Increasing levels of perceived usefulness will have a positive impact on attitudes towards online shopping. d. H5: Increasing levels of perceived social presence will have a positive impact on trust in online shopping. e. H6: Increasing levels of trust will have a positive impact on attitudes toward online shopping. f. H7: Increasing levels of perceived social presence will have a positive impact on the enjoyment in online shopping.		

						g. H8: Increasing levels of enjoyment will have a positive impact on attitudes toward online shopping Hypothesis that were not responded a. H2: Increasing levels of telepresence will have a positive impact on the perceived usefulness of online shopping. b. H9: Increasing levels of telepresence will have a positive impact on trust in online shopping. c. H10: Increasing levels of telepresence will have a positive impact on the enjoyment in online shopping.		
(Huang., et. al., 2022)	Exploratory study	Cross sectional design	145 participants		Following are the economic impacts derived from the findings: a. VR sports activity positively affects the metal health (.081) b. Performance anxiety is reduced through VR sports activity (0.89) c. Indicators of poor performance such as anxiety in the VR can be used as diagnostic criteria for the performance in real life sporting activities. This is because the magnitude of the indirect benefit generated by these modifications is greater			
(Chen , et. al., 2019)	Stage 1= Qualitative study Stage 2= Quantitative study		21 participants in stage 1 332 participants in stage 2	Interviews and survey data on the use of ride sharing options Data collection on the perceptions of the Big Data Analytics and AI	a. Increased likelihood of using ride sharing platforms associated with improved economic returns and savings			a. lack of privacy as a potential threat to the passengers using the ride sharing platforms. b. Improved privacy policies associated with increased chances of using the ride share platforms.
(Kim., et. al., 2018)	Qualitative study	Experimental design	408 respondents analyzed. <19 years old 50.2% female	27 questionnaire items on tourism related to Virtual reality activities		a. Use of authentic VR experiences was associated with increased likelihood of positive experiences; t value= 41.342, 57.758, 61.846, and 48.231 for the increased likelihood of perception of the experiences as authentic genuine, optional and unique experiences respectively). b. Analyzed cognitive responses while using the VRs including knowledge gain, useful source of information, beneficial and a source of forming friendships (t value = 66.076, 64.019, 42.146, and 23.358 respectively).		

| (Oh., et al, 2023) | Quantitative study | | 360 participants 10 to 41 years old, | Roblox or Zepeto VR | | a. Social presence was positively associated with the number of friends and time spent within the Metaverse. | | |

Discussion

Current review was conducted to answer the following research questions: a) what are the current and perceived impacts of the increasing use of the Metaverse on the human population regarding the social and economic aspects? And b) How is the modern world adapting to the Metaverse era? Findings from this systematic review indicate that the increased influence of Metaverse is expected in many aspects of our society among the various parts of the global society. Many studies have reported the increased likelihood of positive economic returns from the Metaverse. In a study published in 2023 by Filipova, reported that the creation of the Metaverse is bound to initiate the second part of the transition of the economy into the digital era (Filipova, 2023). This transformation, also termed industry 5.0, will be a development from the previous or the current stage of digital development known as industry 4.0. The study's authors also reported findings from other researchers, owners and reviewers of the virtual world for example Arthur (2017), who highlighted about a study by NVIDIA Head J. Brian, in which he reported that within 10 years, the Metaverse economy would be way above the real-world global GDP. Arthur (2017) reported that the world is moving towards the physical market's gradual integration with the digital market world (Filipova, 2023). E-commerce was also reported to positively influence online users' attitudes towards purchasing certain products and services associated with improved economic games. A study by Baker., et. al, (2019) compared consumer behavior within the virtual world and the traditional internet-based online shopping platforms. Findings revealed that the users had more perceived enjoyment while using the traditional web-based marketing platforms compared to the new Metaverse or 3D shopping experiences (Afifi et al., 2022). However, this finding is dependent on the time spent by the users within the virtual world, so the study found increased telepresence to be associated with increased enjoyment of the shopping experience and, subsequently, the increased likelihood of using these environments.

Additionally, with the new nature of the Metaverse and the virtual world shopping environments, many users reported difficulty using these virtual realities compared to the 2D E-commerce channels (Baker et al., 2019). The tourism sector has also greatly enjoyed the impacts of internet-based platforms in increasing their marketing, for example studies included in current systematic review reported the expected increased tourism rate through the use of the Metaverse. The use of virtual reality was found to be positively associated with increased enjoyment of the

virtual environment and, therefore, the increased likelihood of intention to visit marketed tourism locations by VR. This study recommended that brands or companies need to use virtual worlds and authentic virtual reality experiences as marketing strategies (Kim et al., 2018).

It is also expected that every associated influence from the use of the Metaverse will occur, as reported by most of the studies included in this systematic review. Studies reported that while many internet platforms currently provide various services, the Metaverse will be a great method for intertwining these platforms into a common digital canal. The study by Filipova et al., (2023) provided the three stages of the development of online platforms, which include web 1.0, which provides basic communication methods uniting various users, web 2.0, which allows for the creation of online communities, and the current ongoing or developing stage web 3.0 that will allow for the creation of virtual worlds by the online communities This study also reported the likelihood of the elimination of the previously existing myriad of social groups within the virtual world, with the latest versions expected to transform real-life individual behavior and characteristics into digital formats

Social and Psychological impacts were also reported by the studies. The quality of life significantly increases with the integration of virtual walls provided by the Metaverse, this was found by a study by Afifi et al., (2022), who analyzed the effects of virtual reality on elderly individuals with mild cognitive impairment and dementia. In this research study the research participants were exposed to a virtual reality world was created o the basis of the provided information about their life stories and important incidents. Individuals indicated significant improvements in various aspects of their lives. This improvement in their quality of life after the three weekly sessions was indicated by the reported lower perceived stress levels and reduced occurrence of mental disturbances. Additionally, the older adults reported that the experience with a socially engaging virtual reality was associated with better engagement with individuals in their lives and improved satisfaction from these relationships Another study (Barreda-Ángeles & Hartmann, 2022), conducted on social media users (N=220)., reported variations in the influence of the social virtual reality platforms compared to the currently existing social media platforms Within the virtual reality world, social interactions were positively associated with connectedness and enjoyment with other individuals within the same virtual environment

Social influence was also reported in a study by Huang et al. (2022) that explored the effect of the Metaverse virtual realities sporting experiences on the real sporting performance of

individuals. The study, which included Chinese athletes, reported that virtual reality sporting experiences were positively associated with improved mental health, including reduced anxiety levels. Therefore, the participants' results reported increased endurance performance during today's sporting activities in the world (Huang et al., 2022).

The field of education has also been greatly benefitted from online platforms. The rise of the Metaverse is expected to get more benefit from the upcoming developments in this field, ad from the findings included in the investigation. For example, one study (Filipova et al., 2023) reported the possibility of School attendance virtually from any corner of the world, especially in safe environments. This study also reported on some examples of improved educational experiences using the Metaverse, such as you must think students into virtual worlds while teaching them about historical events for a better understanding

Conclusion

This investigation aimed to analyze the adoption and the current status and the impact of the Metaverse on various aspects of a global society. Findings from the review indicated that positive influences such as increased economic gains improved social interactions, and improved educational opportunities are associated with adopting the Metaverse and less damage to the physical environments resulting in a green society.

Study Implications and recommendations

Even with the associated positive influences on the Metaverse on the various parts of our society, there are still challenges in its adoption, largely due to Ethical considerations related with it. With a virtual world being a recent development, many aspects are yet to be well explored, so studies such as that by Filipova et al., (2023) recommended close monitoring, especially by legislative parties. It should be applied to mitigate the detriments that may arise from this potentially revolutionary opportunity after implementation of the Metaverse. Future studies should investigate potential risks associated with using the Metaverse.

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