



METaverse FOR HEALTH: FUTURE OPPORTUNITIES, CHALLENGES, AND RECOMMENDATIONS

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Abstrak

Metaverse adalah sebuah konsep yang merujuk pada sebuah dunia virtual yang terintegrasi secara global dan dapat diakses oleh banyak orang dari berbagai tempat. Penelitian ini bertujuan untuk membahas lebih lanjut tentang metaverse untuk kesehatan, dan tantangannya. Adapun metode yang digunakan peneliti dalam penelitian ini adalah metode penelitian literatur. Manfaat teknologi metaverse bagi kesehatan antara lain Pendidikan kesehatan, Terapi kesehatan, remote monitoring kesehatan, penelitian kesehatan, Telemedicine, rehabilitasi kesehatan, dan konsultasi spesialis kesehatan. Adapun tantangan yang harus dihadapi metaverse dalam kesehatan antara lain teknologi yang relatif baru, standar kualitas yang tinggi, Aksesibilitas, Regulasi, profesional kesehatan(Dokter, perawat, dll) harus dilatih, Interoperabilitas, adaptasi, investasi dana yang cukup besar, studi klinis, dan lain sebagainya.

Kata Kunci: *Metaverse, Kesehatan, Masa Depan*

Abstract

Metaverse is a concept that refers to a virtual world that is globally integrated and can be accessed by many people from various places. This research aims to further discuss the metaverse for health and its challenges. The method used by researchers in this study is the literature research method. The benefits of metaverse technology for health include health education, health therapy, health remote monitoring, health research, telemedicine, health rehabilitation, and health specialist consultations. The challenges that must be faced by the metaverse in health include relatively new technology, high-quality standards, accessibility, regulation, health professionals (doctors, nurses, etc.) must be trained, interoperability, adaptation, a large investment of funds, clinical studies, and so on.

Keywords: *Metaverse, Health, Future.*

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PRELIMINARY

Metaverse is a concept that refers to a virtual world that is globally integrated and can be accessed by many people from various places (Barlian & Ismelani, 2022). It is often identified with virtual worlds or virtual worlds from video games (Indarta et al., 2022), but in the context of the metaverse, it transcends the realm of entertainment and is used in fields such as education, collaboration, business, etc (Bonafix & Nediari, 2022). Metaverse is envisioned as providing an interactive environment that enables people to interact with content and with each other in real-time, where applications, content, and services can seamlessly integrate (Barlian & Ismelani, 2022).

The concept of the Metaverse was first introduced by science fiction author Neal Stephenson in his 1992 novel "Snow Crash". In this novel, the metaverse is described as a virtual world that can be accessed by many people via computers and in 3D (Ering et al., 2022).

After that, the concept of a metaverse began to develop in the gaming and entertainment industry, with games such as Second Life and World of Warcraft offering virtual environments that were accessible to many people (Pieters, 2022) (Abbate et al., 2022).

Then, in recent years, the metaverse concept has started to be used in various fields such as education, collaboration, business, etc (Putri et al., 2022). Big tech companies like Facebook, Google, and Microsoft are also starting to invest in the development of metaverse technology (Preston, 2021) (Mystakidis, 2022) (O'Brien & Chan, 2021).

Currently, the metaverse is still in the development stage and has not yet been fully realized, but it is hoped that it will become a platform that can be used in various fields and provide new experiences in interacting with the digital world (Endarto & Martadi, 2022).

The development of metaverse has undergone quite significant developments in recent years. Some of the main developments that have taken place are:

Virtual Reality (VR) and Augmented Reality (AR): These technologies have been growing rapidly and are being used in the development of the metaverse to create realistic virtual environments and enhance user interaction (Kürtünlüoğlu et al., 2022) (Si et al., 2022).

Cloud computing: Metaverse requires a robust infrastructure to support broad access and seamless experience. Cloud computing provides

the right solution for this infrastructure (L.-H. Lee et al., 2021).

5G: with higher speeds and lower latencies, 5G allows for a more fluid and interactive metaverse experience (Njoku et al., 2022).

Blockchain: blockchain technology is used to provide better security and privacy in the metaverse (Gadekallu et al., 2022).

Applications in other fields: Metaverse is starting to be used in various fields such as education, collaboration, business, etc.

Despite significant developments, the metaverse is still in its infancy and not yet fully realized. But it is hoped that in the next few years, the metaverse can become a platform that can be used in various fields and provide new experiences in interacting with the digital world (Kliestik et al., 2022). As for this research, the researcher wants to discuss how the benefits of the metaverse for health, and what are the challenges that must be faced by using the metaverse in the health sector.

METHOD

In this study, researchers used literature research methods. A literature research method is a way to collect, analyze, and interpret information obtained from written sources such as scientific journals, books, reports, and other documents. It is used to gather information about the topic under study and to develop a better perspective on the topic. The literature research method includes several stages; (1) Topic selection: Selecting topics to be researched and determining research objectives, (2) Source search: Searching for literature sources that are relevant to the topic under study through various databases such as JSTOR, Google Scholar, etc. (3) Source analysis: Reading, analyzing, and interpreting found sources to gather relevant information and find patterns or themes related to the topic under study. (4) Result synthesis: Compile and synthesize information obtained from sources of literature sources to compile reports or papers that present research results. (5) Presentation of results: Presenting research results that have been collected and analyzed in the form of scientific papers (Parinata & Puspaningtyas, 2022) (Pustakawan & RI, n.d.).

RESULTS AND DISCUSSION

As for the health sector, Metaverse has been used for the last few years, since the development of virtual reality (VR) and augmented reality (AR) technology began to grow rapidly. The use of metaverse in healthcare has been used as a tool in

medical education, therapy, and remote patient monitoring. However, the use of the metaverse in health is still in its infancy and is still in the process of being developed (Usmani et al., 2022). That's why researchers want to discuss the "Metaverse for Health: Opportunities, Challenges, and Future Recommendations"

Metaverse For Health

There are several opportunities that the metaverse can offer in the health sector, including:

First, Health education: Metaverse can be used in health education by creating a virtual environment that can be used to increase one's understanding and skills in health matters. For example, it could be used to simulate safe and effective medical practices or to provide access to interactive and fun health education materials. Some examples of the use of metaverse in health education are surgical simulations, medical skills learning simulations, and anatomy learning (Petrigna & Musumeci, 2022).

Second, Health Therapies: Metaverse can be used in health therapy by creating virtual environments that can be used to enhance a person's mental and physical well-being. For example, it can be used to improve social skills, reduce anxiety and depression, or in rehabilitation therapy after an injury (Wang et al., 2022).

Third, Remote Monitoring: Metaverse can be used for remote health monitoring by creating a virtual environment that can be used to collect health data and provide relevant feedback and suggestions. For example, it can be used to collect vital data such as heart rate, blood pressure, and respiration and perform real-time monitoring of health conditions. Or it can be used to carry out virtual consultations with doctors, which allows patients to access medical care from anywhere without having to go to a clinic (J. Lee & Kundu, 2022).

Fourth, Health Research: Metaverse can be used for health research by creating virtual environments that can be used to collect data and perform more effective analyses. For example, it can be used to collect patient experience data in a safe and controlled environment or to conduct drug and therapy trials in a well-managed environment. By using the metaverse, researchers can collect more accurate data and reduce the bias associated with capturing data in a real environment (Susilo & Febrianto, 2022).

Fifth, Telemedicine: Metaverse can be used for healthcare telemedicine by creating virtual environments that can be used to provide remote

medical care. For example, it can be used to carry out virtual doctor consultations, which allows patients to access medical care from anywhere without having to go to a clinic. Or it can be used to perform virtual physical examinations, which allow doctors to carry out detailed examinations without having to be in the same room as the patient. Metaverse can also be used for collaboration between healthcare professionals from different locations, such as consulting with specialists from outside a region or country (Dagli, 2022).

Sixth, Rehabilitation: Metaverse can be used for health rehabilitation by creating a virtual environment that can be used to improve one's motor and cognitive skills after an injury or illness. For example, it can be used to perform physical exercises and therapy in a safe and controlled environment or to provide simulated everyday situations that allow patients to improve social skills and adaptation. Some examples of the use of metaverse in health rehabilitation are physical exercise simulations, simulations of everyday situations, and cognitive therapy. Metaverse can be used to increase the effectiveness of therapy and speed up the rehabilitation process and prevent complications (Sutopo, 2022)

Seventh, Specialist Consultation: Metaverse can be used for specialist health consultations by creating a virtual environment that can be used to provide access to health specialists from different locations. For example, it can be used to carry out consultations with specialists from outside the region or country, allowing patients to access better medical care without having to travel to specialist locations. Or it can be used for collaboration between specialists from different locations, such as consulting with specialists from outside the region or country. Metaverse can also be used to conduct consultations with specialists from various health fields such as oncology, cardiology, neurology, and others. However, research on using metaverse in specialist consultations is limited and more research is needed to determine its effectiveness (Tan et al., 2022).

Metaverse Challenges For Health

Some of the challenges that may be faced in implementing the metaverse in health include:

1. **Technology:** Metaverse is still a relatively new technology and it requires a large investment to make it available to users (Munawar et al., 2022).

2. Quality standards: Metaverse must meet high-quality standards for use in healthcare, such as patient data privacy and security (Ali et al., 2023).
3. Accessibility: The Metaverse must be accessible to everyone, including those who may have physical or cognitive disabilities (Akmal et al., n.d.).
4. Regulations: Metaverse must comply with applicable regulations in the health sector, such as HIPAA regulations in the United States (Ismail & Ns, 2022).
5. Education and training: Doctors, nurses, and other health professionals must be trained to use the metaverse effectively in patient care (Wu & Ho, 2022).
6. Interoperability: Metaverse must be able to work with existing healthcare systems, such as electronic medical records (EHR) systems and medical devices (Song & Qin, 2022).
7. Adaptation: There are differences in how patients and healthcare professionals use the metaverse that needs to be recognized and accommodated to increase the effectiveness and efficiency of care (Wiederhold, 2022).
8. Investment: The implementation of the metaverse for health requires a sizable financial investment and needs to be supported by the government and the private sector (Ning et al., n.d.).
9. Clinical studies: Sufficient clinical studies should be conducted to determine the effectiveness of using metaverse in health care (Mastarida et al., 2022).

CONCLUSION

Metaverse is a concept that refers to a virtual world that is globally integrated and can be accessed by many people from various places. There are several opportunities that the metaverse can offer in the health sector, including Health Education, Health therapy, remote health monitoring, health research, Telemedicine, health rehabilitation, and health specialist consultations. The challenges that must be faced by the metaverse in health include relatively new technology, high-quality standards, accessibility, regulation, health professionals (doctors, nurses, etc.) must be trained, interoperability, adaptation, a large investment of funds, clinical studies, and so on.

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