Journal of Computer Science

Original Research Paper

Study of Metaverse Prospect, Implications and Sustainability Based on Perception of University Students in Indonesia

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Article history
Received: 24-10-2022
Revised: 27-01-2023
Accepted: 01-03-2023

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Abstract: Technological advancement is accelerating in this Industry 4.0 era, resulting in numerous changes in human life. As university students or so-called agents of change, we expected to adapt quickly. Metaverse is one of the hotly debated topics these days. Thus, the goal of this research is to look at the metaverse's prospects, implications, and sustainability through the eyes of university students in Indonesia. Purposive sampling was used as the research method. We also designed a metaverse environment simulation room and invited our respondents to come in to experience the world of the metaverse there, followed by filling out the questionnaire. The simulation is held to collect valid data on respondents' perceptions related to the ease of use, usefulness, and intention to use metaverse based on their real simulation experience, not just on their assumptions. The findings indicated that the metaverse's prospects are very decent, but the societies and existing infrastructure are still insufficient to implement the metaverse. Meanwhile, the metaverse's ease of use has a significant impact on the intention to use. As a result, we need to prepare several things carefully during transition and adaptation. Especially in terms of infrastructure readiness and accessibility.

Keywords: Metaverse, Digitalization, Technology Acceptance, Virtual Environment, Behavioral Intention

Introduction

Technological advancements in this era have occurred at a rapid pace, influencing people's lifestyles and patterns. Particularly in the 4th Industrial Revolution era, which is supported by virtual reality, augmented reality, and other technologies that make technology use more sophisticated. Technological advances transform manual labor systems and labor objects into automated ones carried out by systems or the use of technology, allowing them to be more flexible and to produce or carry out large-scale production more quickly. There is a significant impact on various aspects of human life at all levels of society, including the economy, education, health, and so on. As technology advances, users demand greater flexibility and convenience through digitization, which allows everything to be done online. The climax is one that has recently become the buzzword, which is Metaverse.

In mid-October 2021, rumors of a Facebook rebranding spread, sparking public interest in the metaverse. Mark Zuckerberg, CEO of Facebook, announced a name change of his company to Meta, with a focus on creating a virtual world that combines virtual reality and augmented reality technology via the metaverse. Meanwhile, Microsoft, as a software behemoth, is employing and developing holographic blending and extended reality via the Microsoft mesh platform. This technology will eventually connect the real world to augmented reality and virtual reality. Furthermore, many international artists are purchasing digital goods in the metaverse. Some artists, such as Justin Bieber, twenty-one Pilots, and John Legend, even hold virtual concerts in the metaverse. Some interactive games, such as Fortnite, Minecraft, and Roblox, are also metaverse worlds where players can work, collaborate, attend events, and exchange real money for virtual goods and services.

You can find several definitions of the term metaverse by googling it. It is defined as "a persistent virtual environment that allows access to and interoperability of multiple individual virtual realities" by Merriam-Webster. The term "metaverse," which combines the prefixes "meta" (meaning beyond) and "universe," is typically used to describe the idea of a future version of the internet made up of shared, persistent, 3D virtual spaces that are connected to a perceived virtual universe. In the collaborative universe known as the metaverse, everything is possible

simultaneously and in parallel using Virtual Reality (VR) and Augmented Reality (AR) technologies. Human interaction with avatars, as well as a variety of goods and services, is combined between the real world and the digital world without borders. Through this virtual world, users can carry out a lot of activities from shopping to visiting historical places and interacting without having to travel physically.

There are numerous benefits that can be derived from the implementation of metaverse. According to the findings of Accenture research on 24,000 respondents worldwide, as well as 4,650 executives from 23 industries in 35 countries, including Indonesia, conducted from December 2021 to January 2022, 55% of respondents believe metaverse technology will have a positive impact on organizations. 25% believe this technology will lead to a breakthrough (Accenture, 2022). Johnny plate, the minister of communication and information (kemkominfo) also believes that Indonesia has a huge opportunity to develop the metaverse due to the country's noble values and local wisdom. According to him, the development will make use of Indonesia's information technology resources, connectivity, and all other elements by involving various companies focused on developing the metaverse. The creation of the metaverse is viewed by all parties as a significant step in the joint effort to elevate Indonesia on the international stage. This is linked to the theme of the G20 Indonesia 2022 presidency, "recover together, recover stronger," in which the metaverse serves as the primary means of achieving this goal (Radityo, 2022).

However, since this is a relatively new technology, many factors and components must be considered and prepared before the implementation can start. Begin with readiness and progress to procedures, security, effectiveness, market, consumer interest, and so on. Of course, adjusting to a new culture takes time and requires a lot of knowledge before we become accustomed to it. We must, however, continue to adapt. As a result, understanding the perceptions of those who will implement it is critical in order to determine the best and most effective approach method. This will have a significant impact on their level of interest in adopting the technology.

Several factors influence Indonesia's readiness to adopt new technology, as listed below:

- Availability of technology and ease of use
- Benefits that can be obtained
- Trust affects the perception of usability

In this study, we will try to learn more about these factors in relation to the metaverse based on university student perceptions in Indonesia. Using the technology acceptance model, these factors will be divided into three key elements as proposed by Fred Davis: Perceived ease of use, perceived usefulness, and intention to use. According to Davis, among the many factors that can affect system usage, the research's findings point to three crucial components. First, people tend to use certain technologies based on their belief that the technology will help them do their jobs better or not. This initial factor is referred to as perceived usefulness. Second, even if prospective users think the technology is helpful, they might also think it is too complicated to use and that the performance advantages of using the application outweigh the effort required. That is, in addition to usability, perceived ease of use will affect users' intentions to use a product and finally, the element of intention to use itself. Since metaverse implementation in Indonesia is still in its early stages, it's better for us to concentrate on the essentials first.

Therefore, in this research, we focus on these 3 key elements to find out what factors need to be considered in implementing metaverse in Indonesia. We will try to determine the relationship between these three factors, what we need to prepare to increase their readiness to adopt this metaverse technology, and delve deeper into the prospects, implications, along with the sustainability of metaverse development based on Indonesian people's behavioral intentions and perception, particularly among university students in Indonesia as agents of change. Indirectly, active university students at the time of this study conducted (class of 2018-2022) are also included in Gen Z, which is the generation that is most exposed to the internet and has the highest level of internet usage duration compared to others. Therefore, their perspectives will be very interesting to research further.

Objectives

Based on the foregoing, the following are the goals of this research:

- Figuring out the key variables that affect Indonesian students' decisions to adopt and use the metaverse
- Considering and preparing for the components that must be considered and planned for when implementing the metaverse
- Analyzing metaverse technology's prospects, implications and sustainability from the perspective of Indonesian students

How do university students in Indonesia perceive the metaverse in terms of ease of use and usefulness? What is the level of their intention to use the metaverse? What are the prospects, implications, and sustainability of the metaverse in the future? We will find out all these things together in this research.

To get a theoretical basis that can support solving the problem being studied, we also conducted a literature review of previous research. The theory obtained is the first step so that we can better understand the problem being researched properly in accordance with the scientific framework of thinking. The previous research shows in Table 1:

Table 1: Literature review

	Title	Year and Methods	Result
1	Big data and metaverse toward business operations in Indonesia	2022, descriptive method	According to research, the Indonesian government encourages businesses to create an ecosystem for the metaverse there because it can improve decision-making. While this is going on, organizations that provide public services can benefit from the information generated by big data to personalize messages and treatment for specific clients to increase customer satisfaction (Depari *et al*., 2022)
2	Pengenalan digital literasi "metaverse" (tantangan dan potensi e-sport di tanah papua) (Introduction to "metaverse" digital literacy (challenges and the potential of E-sports in Papua))	2022, exploratory method	From the results of the socialization activities regarding the metaverse that was carried out, they were considered very good, ranging from the ability to use applications to the ability to use digital media techniques, all of which showed an average result of 4.6/5.0. However, behind this, there are several challenges in using this technology, such as (1) The lack of available network/internet; (2) The lack of human resources who understand digital skills; (3) Supporting facilities must be adequate (laptops or gadgets that support technological progress); and (4) Lack of utilization of content/applications to support sales (e-sports) (Siahaan and Sawir, 2022)
3	Metaverse regulation formulation in Indonesian cyber law	2022, Normative legal research method using several approaches, namely: (1) Conceptual approach, (2) Analytical approach, (3) Legislative approach and (4) Comparative approach	The results of the research show that the development of technology is very fast among the people so the use of communication technology is also greatly increasing among the people. Behind that, there is the possibility that misuse of usage can occur, so it is important that proper cyber law protection exists in Indonesia. In facing the metaverse era, Indonesia needs a strategy and development of laws and regulations, A Legal reform/formulation of the laws and the government should pay more attention to personal data protection laws (Ridwan *et al*., 2022)
4	Possibility of a metaverse in education: Opportunity and threat	2022, descriptive method	Because the world of education is also impacted by technological advancements, the metaverse has benefits for the field of education, including giving its students new experiences and educating teachers on how to adapt to and use new applications. There are some drawbacks to implementing this technology in the educational setting, where both teachers and students need to have access to the proper resources and assistance in order to use it. This is what leads to poor learning performance, particularly when it comes to the teachers' and students' lack of literacy and of course, applying this technology requires money and time (Fitria and Simbolon, 2022)
5	Analisis potensi implementasi metaverse pada media edukasi interaktif (analysis of potential metaverse implementation in interactive educational media)	2022, descriptive method	From the results of this research, it is shown that the application of metaverse technology as an interactive learning method improves student learning outcomes and students more easily absorb the knowledge learned from visuals produced by VR technology (Endarto and Martadi, 2022)
6	Internal auditing in metaverse world: Between the prospects of virtual reality and the possibilities of augmented reality	2022, explanatory research	There are no scenarios that limit how augmented reality is used within or outside of the metaverse; rather, discussions in this research only takes the form of scenarios about what will happen in the future. Although this technology is thought to be applicable by internal audit because it is thought to be able to minimize financial costs during the internal audit process and is also thought to be safer during the internal audit process, this is based on the discussion's findings (Al-Gnbri, 2022)
7	Is metaverse in education blessing or a curse: A combined content and bibliometric analysis	2022, quantitative and qualitative method	metaverse are considered to be able to have a big impact in the world of education, for example, visiting historical places can be done through this technology without the need to go directly. However, in its implementation, further research still needs to be done, such as what is the impact of implementing this metaverse with students with disabilities and this implementation also

Table 1: Continue

			requires technical guidance to teachers, in creating an attractive virtual platform and collaborating with students (Tlili *et al*., 2022)
8	Know more metaverse as The technology of future	2022, descriptive method	In the development of this technology, the number of internet users will also continue to grow as shown in the picture of Facebook users from year to year. In this research, data usage is increasing so the number of metaverse users is also expected to increase because Facebook is currently working on a project based on metaverse technology, therefore metaverse will be a big change. Metaverse is also a potential technology that will continue to develop because it can facilitate the human daily life through the virtual world (Amirulloh and Mulqi, 2022)
9	The metaverse an alternative education space	2022, descriptive method	Teachers and their students have the chance to work safely in a customizable environment to support learning objectives and outcomes thanks to metaverse platforms like Teamflow, which let users create unique identities in the form of avatars and disengage from business meeting platforms like Zoom, teams, and google meet. The metaverse is a world where students already live, collaborate, and thrive, so incorporating it into shared learning adopts this environment (Mistretta, 2022)
10	A study of college students intention to use metaverse technology for basketball learning based on UTAUT2	2022, quantitative method	The metaverse technology can be improved by fusing it with activities like games and educational programs. Virtual reality, artificial intelligence, game apps, and metaverse gear (such as virtual reality gloves, augmented reality glasses, etc.,) will all be used in the use of virtual reality educational tools (Yang *et al*., 2022a)
11	A study on the intention and experience of using the metaverse	2022, quantitative method	The concept of the metaverse itself has great potential, but there are still many parts to develop and solve in terms of technology, economy and education. The risk factors that arise in the future are also become the parts to be considered. The metaverse is evolving and spreading rapidly within the MZ generation (Toraman, 2022)
12	User acceptance of metaverse: Insights from Technology Acceptance Model (TAM) and Planned Behavior Theory (PBT)	2022, quantitative method	The behavioral control variable has no discernible impact on attitudes toward use. The newness of the technology can be used to explain the current situation. People's ability to control technology is hampered by the widespread use of metaverse. An an important factor in this situation is the inability to use the necessary technology (Toraman, 2022)
13	Prediction of user's intention to use metaverse systems in medical education: A hybrid SEM-ML learning approach	2022, quantitative method	The world will continue to change as a result of the metaverse technology in a variety of areas, including education, politics, entertainment, lifestyle, and economics. Particularly, MS backed by additional technology will be essential in education. A rise in the technological advancement that could fundamentally alter the world is suggested by Facebook's recent announcement that the company is changing its branding to the metaverse. Teaching and learning methods used today will be significantly impacted by the increased breakthroughs and use of VR and AR in educational settings (Almarzouqi *et al*., 2022)
14	Social cognitive theory to assess the intention to participate in the Facebook metaverse by citizens in Peru during the COVID-19 pandemic	2022, explanatory and in quantitative method	The COVID-19 pandemic has accelerated the adoption of virtuality among all age groups, so Facebook's announcement of the Facebook metaverse is an opportune offer. The intention to participate in the metaverse is positively and significantly influenced by institutional support, technological literacy and participation self-efficacy, according to our research. Schools and businesses should pay particular attention to planning and investing in the metaverse as well as understanding the elements that foster a greater desire of getting involved with the Facebook metaverse (Alvarez-Risco *et al*., 2022)
15	Measuring technology acceptance model to use	2022, quantitative method	Users must feel secure and trusted before embracing new technology. Additionally, users' surroundings and other social

Table 1: Continue

	metaverse technology in Egypt		influencers have an impact on their decisions. In order to encourage users to adopt technology, technology providers should offer a positive user experience (Mostafa, 2022)
16	The metaverse as a virtual form of smart cities: Opportunities and challenges for	2022, descriptive method	The political actions taken in response to climate change, the transition to new economic models (low-carbon and digital), ecological modernization, scientific and technological advances, changes in governance and the knowledge/power structure established in Western society all have an impact on the metaverse, just like they do on all other techno-visions. These will decide how it develops and succeeds, as well as probably continue to do so for a while. From a philosophical standpoint, the metaverse can be viewed as a discourse that uses computational and scientific approaches and is motivated by recent technological advancements that have historically become popular before quickly losing popularity as they become situated in experiences (Allam *et al*., 2022)
17	Metaverse: Tantangan dan peluang dalam pendidikan (metaverse: Challenges and opportunities in education)	2021, descriptive method	Due to the fact that metaverse has no boundaries and no set limits on space, it requires a greater level of engagement, so if education joins metaverse, it must be prepared for a more extensive global dialogue. Another issue is that not everyone can access the metaverse in the current socioeconomic climate. Some students continue to voice their dissatisfaction with the the signal which continues to render teaching and learning challenging even today. The digital world's crime, data security, and privacy are just a few of the many difficulties. But once people become accustomed to it, they will be able to use it more freely, which will greatly enhance the standard and experience of future educational experiences (Indarta *et al*., 2022)
18	Fusing blockchain and AI with metaverse: A survey	2022, descriptive method	Blockchain technology and artificial intelligence are expected to plays a major role in the ever-expanding metaverse. For instance, metaverse uses blockchain and artificial intelligence to build a a digital virtual world where anyone can participate in social and business activities that go beyond the confines of the real world. The use of the most recent blockchain and AI technologies will be escalated by the use of the metaverse (Yang *et al*., 2022b)
19	A Survey on metaverse: Fundamentals, security and privacy	2021, Explanatory and descriptive method	Its widespread adoption may be hampered by serious security and privacy violations in the metaverse. In addition, because of the metaverse's inherent qualities of absorbing realism, hyper spatiotemporality, sustainability, and heterogeneity, a number of difficulties, such as scalability and interoperability, may occur in the provisioning of security in the metaverse (Wang *et al*., 2022a)
20	The Metaverse in 2040	2022, quantitative method	This expert poll was prompted by discussions that are currently raging about how "the metaverse" will change and affect society by 2040. The metaverse is a collection of computer-generated, networked XR spaces (which include VR, AR, and/or MR) where humans and automated entities can interact. Some of these spaces are "mirror worlds" that resemble real-world settings, while others are gaming or fantasy settings. Although virtual reality video games and social spaces have been around for quite a while, technological advancements in the early 2020s have brought the metaverse's development to the fore, spurring tens of billions of dollars in investment and prompting predictions that it will be "the future of the internet" or "the next internet battleground" (Anderson and Rainie, 2022)
21	A Survey on Metaverse: The State-of-the-art, Technologies, applications and challenges	2021, descriptive method	Metaverse has a wide range of development and application and opportunities. This study summarizes the work of various countries and enterprises gather papers related to the metaverse, introduces the three characteristics of metaverse's multi-technology, sociality, and hyper spatiotemporality speculates metaverse's first application areas and discusses its problems

Table 1: Continue

			and challenges (Ning *et al*., 2021)
22	Being at home in metaverse? Prospectus for social imaginary	2022, explanatory and the descriptive method	As we continue to think about our prospects for coexisting with of the metaverse, going back to (Taylor, 2007) past nowadays secularism may be helpful. As Taylor suggests, it will take centuries to determine whether or not humans are able to feel comfortable in a godless environment. Our social structures as a subspecies of aeternitatis have changed drastically in a short period of time, with little opportunity for adaptation. Taylor (2007) argues that a number of troubling contemporary's phenomena, including a meaning crisis and an uptick in mental health problems like anxiety and depression, are consequences of exclusive humanism. If we keep going in the same direction, these might portend what lies ahead (Gorichanaz, 2022)
23	Mobility aware optimization in the metaverse	2022, quantitative method	The metaverse is anticipated to place significant demands on 5G and beyond networks in terms of energy consumption, persistent high data rate support and advanced edge caching/computing capabilities. For content-rich metaverse applications, this study suggests an integrated optimization framework that explicitly takes into account model rendering, mobility of users and service decomposition. This framework aims to balance energy use user perception quality and service delay. The suggested optimization framework, in comparison to non-mobile schemes, can deliver an average delay reduction of 11.8-35.6% with no reducing user experience quality or raising necessary power consumption (Huang and Friderikos, 2022)
24	Reducing stress and anxiety in the metaverse: A systematic review of meditation, mindfulness and virtual reality	2022, descriptive method	The findings show that current works have a significant accumulation of utilizing VR immersion to improve user presence (letting them be away from their daily stressful life). Some of these works are innovative in their use of physiological detection in conjunction with interactive virtual objects. Other than breath meditation, meditation has many different types and adaptations. There is also plenty of room to explore in VR, 3D modeling and physiological detection and it is not convincing that the most advanced rendering technology, the most comprehensive multi-sensory stimulation and the richest the interaction will achieve the best meditation effect. To integrate the appropriate technologies and maximize the potential, future research should aim to determine the processes, mediators and objectives of the specific meditation type or mindfulness activity (Wang *et al*., 2022b)
25	AI and 6G into the metaverse: Fundamentals, challenges and future research trends	2021, descriptive method	This survey paper provides a thorough examination of the role of AI and 6G in realizing metaverse's immersive experiences. In particular, we investigated several underlying technologies of AI and 6G in the context of the metaverse, such as advances in computer vision, learning paradigms, and wireless communication technologies. In addition, we investigate the role of AI and 6G technologies in obtaining ubiquitous intelligence, tactile feedback and self-optimization capabilities for a variety of metaverse services ranging from holographic telepresence to remote surgeries. Following that, we highlight the long-term viability of metaverse services, followed by applications, use cases and ongoing projects. Finally, we illuminate numerous open issues, future directions, and lessons learned for potential metaverse researchers and developers (Zawish *et al*., 2021)
26	A metaverse: Taxonomy, components, applications and open challenges	2021, descriptive method	Instead of focusing on marketing or hardware, this study breaks down the fundamental ideas and methods needed to realize the metaverse into three categories: Hardware, software and contents; and three approaches: Interaction with users, deployment and application. As a representative of the metaverse,

Table 1: Continue

			ready player one, Roblox and Facebook research in the fields of movies, video games, and studies, there is also an explanation of the key methodologies based on these three components and techniques (Park and Kim, 2022)
27	Metaverse for wireless systems: Vision, enablers and architecture and future directions	2022, exploratory method	The metaverse has the potential to be a promising technology for deploying 6G and beyond wireless systems. A set of critical enablers for such a wireless system have been identified. This the study also proposed a high-level architecture for a metaverse-based wireless system, as well as an actual wireless system example (Khan *et al*., 2022)

From these previous studies, we identified most of them are focused on literacy and providing knowledge about the metaverse to the community, which is very helpful for us in obtaining theories related to the metaverse, prospects for fields that can be supported by metaverse, as well as aspects that need to be considered in implementing metaverse. The novelty of this study is that it also offers our respondents direct experience through using the metaverse environment room that we have created, allowing them to gain firsthand knowledge of the metaverse and form judgments based on that knowledge rather than understanding. We aim to get an opinion after getting hands-on experience using the metaverse technology itself.

Based on the previous research, we all agree that the metaverse can have a huge impact on various aspects of human life in a positive way. However, there are many things that need further attention, such as security, availability of infrastructure, and so on. These existing findings from previous studies can be used as indicators for our research to learn more about the prospects for the metaverse in Indonesia after the respondents tried using the metaverse directly.

Research Model and Hypothesis Development

Research Model

The research model that we employ is the Technology Acceptance Model (TAM), which was developed by Fred Davis and Venkatesh and can be used to examine the variables that affect how well a new technology or information system is received. We developed an understanding of how each of the variables in the technology acceptance model related to one another. The definitions of these variables, along with their connections to the context of the study and each relationship's corresponding hypothesis, are provided below.

Perceived Ease of Use

Perceived usability is defined by Davis (1989) as the degree to which a person believes technology is understandable. Adams *et al*. (1992) claim that a system's level of use and user-system interaction can also be used to determine how easy it is to use. The more frequently utilized system suggests that it is simpler to comprehend, use and operate. The conclusion that can be drawn from this definition is that a person's level of belief in the technology's ease of understanding and the ease with which they can operate and use the system used will determine how simple they find it to use. Indicators of perceived usability are described by Lee and Lin (2005) and they include:

- Information technology is very easy to learn
- Easily skilled in the use of information technology
- Information technology is very easy to operate

Perceived Usefulness

Perceived usefulness is defined as "the extent to which a person believes that using a particular system would enhance his or her job performance," according to Davis (1989). Users obviously think that utilizing the information and communication system will help them perform better. The system's advantages to users in relation to various aspects are described here. Therefore, one's belief about the usefulness of a system influences whether or not one chooses to use it. The presumption is that if a user thinks the system is beneficial to them and offers advantages, they will use it; however, if they don't think it is beneficial, they won't use it.

As stated by Davis (1989), there are a number of factors that can influence how a system is used, but two major factors have been identified by prior studies. First, people often use apps or don't in accordance with how much they think doing so will improve their ability to perform their jobs. Perceived usefulness is the name of the first variable. Second, even if prospective users think a given application is beneficial, they might also think that using it will result in better performance and that using it is not worth the effort because it is too complicated. In other words, it is hypothesized that perceived ease of use also affects usage, in addition to usability. Users who believe in the existence of a favorable use performance relationship have a high perception of the usefulness of a system. By using perceived usefulness and perceived ease of use as two independent variables and system use as a dependent variable, Davis (1989) carried out numerous experiments to validate the technology acceptance model.

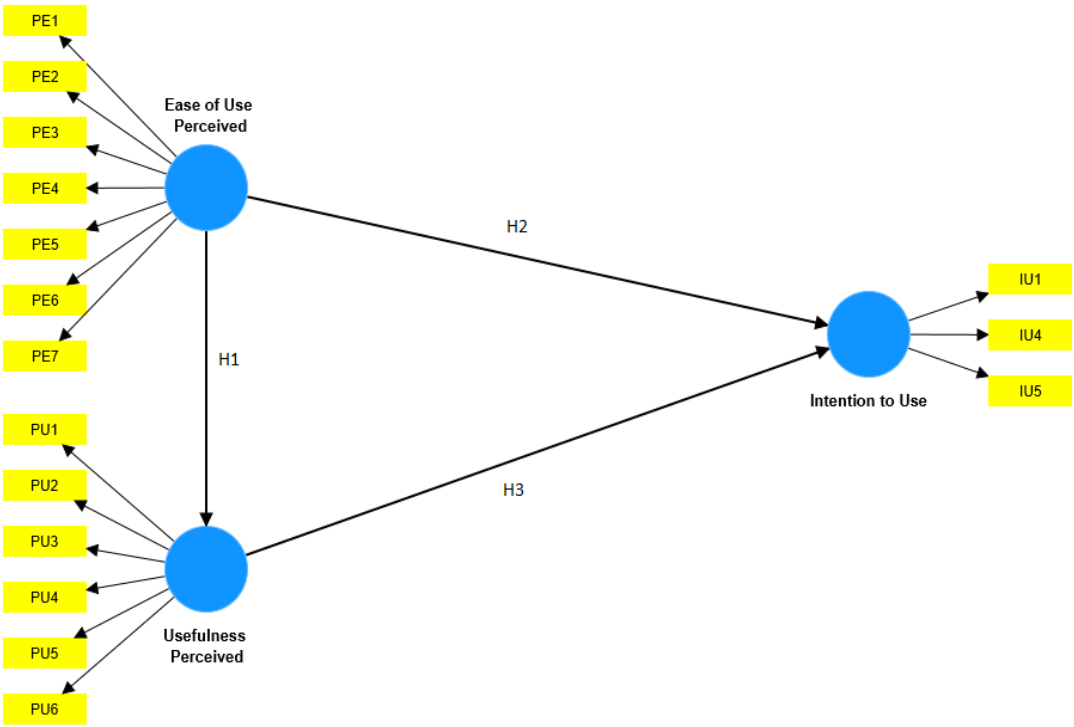

Fig. 1: Research model

He discovered that estimates of future self-use and self-reported use were both significantly correlated with perceived usefulness. Actual and anticipated use were both strongly correlated with perceived ease of use.

In order to comprehend these effects, based on the theories and literature review discussed in the previous section, the research model formulated (Fig. 1).

According to research by Lee and Wan (2010), perceived ease of use is a user's belief in ease of use in learning and applying new technology. If the procedure for using Metaverse is simple, easy to use, and does not necessitate a lot of setups, then it will provide a lot of benefits. So, the first hypothesis that will be tested in this study in accordance with the framework is as follows:

H_1: Metaverse's ease of use influences university students in Indonesia's perceived usefulness towards metaverse

According to research by Lee and Wan (2010), users can become more interested in trying and using new technology, in this case, metaverse, if the process of using metaverse is easily understood and access to metaverse is easily obtained. The second hypothesis that will be tested for truth in this study is as follows, in accordance with the framework of thought:

H_2: Metaverse's ease of use affects university students in Indonesia's intention to use the Metaverse

In this case, the intended subject is the intention to use metaverse in daily life, and in accordance with Lee and Wan (2010) definition of perceived usefulness, perceived usefulness is a person's degree of assurance in the use of a particular subject that can benefit people who use it. Accordingly, the third hypothesis that will be tested for truth in this study in accordance with the framework of thought is as follows:

H_3: Metaverse's usefulness affects university students in Indonesia's intention to use the metaverse

Methodology

In this research, there are several stages that we do. Starting from the experiment with the metaverse simulation session, filling out a questionnaire (Likert scale), data analysis of the numerical data obtained, interpretation of the results, and discussion. Based on the research conducted and the type of data used, our research is quantitative where we will present research data in the form of numbers. Data is gathered using research instruments (in this case, a questionnaire method) and after being statistically and quantitatively analyzed, the quantitative method is a positivist-based research technique used to examine particular populations or samples. The questionnaire method is the data collection

technique that we use to collect research data, in which researchers provide a list of questions or written statements for respondents to answer. The method of our research is displayed in Fig. 2.

Since the main indicators in this model are the ease of use, usefulness, and intention to use of the respondents, of course, it will be more valid if they have a clear understanding of what metaverse is and get real experience in using metaverse first before they fill out the questionnaire. Thus, we created a simulation in which potential respondents could experience the metaverse in the first step. We create virtual rooms and simulate the metaverse experience with Mozilla Hubs, a virtual collaboration platform that can be accessed via an internet browser. With the aid of mixed reality, virtual spaces can be built using Mozilla Hubs, a collaboration tool. It differs from other browser-based collaboration tools because it is first-person (either through VR or keyboard + mouse). The Mozilla environment is supported by a networked environment that can incorporate a wide range of platforms into its user interface. Hubs can be used to promote customer interaction by offering creative replacements for non-physical interactions.

We decided that the Mozilla Hubs platform would be a good fit for our research because it is an open-source platform with secure privacy protection. It has transparency regarding data protection and privacy information clearly listed on the platform's website. Also, the system requirements tend to be low and do not require too high specifications so that it can be accessed by anyone easily.

Below are the minimum specification for using this Mozilla Hubs.

Windows

- Windows 7 or later operating system
- Pentium 4 or newer processor that supports SSE2
- 512MB of RAM/2GB of RAM for the 64-bit version
- 200MB of hard drive space

MacOS

- MacOS 10.12 or later
- Mac computer with an Intel 86 or apple silicon processor
- 512 MB of RAM
- 200 MB hard drive space

GNU/Linux

1. Firefox will not run at all without the following libraries or packages:
   - Glibc 2.17 or higher
   - GTK+ 3.14 or higher
   - Libstdc++ 4.8.1 or higher
   - X.Org 1.0 or higher (1.7 or higher is recommended)
2. For optimal functionality, we recommend the following libraries or packages:
   - DBus 1.0 or higher
   - GNOME 2.16 or higher
   - Libxtst 1.2.3 or higher
   - Network manager 0.7 or higher
   - Pulse audio

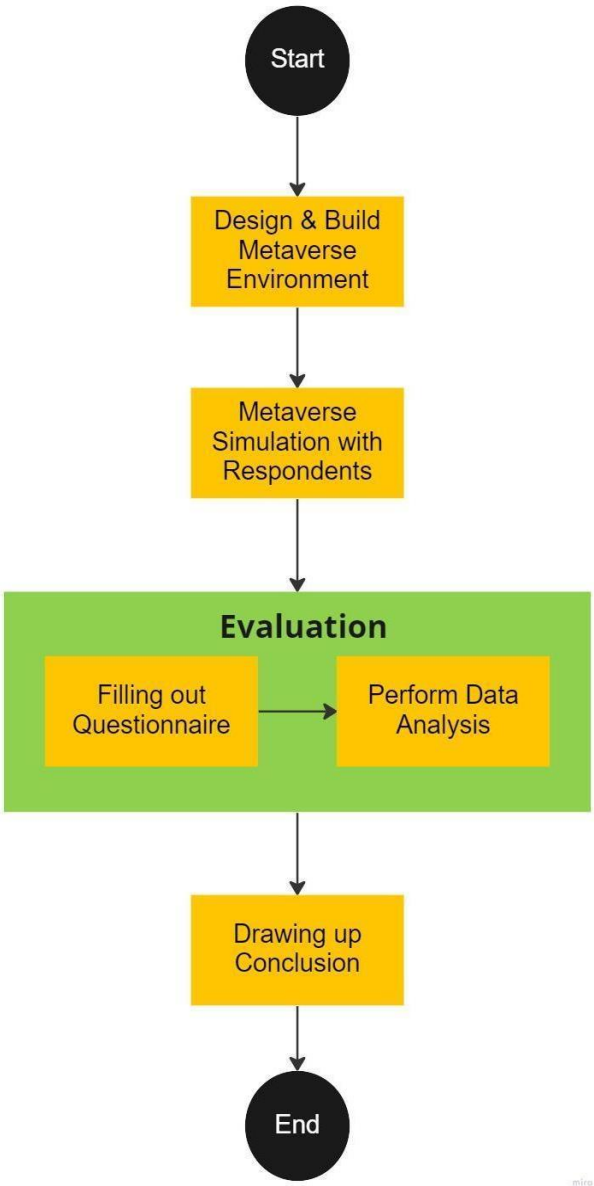

Fig. 2: Research method

Android 61.0

- Android 4.1 or above version
- 50 MB internal storage
- 384 MB of RAM
- Display at least 320 pixels high and 240 pixels wide

iOS 29.0

- iOS 11.4
- iOS 12
- iOS 13
- iOS 14

The simulation is divided into two steps. First, we will convene potential respondents in a conference call to briefly explain the metaverse and the simulation mechanism. Then we'll grant them access to the Mozilla Hubs room where they can experience metaverse before filling out the questionnaire. We also make sure that all of the respondents have a clear understanding of what the metaverse itself is through some explanation. Figure 3 shows some use cases that we conduct in the metaverse room that we have created.

Fig. 3: Use case diagram of the metaverse simulation environment

Data Collection and Measures

This study employs a quantitative methodology, as previously mentioned, with the goal of testing hypotheses to determine the relationship between variables. The data in this study is gathered by primary data collection methodology using structured questionnaires. This questionnaire was completed by university students in Indonesia, regardless of their gender, age, race, religion, or other characteristics. University students, who are also included in the Gen Z category, play an important role in the development of this metaverse technology, as they are very aware of changes and developments in this technology and it provides many advantages in the workplace. On the other hand, we look for respondents who live in Indonesia's major cities because most digitalization changes were initiated by people in major cities. They also have a supporting infrastructure and an internet network and they are accustomed to using smartphones. To conclude, the respondent's criteria that need to be validated consist of (1) University students (class of 2018 to 2022), (2) Living in a big city in Indonesia, (3) and having supporting infrastructure and as well as an internet network.

Data was collected by a valid and reliable questionnaire. The questionnaire contains questions to find out the perceptions of university students in Indonesia related to the metaverse of the experimental results that have been previously carried out. With the form of multiple choice and free text answers as well as the use of nominal and interval scales, respondents can choose to answer that suits their opinion on the statement given. The metaverse simulation and data collection from this questionnaire took about two weeks, with the simulation sessions divided into three batches:

1. September 8th, 2022 (8 respondents)
2. September 12th, 2022 (12 respondents)
3. September 18th, 2022 (11 respondents)

Table 2 shows the questions and their indicators asked in the distributed questionnaire that has been filled out by the respondents:

Table 2: Measurement items table

Indicators	Measurement items	Answers
Perceived Ease of use (PE) (x_1)	PE1: Metaverse technology is easy to learn	Likert scale (4-points)
	PE2: Metaverse technology is simple to grasp	Likert scale (4-points)
	PE3: Metaverse technology is easy to use	Likert scale (4-points)
	PE4: Getting access to metaverse technology is easy	Likert scale (4-points)
	PE5: It is simple to obtain information and instructions for using metaverse technology	Likert scale (4-points)
	PE6: I believe that metaverse technology will make it easier for me to perform a task or carry out daily activities	Likert scale (4-points)
	PE7: I believe that metaverse technology can improve my daily performance and productivity	Likert scale (4-points)
Perceived Usefulness (PU) (x_2)	PU1: Metaverse makes me feel a new experience on Interacting virtually	a Likert scale (4-points)
	PU2: Metaverse can make it easier for me to socialize and interact with people virtually	Likert scale (4-points)
	PU3: Metaverse could be a channel for my hobby to play games in the virtual world	the Likert scale (4-points)
	PU4. Metaverse can be used as a more interactive alternative to online meeting conferences	Likert scale (4-points)
	PU5: Meeting foreigners from all over the world makes the metaverse is a fun place to learn foreign languages	Likert scale (4-points)
	PU6: Metaverse would be an interesting virtual entertainment place for me	Likert scale (4-points)
Intention to Use (IU) (y_1)	IU1: After understanding about metaverse, I am interested in using the metaverse	Likert scale (4-points)
	IU2: Reasons for being interested/not interested in using metaverse	Free text
	IU3: In which aspects of use are you interested in using metaverse?	Checkbox options: • Education • Game • Art • Business/office work others
	IU4: I hope metaverse can be implemented thoroughly in my country	Likert scale (4-points)
	IU5. I prefer to use metaverse in my activities compared to activities that are carried out face-to-face/online like now	Likert scale (4-points)

Table 3: Respondent demographics

	Variables	Frequency	Percentage
Gender	Male	15	48.4
	Female	16	51.6
Age category	18-22	31	100.0
Domicile	Jakarta	23	74.2
	West java	2	6.5
	Central java	1	3.2
	Banten	1	3.2
	Riau	2	6.5
	South Sulawesi	1	3.2
	South Sumatera	1	3.2

Sampling Technique

Purposive sampling is a method used in this study. The term "purposeful sampling" describes a group of non-probability sampling techniques where units are chosen because they have the qualities that you need in your sample. Therefore, in purposive sampling, units are chosen "on purpose". We used this method to find the right respondents to participate who already meet the pre-defined criteria. A total of (31) respondents participated in this study. The respondent demographics are given in Table 3.

Based on the demographic profiles of respondents who completed the questionnaire, as depicted in Table 3, we can see that all the respondents are between the ages of 18 and 22 (university students) and live in Indonesia's major cities, which is in accordance with the respondents' previously determined criteria. The gender gap between men and women is also not too far away, so we can see perspectives from both sides equally.

Results and Discussion

This section will explain the outcomes of the simulation and the questionnaire responses.

Metaverse Environment Simulation

As we know from the previous section, we are using Mozilla Hubs and have set up a virtual room for respondents to explore. Our simulation room is divided into two rooms, the first one is called the art gallery and the second is called the meeting room, as illustrated in Figs. 4-5.

We made both rooms as interactive as possible so that respondents can gain the best experience of using the metaverse. Fig. 5, there are several functions that can be utilized by the users in the form of buttons at the bottom and at the right top corner of the screen, where they also become the use cases that we conduct in our metaverse environment room. We highlighted the buttons with numbers. Each number represents each function such as (1) Customizing the avatar, (2) Walking in the virtual environment, (3) Chatting with other avatars, (4) Texting with other avatars, (5) Interacting with objects, (6) Adding a variety of objects, (7) Draw in 3D spaces, (8) Make reaction, (9) Share screen and (10) Move from one to another room.

In the first room, we encourage the respondents to explore these features as much as possible, because the design of the first room is also very interactive with many objects that we have added. Following that, respondents will enter the second room. They will be given time in the second room to watch a short video about the metaverse before being directed to open a questionnaire via a link provided in the second room. In this second room, the respondents also exchange a lot of stories about their experiences using the metaverse in the first room.

Below is the documentation of the metaverse environment simulation. Figure 6 shows the documentation of the simulation process.

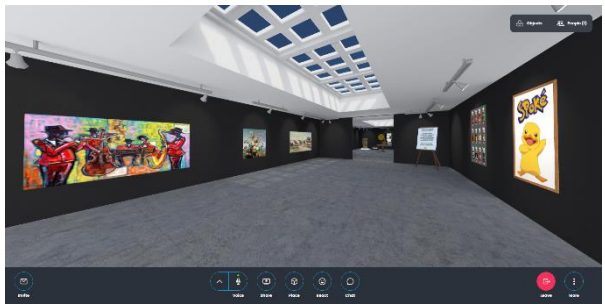

Fig. 4: Room 1: Art gallery

Fig. 5: Room 2: Meeting room

Fig. 6: Metaverse environment simulation documentation

Questionnaire Results

Before the respondents leave the metaverse room, they fill out the questionnaire that we have provided to share their thoughts regarding the metaverse based on their experience. From the results of all the questionnaire responses that we got, we then ran it and analyzed it further using the smart PLS 4.0 software. With a graphical user interface, Smart PLS is a program that uses the partial least squares path modeling technique to model structural equations based on variance. It combines cutting-edge techniques with a simple and clear graphical user interface. The reason for using this program is that the research is more focused on predicting and explaining latent variables than on testing a single theory or many samples. For studies on technology adoption that concentrate on predictive modeling, PLS-SEM is much more suitable (Venkatesh and Bala, 2008; Venkatesh and Davis, 2000). In contrast to CB-SEM (covariance based), the PLS approach is a better fit for incremental studies, that is, developing new metrics and structural pathways, particularly in information systems research (Hair *et al*., 2011). Since this study involved building new structural paths, PLS-SEM was an appropriate match for the task.

Three sets of relationships make up the path analysis model for all latent variables in PLS: (1) The outer model; (2) The inner models; and (3) The weight relations.

Reflective outer model (measurement model); The relationship between latent variables and indicators is described by the outer model. Blocks with reflective indicators have the following equation for the outer reflective model:

$$x = \lambda x\xi + \delta \tag{1}$$

$$y = \lambda y\ \eta + \varepsilon \tag{2}$$

where, exogenous and endogenous latent variables' respective indicators are x and y. In opposition, λx and λy are loading matrices that describe simple regression coefficients connecting latent variables with their indicators, while η describes vectors of endogenous (dependent) latent variables and ξ is vectors of residual exogenous variables, measured by δ and ε as measurement errors.

The inner model (structural model); based on theory, the inner model specifies how the latent variables are related. The equation model looks like this:

$$\eta j = \sum i\beta ji\ \eta i + \sum i\gamma jb\ \xi b + \zeta j \tag{3}$$

where, ζj is the residual variable vector, βji, and γjb are the path coefficients connecting endogenous and exogenous latent predictors along the range of index i and b.

Weight relation; The outer and inner models provide specifications that are followed in the estimation of the PLS algorithm. The case values for each latent variable estimated in PLS are:

$$\xi b = \sum kb\ Wkb\ Xkb \tag{4}$$

$$\eta i = \sum kiWki\ Xki \tag{5}$$

where, Wkb and Wki are the weights of k used to estimate the latent variables ξb and ηi. Latent variable estimation is a linear aggregation of indicators, where the outer and inner models specify the PLS estimation procedure to be used to determine the weight values of the indicators, where η is a vector of endogenous (dependent) latent variables and ξ is a vector of exogenous (independent) latent variables. Latent variables and indicators are assumed to be on a scale with unit variance and zero means with standardized values in order to eliminate constants from the model without sacrificing generalizability.

The collected ordinal data were analyzed using the Partial Least Square Structural Equation Modeling (PLS-SEM) technique as a non-parametric second-generation multivariate analysis and continued with performing statistics analysis, validity, reliability, and hypothesis testing. In the next section, we will discuss the results of each analysis.

Statistics Analysis

Below is a statistical table of the results obtained for each indicator.

According to the descriptive statistics on the indicators shown in Table 4, the mean of each indicator ranges from (3.217-3.543) and the standard deviation ranges from (0.664-0.756). This average value is derived from answer choices that vary greatly and some even contradict one another, as evidenced by the minimum (1) and maximum (4) values for all indicators. The Likert scale questionnaire was scored from 1 (strongly disagree) to 4 (strongly agree), with most respondents agreeing or strongly agreeing.

The maximum mean value was for the metaverse's perceived usefulness (x_2) (3.543) and the minimum was for the metaverse's perceived ease of use (x_1) (3.217). We can conclude from the respondents' experiences that they are aware and understand that the prospect of using metaverse technology is very large, with features that are useful to them. However, the metaverse technology's level of ease of use still needs to be improved. In terms of intention to use (y_1) metaverse, there are both pros and cons, with the majority responding that they were very interested or interested, but there were also those who responded that they were very disinterested. To see the detailed results, Table 5 shows statistical results for each indicator.

Table 4: Descriptive statistics for three key elements

	Mean	Min	Max	Std. dev	Kurtosis	Skewness
Ease of use	3.217	1	4	0.687	-0.321	-0.479
Usefulness	3.543	1	4	0.664	-2.617	-1.524
Intention to use	3.226	1	4	0.756	-0.471	-0.587

Table 5: Descriptive Statistics for Indicators

	Mean	Median	Min	Max
EP1	3.452	3	2	4
EP2	3.452	3	2	4
EP3	3.387	3	2	4
EP4	3.161	3	2	4
EP5	3.065	3	1	4
EP6	3.032	3	1	4
EP7	2.968	3	1	4
IU1	3.355	3	2	4
IU4	3.258	3	2	4
IU5	3.065	3	1	4
UP1	3.774	4	2	4
UP2	3.484	4	2	4
UP3	3.290	4	1	4
UP4	3.516	4	1	4
UP5	3.548	4	2	4
UP6	3.645	4	1	4

Table 6: Reasons for being interested/not interested in using Metaverse

Intention	Answer	Total answer
Interest to use metaverse	New experiences	15
	Easy to use	8
	Sense of urgency to adapt	3
Not interested to use metaverse	Inadequate infrastructure	3
	Already comfortable with the current condition	2

From the table, we can see further, which indicators still have low values for our next focus on improvement. On a scale of 1-4, the results above can actually be said to be quite good since there is only 1 indicator that has a value below 3, which is EP7 (I believe that metaverse technology can improve my daily performance and productivity). This is triggered by the limited access and information to use metaverse which can also be seen in the low results of the EP4, EP5, and EP6 indicators, so respondents doubt if metaverse can increase their productivity.

Moreover, in the questionnaire, we also asked why they were interested or not interested in using metaverse (IU2: Reasons for being interested/not interested in using metaverse). Let's see Table 6 for their answers.

Most respondents said they were interested in using Metaverse since it provided them with new experiences they had never had before. They can interact with others or objects in the virtual world using the metaverse. They also believe that using the metaverse is simple to learn and practice. Some also believe that the metaverse will become very big in the future with broad prospects in various aspects, so they need to be able to adapt to this technological development.

However, if we look at the bottom of the list of people who aren't interested in using the metaverse, we also can find some interesting perspectives. They discovered that the current infrastructure is insufficient to support metaverse usage, so access to the metaverse itself will be difficult as we already mentioned in the previous paragraph too. This causes them to be discouraged from using Metaverse soon. There are also some who are already comfortable with the current state of technology, so there is no need to use Metaverse.

However, when it comes to the metaverse's usefulness, of course, many aspects can be explored using the metaverse. We can also go over the various theories and literature reviews from the previous section to review the implication that can be made using metaverse. Figure 7 depicts the respondents' perspectives on the aspects of the metaverse that they are interested in.

The majority of respondents answered games, followed by education/learning, office/business work, artwork/entertainment, and social media.

Validity and Reliability Testing

A study's instruments or measuring tools must have reliable validity and reliability. The measuring instrument used becomes a crucial element in research since it will almost surely affect the study's outcomes.

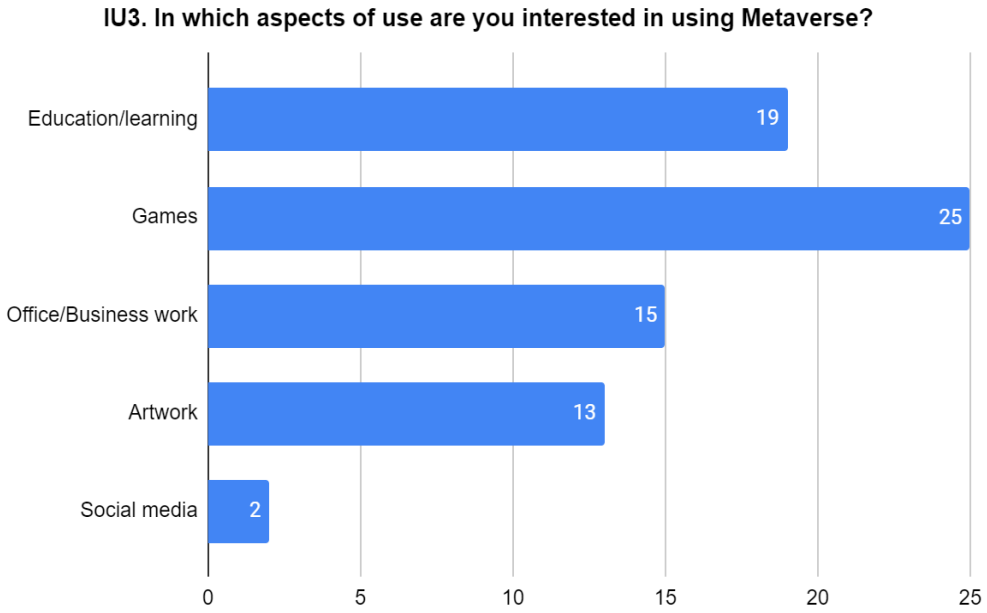

Fig. 7: In which aspects of use are the respondents interested in using metaverse

The questionnaire used as a research instrument is put to the validity test to see if it is reliable. The instrument's stability or consistency of test results is evaluated using reliability testing. A test's suitability for a given circumstance can be determined through validity testing and the reliability of test results can be determined through reliability testing. Unless we are confident that the test is reliable, we cannot infer any meaningful conclusions from the results. A test might not be valid even if it is reliable.

Thus, we will try to present the results of the validity and reliability testing below.

Correlation Coefficient

The first variable that we use for validation is the correlation coefficient value. If the correlation coefficient generated by each indicator is greater than 0.50, the indicator is said to be valid as a research instrument. On the other hand, if the value is less than 0.50, the indicator will be not valid and must be excluded from the research instruments. The validity testing results are shown in Table 7.

According to the data in the table, PE3 (0.817) has the highest correlation value for perceived ease of use and PE1 has the lowest value (0.541), but PE1 still has a reliable correlation score. Meanwhile, the highest correlation value of Intention to Use comes from IU1 (0.794) and the lowest value comes from IU5 (0.711). In the Perceived Usefulness, PU4 (0.855) gives the highest correlation score among all indicators listed. Although it gets the lowest score, PU5 (0.655) still has a valid correlation value for Perceived Usefulness. Overall, it can be stated that all measurement items are valid (>0.50) and correlated with each other. Thus, it all can be used in this study.

Cronbach's Alpha

Cronbach's alpha is used in the reliability test for more than two alternative answers and its value is compared to the minimum acceptable reliability coefficient value. The following are the test criteria:

- A reliable research tool has a Cronbach's alpha value of greater than 0.6
- The research instrument is unreliable if Cronbach's alpha value is less than 0.6

Table 8 shows the result for Cronbach's alpha value of each element.

From the results of the Cronbach alpha number obtained, we can see that the three key elements have a Cronbach's alpha value that is greater than 0.6 and can be stated to have a good level of reliability. So, it all can be used as the basis for accurate decision-making in this study.

Rho_A

One of the "quality criteria" for validity and reliability is Rho_A. The rho_A value is shown because it is a useful tool for measuring reliability and a reliable indicator of reliability. For a good indication, Rho_A should have a value of 0.70 or higher.

Table 9, The value of perceived ease of use (x_1) and perceived usefulness (x_2) is above 0.70 which means that it is a good indication, while the value of intention to use (y_1) is 0.644, but it is still acceptable since the value is not too far from 0.70.

Table 7: Correlation between factors

	Perceived ease of use	Intention to use	Perceived usefulness
PE1	0.541	-	-
PE2	0.665	-	-
PE3	0.817	-	-
PE4	0.758	-	-
PE5	0.705	-	-
PE6	0.553	-	-
PE7	0.691	-	-
IU1	-	0.794	-
IU4	-	0.765	-
IU5	-	0.711	-
PU1	-	-	0.793
PU2	-	-	0.829
PU3	-	-	0.707
PU4	-	-	0.855
PU5	-	-	0.655
PU6	-	-	0.808

Table 8: Cronbach's alpha

	Cronbach's alpha
Perceived ease of use	0.802
Intention to use	0.632
Perceived usefulness	0.868

Table 9: Rho_A

	Composite reliability (Rho_A)
Perceived ease of use	0.809
Intention to use	0.644
Perceived usefulness	0.882

Table 10: Average Variance Extracted (AVE)

	Average Variance Extracted (AVE)
Perceived ease of use	0.463
Intention to use	0.574
Perceived usefulness	0.605

Table 11: Path coefficient

Hypothesis	Details	Path coefficient	T-statistics	p-value
$Hypothesis_1$	PE → PU	0.671	3.298	0.000
$Hypothesis_2$	PE → IU	0.514	7.571	0.001
$Hypothesis_3$	PU → IU	0.353	1.921	0.055

Average Variance Extracted (AVE)

The output AVE value must exceed 0.50 in order to meet the Fornell Larcker criteria. When the AVE value is greater than 0.50, the outcomes are considered to be satisfactory. An AVE of less than 0.50 indicates that the constructs' variance is not fully explained by the indicators.

Table 10 shows the Average Variance Extracted (AVE) value of each indicator.

The AVE of Intention to use (y_1) and perceived usefulness (x_2) is above 0.50 this construct can account for at least 50% of the item variance. Meanwhile, the AVE of perceived ease of use (x_1) is below 0.50. This value is also not too much different from the standard average, so it is considered acceptable.

Hypothesis Testing

This study employs the path analysis method for testing hypotheses. Multiple regression analysis is expanded upon by path analysis. Table 11 shows the result of the path analysis results.

Table 11, $Hypothesis_1$, and $Hypothesis_2$ were accepted with a p-value of 0 and 0.001. Only one hypothesis ($Hypothesis_3$) was rejected with a p-value of 0.055. Thus, as a result, it concluded that all existing hypotheses can be proven true, except $Hypothesis_3$. The metaverse's usefulness didn't affect university students in Indonesia's intention to use (y_1) the metaverse. Meanwhile, if we can increase the metaverse's perceived ease of use (x_1), we can greatly increase the level of perceived usefulness (x_2) and university students' intention to use (y_1) metaverse.

If the level of intention to use (y_1) metaverse itself is already high, of course, the prospects for metaverse to be widely used in Indonesia will be even greater, which will also affect the implications of using metaverse with its usefulness. If these two things can be achieved, certainly, the level of sustainability from the use of the metaverse itself in Indonesia will also be high.

This, of course, must be supported by security and privacy that is safe in its use. In the case of Mozilla Hubs, according to their security guidelines, all database data and backups are encrypted at rest for whatever data they do capture. Furthermore, they don't save unprocessed emails in our database. Also, when a security flaw is discovered (in their software or software from a third party), they may quickly update all stacks. They automatically update packages for security upgrades and update their version on a monthly frequency. They receive the load balancing and DDoS defense features of AWS's network architecture. Mozilla Hubs also has a secure privacy policy with clear guidelines for account information, avatar data, voice data, etc. According to Mozilla Hubs' standard privacy policies, anything communicated in a room is only accessible to

those users who are connected to that room. Also, they will never engage in deep surveillance or user monitoring, especially when using VR data sources like gaze tracking. They'll keep limiting the amount of personal information they gather and when they do, they'll invest in technologies that protect privacy, including differential privacy.

With trusted security and privacy, of course, we can use Metaverse in various fields. The applicability of the metaverse itself is quite extensive. Starting with the field of education, where virtual environments can be used for teaching and learning activities. The virtual world of entertainment includes anything from virtual concerts and virtual games to virtual supermarkets where consumers and sellers may engage in unique interactions with one another. Even to religious activities such as weekly ceremonies in the virtual environment. But again, we need to increase the level of perceived ease of use (x_1) to achieve all of that. Including the preparation of adequate infrastructures and facilities to implement the metaverse, including mobile devices (smartphones, tablets, laptops) or PCs, cloud databases, and internet connections. Wearable technology should be included if users would like to enhance their experiences, such as a VR headset and VR haptic gloves. These are all needed to provide the best metaverse experience and be as interactive as possible.

Conclusion

In this era, technology is very sophisticated and many industries have turned to technology or implemented technology in their business, both developed and developing countries such as Indonesia. With the presence of the metaverse which has very broad prospects, the competition is getting tougher. These reasons led us to conduct this research with the aim of better understanding the opportunities for metaverse implementation in Indonesia from the perspective of the students as an agent of change. This kind of research can of course also be carried out, especially in other developing countries. So that later the results of this research can be compared with the results of research that we have done in Indonesia, to support the development and sustainability of metaverse implementation in various fields.

In order to enhance the power of research, future study is also suggested with more advanced technology, such as Virtual Reality (VR) or Augmented Reality (AR) technology to get a more real experimental simulation. Using these additional technologies can certainly enrich the respondent's experience in using the metaverse technology and of course, can strengthen the data and research results provided.

From the data that we got, we conclude that the enthusiasm of the Indonesian people is quite high for implementing this technology. The main reason that causes this situation is that the metaverse will bring a whole new experience for them that they never met before and this technology is fairly easy to use.

However, we also found out that several of them still can't accept the metaverse to be implemented. It is caused by access that is still difficult to obtain. The information and instructions for using metaverse technology are also still difficult to get. Although it seems that Indonesian university students have very high enthusiasm for the implementation of this technology, as we all know, making technological changes is not as easy as imagined. Especially when people are already used to using old technology, it may take some time to adjust to the new technology.

Indeed, the metaverse has a big opportunity with its features. Based on the results of our research, we assess that if we can increase the level of ease of use (x_1) of metaverse to make it more accessible and affordable, we can improve the prospects, implication, and sustainability of metaverse in Indonesia going forward. Some of the aspects that we can focus on right now are as follows:

- Introducing the metaverse to the public (uses and benefits)
- Easier access to use metaverse
- Provide clear and simple instructions for use
- Use metaverse technology in a variety of key areas, including business, education, and others

This is considered the most appropriate choice that we can implement now to increase the prospects for using metaverse, great implications in various fields, and the sustainability of this technology in the future.

Acknowledgment

This research was supported by the Bina Nusantara University. I am thankful to research and technology transfer Office of BINUS University provided expertise that greatly assisted the research. I am also immensely grateful for the comments given by the reviewers on earlier versions of the manuscript, although any errors are my own and should not tarnish the reputations of these esteemed professionals.

Author's Contributions

Yohannes Kurniawan: Designed the research plan and organized the study. Coordinated the work.

Natasha Liberty and Samuel Caesar: Participated in all experiments, coordinated the data-analysis and contributed to the written of the manuscript. Designed the prototype.

Calvin Winardi: Participated in data collection and contributed to the written of the manuscript.

Norizan Anwar: Participated in reviewed, validate the designed and prototype designed.

Ethics

Authors confirm that this manuscript has not been published elsewhere and that no ethical issues are involved.

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