

## A Study on Metaverse Hype for Sustainable Growth

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### **Abstract**

*Metaverse is an immersive 3D virtual environment, a true virtual artificial community in which avatars act as the user's alter ego and interact with each other. If we do not manage the hype for the metaverse, which has recently been receiving a surge in interest, the metaverse will fail to cross the chasm. In this study, to provide stakeholders with insights for the successful introduction and growth of the 3D immersive next-generation virtual world, metaverse, we analyzed user-side interest, media-side interest, and research-side interest. For this purpose, in this study, search traffic, news frequency and topic, and research article frequency and topic were analyzed. The methodology and results of this study are expected to provide insight for the stable success of metaverse transformation and the coexistence of the real world and the virtual world through hyper-connection and hyper-convergence.*

**Keywords:** *Metaverse, Hype, Technology adoption lifecycle, Chasm, Search traffic, Structural Topic Modeling*

### **1. Introduction**

Almost every 10 years, ICT platforms have undergone a paradigm shift. The paradigm of PC communication in the 1990s, the web in the 2000s, and mobile in the 2010s has changed dramatically. The keyword of the paradigm of the 2020s is “metaverse”. Metaverse is a concept derived from the novel “Snow Crash” published by Neal Stephenson in 1992, and represents a three-dimensional virtual world in which ‘Meta’ means virtual and abstract, and ‘verse’ means universe. The metaverse is a virtual construct in which participants interact with themselves through avatars created by themselves to participate or reproduce real life in a virtual metaphorical environment without temporal and spatial constraints [1]. The concept of a metaverse or virtual world goes beyond commerce and entertainment to create a truly virtual artificial community in which digital users or avatars become ourselves and interact with each other socially and economically with immersive three-dimensional virtual and multi-user online environments.

Recently, with the development of smartphones and VR devices, interaction between various real and virtual objects is possible, and a new world of metaverse is spreading rapidly. The status of the metaverse is growing every moment to the extent that BTS, who leads K-pop around the world, introduces their new song “Dynamite” for the first time in a metaverse game called “Fortnite”.

Now, the real world is being connected with the virtual world through metaverse transformations.

Expectations for the metaverse have become hype and are rising. If the technology, content, and various surrounding factors related to the metaverse do not converge and interact, then the hype of the metaverse will fail to overcome the chasm and fall [2, 3]. This study aims to provide insight for the sustainable growth of the metaverse by identifying and analyzing the hype for the metaverse. To this end, this study analyzes search traffic to analyze attention of user-side. And it collects data from news media that serve as a communication channel related to innovative technologies [4, 5], and uses topic modeling, a machine learning-based big data analysis method, to classify news topics and perform content analysis. Finally, research topics related to the metaverse from perspective of researchers are classified and content analysis is performed.

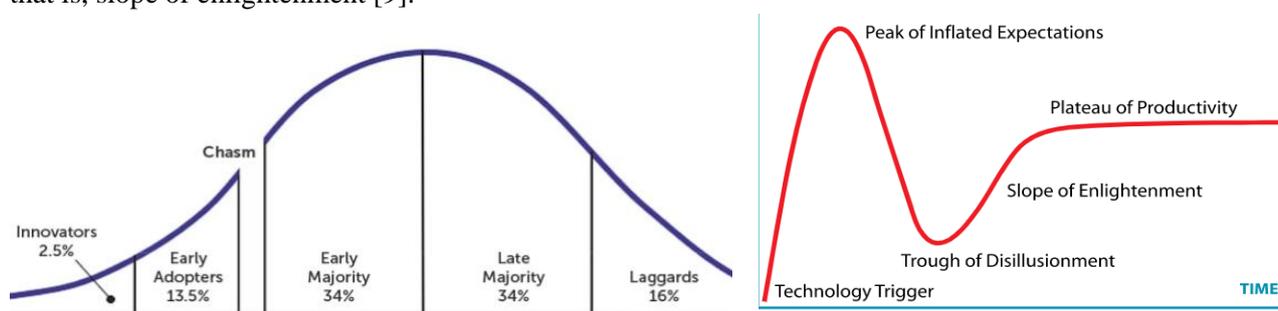
## 2. Related work

### 2.1 Technology adoption lifecycle model, Chasm and Hype cycle model

Innovative new technologies often form a lifecycle through the process of social acceptance as well as the efforts of producers. Therefore, innovative technology should analyze the acceptance process from the user's point of view and understand the development process [6]. Rogers classified users into five categories in the technology adoption lifecycle model: innovators, early adopters, early majority, late majority, and laggards [7].

Moore noted that the stagnant phenomenon in the diffusion of innovative technologies often occurs in Rogers' innovative technology adoption life cycle, and defined this stagnant period as "chasm" [8]. A stagnant phenomenon, or chasm, of diffusion occurs between early adopters and the early majority of the technology adoption life cycle, as shown in Figure 1.

Gartner's model of the hype cycle is a model of innovation acceptance patterns that accounts for the gap between consumer interest and acceptance decisions in the adoption process of innovative technologies [9]. As shown in Figure 1 on the right, expectations for innovative technology rise sharply, that is, peak of inflated expectations, and then disappoint, that is, through of disillusionment, due to inconsistency in expectations according to reality perception, and then after a certain period of time, expectations rise again, that is, slope of enlightenment [9].



**Figure 1. The chasm theory based on the technology adoption lifecycle model, and the hyper cycle model [8, 9]**

For innovative technologies to continue to grow and not end as fads, they must recover after a hype trough in early adopters. And, early adopters should cross the chasm and diffused to the early majority. To this end, it is necessary to identify the characteristics and situational factors of the adopters, and to develop a diffusion strategy [3, 5, 9].

## 2.2 VR/AR/MR and Metaverse

Since the metaverse is a virtual environment in which participants interact through digital objects or avatars [1], it is a paradigm in which technologies and contents of augmented reality (AR), virtual reality (VR), and mixed reality (MR) have expanded and evolved into the virtual world. While VR brings objects into the non-real world and allows you to immerse yourself in them, AR adds information to the real world. And the case where both AR and VR interaction options are found inside the object corresponds to MR [10].

## 3. Research method and results

### 3.1 Research framework

The purpose of this study is to analyze the hype in the metaverse for the success of the diffusion and sustainable growth of the metaverse. To this end, this study analyze the attention of users, the attention of media, and the attention of researchers. The research framework of this study is shown in Table 1.

**Table 1. Research framework**

Research process	User-side	Media-side	Researcher-side
Data collection	Data collection of search on metaverse - Google Trends	Data collection of news on metaverse - BIGKinds	Data collection of research on metaverse - Scopus
Frequency analysis	Frequency analysis of search traffic on metaverse	Frequency analysis of news on metaverse	Frequency analysis of research on metaverse
Topic analysis	Search phrase analysis for metaverse - Google Trends	Topic analysis of news on metaverse - Structural Topic Modeling	Topic analysis of research on metaverse - Structural Topic Modeling
Discussion	Discussion and conclusion		

### 3.2 Analysis of search traffic on metaverse

Since search traffic is related to the interest level of potential adopters [11], it serves as a pre-analysis tool for users' interest level in the metaverse. In this study, we analyzed search traffic on Google using Google trends. As shown in Figure 2, this study compared the traffic searched for '메타버스' or 'metaverse' in Korea with the traffic searched for 'metaverse' all over the world except Korea for the past 5 years. Korea had little search traffic until the third quarter of 2020. Then, from the fourth quarter of 2020 to the present, it has risen sharply.

For further analysis of the search, search phrases searched together were investigated. Table 2 compares search query phrases that have recently increased rapidly. Although there was a slight difference in ranking, the query phrases were almost the same. Users were able to confirm that interest in metaverse-related stocks, metaverse coin (virtual currency), metaverse games, and metaverse platform is increasing recently. The metaverse alliance, which ranks 7th in terms of search query terms in Korea, was formed in May 2021, centered on domestic metaverse-related industries and associations.

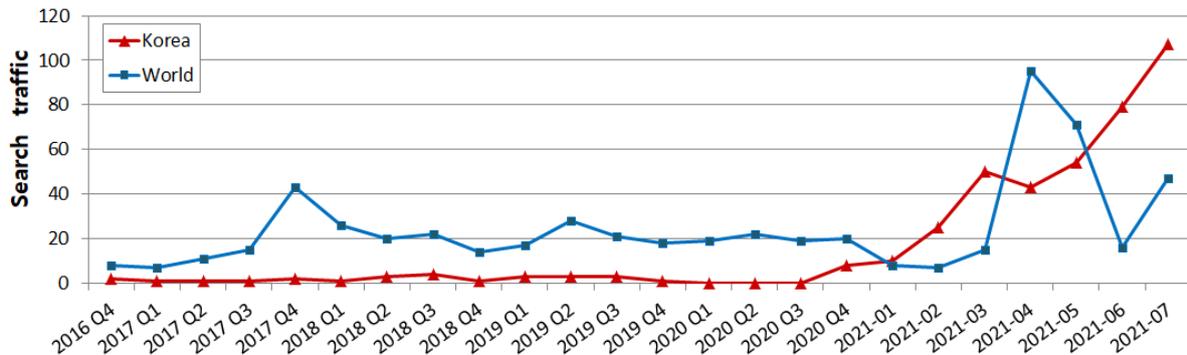


Figure 2. Comparison of search traffic trends in Korea versus the world (through 2020 quarterly data are shown and monthly data are shown for 2021)

Table 2. Comparison of search query phrases in Korea versus the world

Ranking	search query phrases in the World	search query phrases in Korea
1	Roblox	메타버스 관련주 (Metaverse related stocks)
2	Metaverse champions	메타버스 코인 (Metaverse coin)
3	Etp metaverse	메타버스 게임 (Metaverse game)
4	Metaverse mod squad	메타버스 주식 (Metaverse stock)
5	Metaverse persona 5	메타버스 플랫폼 (Metaverse platform)
6	Metaverse games	로블록스 (Roblox)
7	Metaverse coin	메타버스 얼라이언스 (Metaverse alliance)

### 3.3 Analysis of news on metaverse

**Data collection of news on metaverse.** This study analyzes news data that mentions metaverse in news media that serve as communication channels related to innovative technologies [4, 5]. For this purpose, 'BIGKinds', a domestic news archive and a big data analysis service, was used. We searched and collected news up to July 31, 2021 using the search keyword 'metaverse' in the 'IT\_science' category. The total news collected was 3,083 cases.

**Frequency analysis of news on metaverse.** Metaverse first appeared in the domestic news on March 8, 1996. It was news introducing Neal Stephenson's novel "Snow Crash". From 1996 to 2019, the frequency of news mentioning the metaverse averaged 2.1 per year. In 2020, when COVID-19 occurred, there were 60 cases, and in 2021 (through July 31) there were 1,940 cases. Figure 3 shows a weekly graph of the number of news articles from the fourth quarter of 2020, when the frequency of news begins to skyrocket, to July 31, 2021. Through this, we could confirm that the present is the rising period of the metaverse hype. Also, due to the situational factor of COVID-19, hype is rising surprisingly.

**Topic analysis of news on metaverse.** To analyze the metaverse-related topics discussed in the news, keywords were extracted based on weights from the collected news data and topic analysis was performed. The weight is obtained using the topicrank algorithm, which creates a dynamically interacting semantic network by performing simultaneous analysis and word clustering on the search results based on the input query. This study used Structure Topic Model (STM) for topic analysis. STM is a topic model algorithm that improves the shortcomings of the most widely known Latent Dirichlet Allocation (LDA) [12, 13]. It is possible to classify topics more accurately and estimate correlations between topics by additionally utilizing

metadata about documents [14, 15]. To find the number of topics, which are hyper parameters of STM, held-out likelihood and semantic coherence were calculated [16]. As a result, the number of topics was set to 6 and STM was performed. Table 3 (a) summarizes the topic analysis results.

*Topic 1. Metaverse entertainment:* These were about entertainment such as concerts in metaverse. The girl group "aespa", which SM Entertainment debuted in November 2020, communicates through the 'digital world', an intermediate world between real and virtual, between artist members in the 'real world' and avatar members in the 'virtual world', and has a storytelling that sympathizes and grows. It was news about future entertainment on the metaverse, such as BTS and Black Pink, the representative K-pop artists, releasing new songs and holding fan signings in the metaverse world.

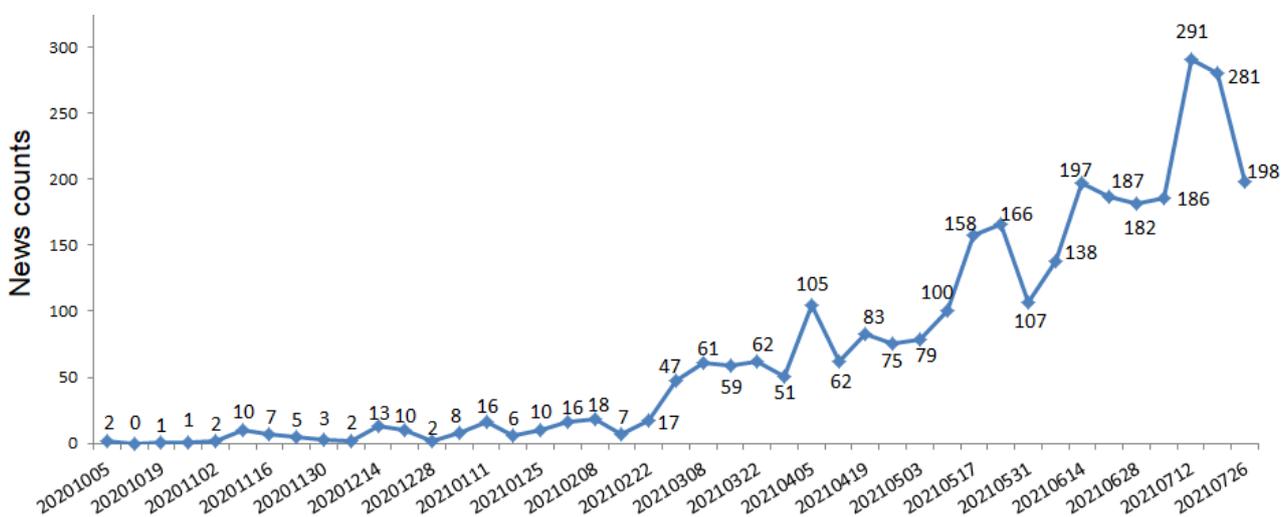
*Topic 2. Virtual assets:* Metaverse enables economic activities in the virtual world. These were Non-Fungible Token (NFT), blockchain, Ethereum, Bitcoin, cryptocurrency, digital assets and virtual assets, that is, digital assets in the virtual world.

*Topic 3. Non-face-to-face culture technology in the time of COVID-19 :* The metaverse was mentioned as a cultural and technological environment that appeared characteristically in the online non-face-to-face era due to the COVID-19 pandemic.

*Topic 4. Artificial Intelligence and metaverse:* These were about the next-generation virtual world using artificial intelligence. For example, users can use artificial intelligence to have their avatars learn professional skills and perform professional work in a virtual world.

*Topic 5. Metaverse service:* The news corresponding to this was the contents of the metaverse service using the realistic contents of AR/VR/MR, for example, virtual experience hall, dementia prevention physical education class, children's sports day, and virtual factory (digital twin). And it was about financial services in a virtual environment that combines metaverse and blockchain.

*Topic 6. Metaverse, a new growth engine:* The corresponding news was about the metaverse ecosystem, the metaverse environment (network, cloud, smartphone, headset), the acquisition of a metaverse developer, and investment attraction.



**Figure 3. Weekly graph of the number of news articles mentioning metaverse from Q4 2020 to July 31, 2021.**

### 3.4 Analysis of research on metaverse

**Data collection of research on metaverse.** In order to analyze researchers' interest in metaverse, this study collected research papers (articles from journals and conferences) using the keyword “metaverse” from Scopus, an academic database. The collected data were 118 cases from 1995, when “metaverse” first appeared in the paper, to the present, that is, July 31, 2021.

**Frequency analysis of research on metaverse.** The article containing metaverse keyword first appeared in 1995. However, by July 2021, only 118 papers had been collected. Considering that “metaverse” is used in a similar sense to “virtual world” [1], we compared the frequency of articles on “metaverse” and “virtual world” as shown in Figure 4. Although the term “metaverse” appears frequently in the news recently, researchers have already used the term “virtual world” a lot since the mid-1990s. Research on “virtual world” has surged since 2005, peaking in 2010, decreasing until 2017, rising in 2019, and declining slightly again.

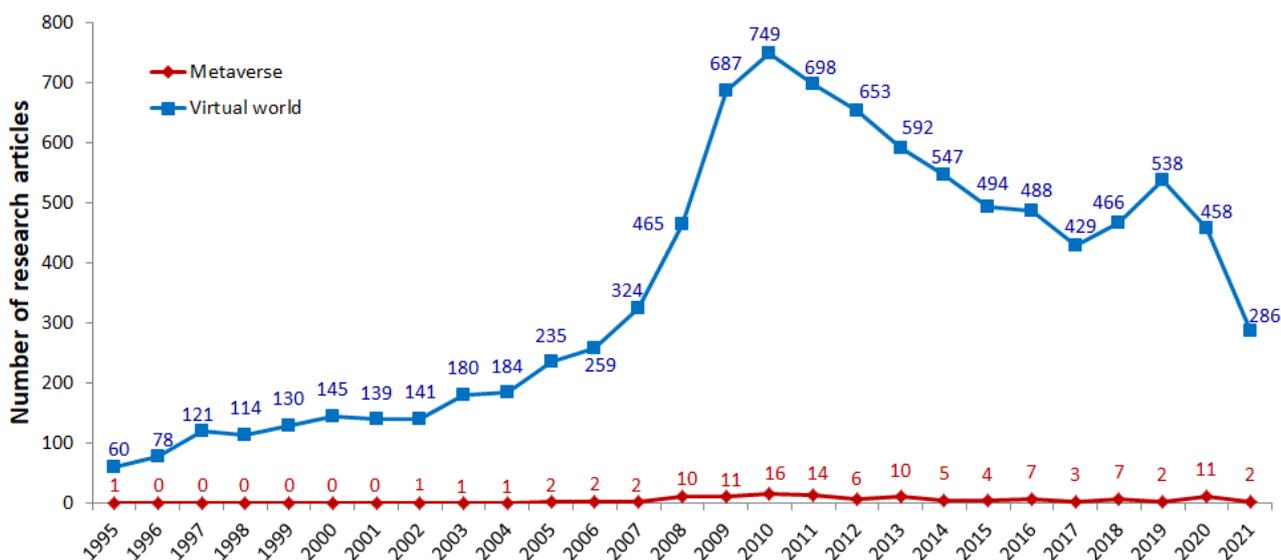


Figure 4. Annual frequency of research articles on 'metaverse' and 'virtual world' in Scopus

**Topic analysis of research on metaverse.** In this study, STM-based topic analysis was performed on the abstracts of the collected articles to identify the interests of researchers [15-17]. Based on the results of calculating held-out likelihood and semantic coherence, we set the number of topics to 6. Table 3 (b) summarizes the topic analysis results.

*Topic 1. Education in metaverse:* These were studies on the use of metaverse for education. These were the methods and effects of applying the material augmented reality of the metaverse to education [18], language and cultural education using a 3D virtual environment [19], an education strategy considering the dual identity between the student and the avatar [20], and the implementation of a learning platform.

*Topic 2. Platform for interaction:* This was a study on using the metaverse (virtual world) as a platform and digital communication tool for communication and interaction [21].

*Topic 3. Metaverse-commerce:* These were studies on the service quality of sales, purchase, and retail business in Metaverse [22, 23].

*Topic 4. Space for cultural/arts/games:* These were studies for an immersive, three-dimensional, fully interactive metaverse to replace web portals and become spaces of culture, art, and games [24].

*Topic 5. Syncretistic worldview:* These were the topics that the metaverse should understand and implement

the metaphysical multi-layered worldview and deterritorialization through mixed reality interaction [25].

*Topic 6. Realization of metaverse world:* These were about realization of 3D virtual world and avatar. These were studies on the typography design mechanism inside the 3D virtual world known as the metaverse, and the re-creation of buildings and places where avatars live [26].

**Table 3. STM-based topic analysis results**

(a) Korean News topics		(b) Research topics in Scopus
Topic label (Topic proportions)	Topic Ranking	Topic label (Topic proportions)
Entertainment in metaverse (20.3%)	1	Education in metaverse (24.5%)
Virtual assets (18.2%)	2	Platform for interaction (18.7%)
Non-face-to-face culture technology in the time of COVID-19 (17.9%)	3	Metaverse-commerce (17.5%)
AI and metaverse (15.8%)	4	Space for cultural/arts/games (14.8%)
Metaverse service (14.1%)	5	Syncretistic worldview (12.6%)
New growth engine metaverse (13.7%)	6	Realization of metaverse world (11.9%)

#### 4. Discussion and Conclusion

Innovative technologies and services either succeed or fail depending on the user's hype flow. Therefore, it is important to manage and respond to hype. In this study, the attention of users, media, and researchers were analyzed in order to provide users with insight into how metaverse, a 3D immersive next-generation virtual world, can successfully adopt and grow continuously.

In this study, search traffic was analyzed to understand the user-side attention. Search traffic from all over the world, except Korea, surged in the fourth quarter of 2017 and continued to be large, surged in April 2021, declined sharply in June, and then increased again. On the other hand, search traffic in Korea increased from the fourth quarter of 2020 and continued to increase, surging in March 2021, and even surpassed the global search traffic volume after June 2021. It was confirmed that users' hype for metaverse was particularly high in Korea. As a result of looking at the search phrases searched with "metaverse", metaverse games were mostly found in worldwide searches, whereas in Korea, there were many metaverse stocks and virtual currency used within the metaverse. This can be interpreted as not only young people in their 10s and 20s, but also people in their 30s or older who are economically active, showing high interest in the metaverse. Since they correspond to the early majority in Rogers' category of innovation adopters, the chasm between early adopters and early majority can be expected to be narrow.

The frequency and topic of Korean news were analyzed to understand the interest in news media. Changes in news frequency appeared similar to changes in search traffic. In the first week of April 2021, when the rise was noticeable, there was news that the number of users of ZEPETO, a metaverse created by Naver, exceeded 200 million. And there was news that Cyworld would restart the mini-hompy service. In the last week of May 2021, there were metaverse golf broadcasts, fashion shows, real estate, virtual fan signings, and articles listed on the KOSDAQ of metaverse companies. In the second week of July, which appeared as an

upward peak, there were many articles about the convergence of metaverse, banking, education, and travel.

Research-side attention in the metaverse (virtual world) peaked in 2010, 10 years earlier than that of users and media. Researchers predicted that metaverse would be a 3D immersive next-generation platform that replaced e-learning, web portals, and e-commerce, and were conducting research on it. Therefore, a lot of research is already underway and developing on the technical issues of metaverse construction and the development of various and high-quality services and contents.

Based on the analysis of this study, the following suggestions are made for the sustainable growth of the metaverse. First, empirical studies on new metaverse users are needed. Through this, users' satisfaction, dissatisfaction, and requirements should be identified, and these should be reflected in the development and operation of the metaverse. Second, we need to understand and accept the metaverse as another "world" connected to the real world, away from narrow concepts such as "3D game" or "3D experience". Many considerations for this (eg, ownership of virtual assets, privacy, virtual world addiction, and avatar sexual harassment, etc.) need to be studied and policies developed. Finally, continuous monitoring is needed to identify the hype and attention of stakeholders including users and media and respond quickly to changes.

The methodology and results of this study are expected to provide insight for the stable success of metaverse transformation and the coexistence of two worlds, the real world and the virtual world, through hyper-connection and hyper-convergence.

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