

Article

Exploring the Online News Trends of the Metaverse in South Korea: A Data-Mining-Driven Semantic Network Analysis

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Abstract: It is presently being questioned whether the metaverse is mere hype or the next transformative vision. It should be examined how the issues associated with the metaverse are being dealt with socially, and accordingly, how the public's interest has changed. This paper aims to explore the metaverse's issues and its rapidly changing trends in South Korea during the pandemic period of 2020–2021, in which the term was very widely used. This study conducted a semantic network analysis using online news big data with a text mining approach to analyze online news content from search engine portals such as Naver, Daum, and Google. TF-IDF, degree centrality, word cloud visualization, and CONCOR analysis were used within the Textom and UCINET6 programs. This research provides valuable insights into how the metaverse is being embraced and discussed within the South Korean context, shedding light on its potential impact and the changing dynamics of public engagement. The results showed that the topics of the public's interests in the metaverse varied in the year 2021 as compared to 2020, and the opportunities and concerns revolving around it are referred to at the same time. The study found that there were significant changes in the subjects that gained public interest in the metaverse between 2020 and 2021. In 2020, the term “Metaverse” became popular in the news due to its increasing popularity in the world of virtual online gaming, particularly among younger populations. This was further accelerated by the COVID-19 pandemic restrictions, resulting in a rise in virtual experiences. In contrast, the year 2021 was marked as the time when the concept of the metaverse gained widespread recognition and established itself as a platform for business and financial opportunities, suggesting the growing interest of older generations in the metaverse.

Keywords: metaverse; online news; big data; text mining; semantic network analysis; CONCOR analysis**Citation:** Kim, E.J.; Kim, J.Y.Exploring the Online News Trends of the Metaverse in South Korea: A Data-Mining-Driven Semantic Network Analysis. *Sustainability* **2023**, *15*, 16279. <https://doi.org/10.3390/su152316279>

Academic Editor: Hao-Chiang Koong Lin

Received: 6 October 2023

Revised: 13 November 2023

Accepted: 17 November 2023

Published: 24 November 2023



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1. Introduction

The COVID-19 pandemic has made virtual interactions part of daily life. Taken together with the social demands of virtual communication, the technological advancements in augmented reality (AR) and virtual reality (VR) help to actualize the concept of the “Metaverse” among the public; it had been considered to only be possible in science fiction. The term metaverse is a compound word of “Meta”, meaning transcendence, and “Universe”, meaning world; it refers to a three-dimensional virtual world that exists beyond reality. The metaverse is a digital world that reflects—and intertwines with—the real world. It is being hailed as a new digital paradigm of the next generation because it offers the possibility of breaking free from physical constraints and allowing a great expansion of human activities in socialization, productivity, shopping, and entertainment.

The metaverse is fast-growing, as shown by the great number of investments in metaverse platforms and technologies from the largest global tech companies. In 2021, Facebook renamed itself Meta and announced that it would lead the next digital frontier,

the metaverse [1]. This signified a transition from personal computers to smartphones and now to the metaverse as the new ICT (information and communications technology) ecosystem. Other companies, like Sony, Microsoft, and Intel, have become more active in mergers and acquisitions, so it has been predicted that the metaverse can contribute USD 3 trillion to the global GDP by 2031 [2–4]. Companies in South Korea are also actively pursuing their entry into the global metaverse market with the help of the strong of K-pop and K-culture fandoms [5], following the successful example of Zepetto serving more than 200 million subscribers. Thus, the competition as to who will be the first to embark on the new digital world of the metaverse is becoming intense.

While the metaverse presents a new business opportunity, there are also many concerns related to the metaverse that must be approached with caution. John Carmack, the former chief technology officer of Oculus VR, did not deny the concept itself, but he expressed anxiety because it still requires massive adoption, including the broader use of VR headsets, a super-powerful processor to handle graphical demands, and other immersive technologies [6]. When considering whether the metaverse is mere hype or the next transformative vision, it is important to examine its social impact and the public's changing interests. This study was conducted to analyze the social issues associated with the metaverse and their rapidly changing trends in South Korea during the pandemic period of 2021 to 2022, when the term was used more frequently than ever. A semantic network analysis approach was used with text mining to explore online news data disseminated through portal sites, and implications about the future prospects of the metaverse were identified to help society's successful transition or preparation to the next stages of a new digital paradigm.

Recent research on the metaverse has primarily focused on its technological applications and educational tools in the fields of computer science and engineering [7–10]. In terms of the metaverse's definition and prospects, earlier studies have focused on Second Life, the forerunner of the metaverse, in 2006 [11–13]; since 2020, when the metaverse began to gain attraction again, over 82 papers were published in 2021 in South Korea alone, compared to 55 papers in the first half of 2022. Post-2020 research papers have attempted to analyze various aspects, from the metaverse's origin, development, technical support, current progress, and feasibility to its limitations [14–16]. There is not much research that has specifically dealt with the metaverse boom as a social phenomenon interconnected with public perceptions of it. Before speculating on its commercial worth, it is necessary to understand what kind of metaverse-related concerns or issues have received attention from users and media and how the metaverse will evolve during its life cycle through the media's overenthusiasm.

This study offers three main contributions: First, it includes a comparative analysis between 2020 and 2021 that looks at how media coverage or public awareness has changed. It is worth noting that previous studies which have examined online news data have only used data from a limited period that corresponded to the time of the study [17–19]. In contrast, the present study extracted news data spanning the entire two years of 2020 and 2021, as well as a few months from 2022, allowing for a more comprehensive analysis over a longer time frame. This time period represents a phase in which social interest in the metaverse has skyrocketed and national policies have begun to be pursued in earnest. Second, online news articles that had been distributed through Internet portal sites were used rather than traditional news channels such as TV, radio, or newspapers. With the advent of the big data era, massive information stored online has become a valuable resource for knowledge discovery; in particular, online news articles are the quickest and easiest resources that can be obtained to access the important social issues that are currently being raised [20]. Third, in order to retrieve qualitative and quantitative insights from unstructured online news data, this study generated and analyzed the semantic networks as a method of visual text analytics. Semantic network analysis is widely used to explore and analyze the fast-changing online issues or social network service (SNS) big data [21,22]. This study aims to identify the news media trends related to metaverse by employing text

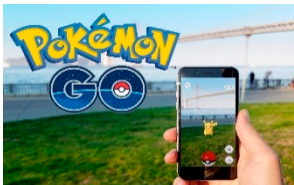
mining and semantic network analysis, eventually to find future prospects for a new digital paradigm called metaverse and the implications for its future direction.

2. Related Studies

2.1. Metaverse Evolution Stages and Metaverse Craze in South Korea

The metaverse is characterized by evolution—not revolution—because its actualization dates back to 2003 and it is currently in the third stage of evolution, as shown in Table 1 [23]. In the first stage, the term “Metaverse”, initially coined in the 1992 American sci-fi novel *Snow Crash*, captured public attention due to the three-dimensional virtual game *Second Life*. However, its popularity declined rapidly due to technical constraints, a lack of compelling virtual experiences, and a failure to quickly adopt emerging trends [13]. After progressing through the transitional stage where the immersive technologies such as VR, mixed reality (MR), and the digital twin continued to develop, the metaverse entered the maturation stage. Since 2020, aligning with the popularity of digital platforms including Roblox and Fortnite, it has reached the third stage.

Table 1. Three stages of metaverse evolution.

Period	Before 2010	2010~2020	2020~Present
Stage	Trigger stage	Transitional stage	Fusion stage
Definition	Introduction of the concept of metaverse	Commercialization the intertwined experiences between “real” and “virtual” worlds	Co-existence of the virtual worlds in real time through using immersive technologies, artificial intelligence, and big data and cloud computing
Applied technologies	Virtual simulation, avatar, 3D technology	Smartphone AR, VR/XR headset, AR glass	5G, AI, Blockchain, IoT
Representative examples	 Second Life (Linden Lab)	 Pokémon GO (Niantic)	 Zeppetto (Naver), Roblox (Roblox), E-friend (SKT)

In other words, the metaverse is not a concept that emerged abruptly but is one that has evolved through various stages. In a scenario where it has regained prevalence since its initial introduction, there is a need to reassess the existing definition or components of the metaverse [24] and delve into associated social issues. This is crucial to ensure that the development of the metaverse aligns with public consensus.

In this context, the surge in interest in the metaverse among South Koreans is particularly noteworthy. As depicted in Figure 1, examining the Google Trends graph of metaverse queries from October 2020 to May 2022 reveals a global spike following Facebook’s rebranding to Meta in October 2021, followed by a sharp decline since February 2022 (Figure 1A). However, contrary to the global trend, the search trendline in South Korea has shown a steady increase and continues to do so (Figure 1B).

The graph also reveals that the interest in the metaverse in South Korea predates the rebranding of Facebook to Meta. This early interest can be attributed to South Korea’s decade-long experience in constructing virtual worlds through an SNS platform, Cyworld, which boasted over 40 million users since the early 2000s, even before the metaverse gained global recognition. Cyworld offered services similar to those provided by the metaverse including 2D avatars, virtual room decoration, socializing with friends in a virtual environment, and customization of background music and photo albums. The platform facilitated

the buying and selling of virtual products using “Acorn” cryptocurrency, with annual sales that surpassed USD 80 million.

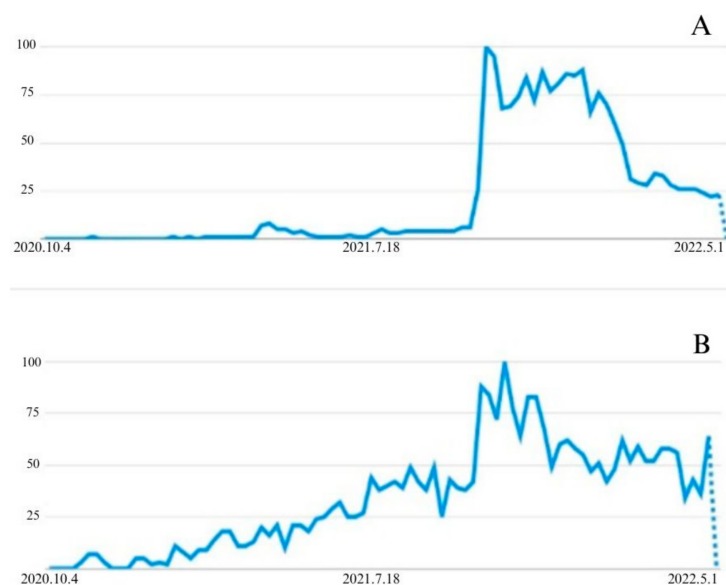


Figure 1. Metaverse queries via Google Trends from 2020 to present: (A) world; (B) South Korea.

Drawing from this early version of the metaverse, South Korea has swiftly translated its experience into tangible results and revenue. Examples included marketing K-pop entertainment through the release of BTS’s single album on Fortnite and organizing virtual fan signing ceremonies of Blackpink on Zeppetto. Furthermore, K-game companies in South Korea are rapidly transitioning to a metaverse platform with business models centered around NFTs (non-refundable tokens), blockchain technology, and Play-to-Earn (P2E) models [25].

Currently, South Korea is making substantial investments in the metaverse, both in terms of technology and education. The Korean Office of Technology and Standards is offering support to companies that are interested in establishing technical standards in this field, while the South Korean Ministry of Education is encouraging the inclusion of metaverse-related topics in educational curricula. These initiatives underscore South Korea’s commitment to emerging as a global leader in the metaverse [26].

This commitment is further evident through various funding programs and technological initiatives by different companies. For instance, SAMSUNG has launched the “Samsung Global Metaverse Fund” [27]. Another company, Urbanbase, has introduced a 3D cloud-based AR platform that transforms the floor plan of any building into a 3D visualization [28]. In addition, the Korean Information and Communications Industry Promotion Agency has founded a “Metaverse Alliance” in collaboration with the private sector, providing an open metaverse platform in South Korea [29,30].

2.2. Online News Big Data and Semantic Network Analysis

With the widespread use of smartphone and fast internet connectivity, it has become a common practice in South Korea to consume online news through portal websites or popular search engines. By 2022, this trend had gained significant influence with 63.3 percent of the entire population primarily reading news articles through portals rather than TV or other traditional media sources [31]. Through the websites, people not only stay updated on recent news and events but also share their opinions with others. Therefore, online news is gradually expanding its dominance over shaping social public opinion and influencing the formulation and activation of government policies [32]. Given the social impact and accountability of news, online news big data are utilized to comprehensively grasp various viewpoints due to the substantial amount of accumulated data. Previous studies have

employed online news coverage to examine the inherent nature of social problems such as wealth inequality [20], explore public opinion on workplace bullying in the nursing field [32], and investigate issues related to the COVID-19 pandemic [33]. Big-data-driven analysis using online portal news has gained attention as a useful analytical method to provide a richer understanding of population-scale phenomena compared to individual surveys and interviews [21,34].

Semantic network analysis (SNA) involves analyzing the structure of a semantic network derived from a massive volume of unstructured text datasets [35,36]. Evolving from social network analysis that focuses on patterns of relations among people and among groups [21,31], SNA incorporates text mining techniques and network analysis to process and characterize the given semantic network, representing relationships in a graph with labeled nodes and edges [35].

SNA offers an advantage in uncovering the relational structure between social phenomena associated with a particular word. This is achieved by examining the role that a specific word plays in its relationships with other words and understanding the conveyed meaning [37]. Compared to traditional methods of textual data analysis, SNA is more objective and accurately measures the structural relationship between individual words and the overall context with relatively little subjective intervention by researchers [20]. Therefore, SNA serves as a visual text analytical tool actively used to explore the qualitative aspects and intrinsic meaning of a particular social issue by focusing on the relationships within online big data, such as those on social media platforms or portal site news. Some studies have explored the potential application of SNA to understand public awareness on topics like the concept of sustainability in fashion [21], vaccine sentiment [38,39], and governmental policy [40].

Internet portal sites or social media have become the primary news channels and provide useful big data sources to deduce public opinions and upcoming social trends using text mining technology. Consequently, this paper attempts to apply SNA and text mining to explore public awareness and identify prevalent trends related to the new digital paradigm of the metaverse.

3. Method

3.1. Data Collection and Preprocessing

This study collected the original dataset from the top three search engines in South Korea: Naver, Daum, and Google. These, respectively, hold the 1st–3rd positions on major news portal sites. Naver, a portal news platform, exerts a considerable influence, reaching 94.3 percent of adult men and women (ages 19–59) and playing a significant role in web news. Following Naver is Daum, with an influence of 51.7 percent; Google ranks third, with 34.8 percent influence [31].

For the purposes of this study, online news was collected using the keyword “metaverse” in both the title and text for the years 2020 and 2021, as shown in Table 2. The year 2020 marks a period when metaverse-related articles began to see a significant increase, particularly in the aftermath of the COVID-19 pandemic. In contrast, 2021 represents a year when the concept of the metaverse became more familiar to the public. A comparative analysis between these two years was conducted to identify changing trends over time.

Table 2. Data collection channel and number of articles by year.

Data Collection Channel	2020	2021
Naver (www.naver.com (accessed on 2 November 2023))	258	881
Daum (www.daum.net (2 November 2023))	804	1000
Google (www.google.com (2 November 2023))	362	231
Total	1424	2112

In this study, Textom 6.0 was used as a data collection and preprocessing tool. It functions as a comprehensive big data management solution that automates the collection of text data, refines them through morpheme analysis, creates a co-occurrence matrix, and counts word frequencies [35]. This tool not only facilitates the collection of big data from various acquisition channels, but also produces highly compatible data that can be applied to various statistical programs. Several studies have successfully employed Textom 6.0 to automatically gather extensive data from portal sites and social media [20,21,40,41]. To acquire the data, the keyword “metaverse” was input into the Textom website (www.textom.co.kr (2 November 2023).) and the resulting data were obtained in the form of an Excel file. Textom also generates a wordcloud to aid visualization as shown in Figure 2.



Figure 2. Top 50 keywords—wordclouds: (A) 2020; (B) 2021.

The preprocessing procedures were conducted in the following manner. First, repeated news and advertisements were removed from the Textom system. Then, syntactically functional words such as conjunctions and prepositions and irrelevant data such as numbers and symbols that are unrelated to metaverse were eliminated. Only nouns were left. A comparison between the original data and the first round of refined data was performed to ensure the removal process was executed appropriately. The validated data were then re-uploaded to Textom for further noun refinement and subsequently converted into an Excel file for the second round of cleansing.

Following a list of morphemes provided by the National Linguistic Institute, additional processing was applied to eliminate unspoken and meaningless words, and to combine or unify different forms of the same word (e.g., merging “AR” and “augmented reality”). To streamline the network, the top 50 keywords were extracted based on their frequency of appearance and TF-IDF values with focus on their relevance to the metaverse in terms of applications, popularity, opportunities, and concerns.

3.2. Analytical Methods

To uncover structural connections, keywords were extracted from online news articles in the dataset. The processed texts were used to generate a word co-occurrence matrix for SNA. To simplify the network, the top 50 keywords were extracted based on the

frequency of word appearance. Next, UNICET 6 software was employed to perform keyword-to-keyword linking, centrality analysis, and a convergence of iterated correlations (CONCOR) analysis. NetDraw, bundled with UNICET, was then utilized for network visualization to derive meaningful knowledge and implications from the structured yet complex semantic network.

The network comprises nodes that represent keywords and links that indicate the frequency of connections between keywords [35]. This study identified the network structure of keywords centered on TF-IDF, degree centrality, and CONCOR analysis.

TF-IDF is a numerical statistic derived from the multiplication of term frequency (TF) and inverse document frequency (IDF). It weighs the importance of a word within a document [42]. Degree centrality is effective in identifying crucial nodes by calculating the number of nodes that are neighbored with other nodes. A higher degree of centrality indicates a more significant impact on other words and a more dominant role within the semantic network [37]. To examine the adjacency and interrelationship between top keywords, a dendrogram was generated to assess structural equivalence and the arrangement of hierarchical clusters [43]. Then, CONCOR analysis was performed to identify semantic clustering, discover hidden subgroups, and deduce joint meanings among each group. While structural equivalence analysis focuses on direct relationship between nodes, CONCOR measures the frequency of simultaneous emergence between keywords to identify appropriate groups within the semantic network. Based on the results of the CONCOR analysis, NetDraw was utilized to visualize the network to provide a meaningful representation of the dataset. Each keyword group was named considering the contexts in which the keywords in a group were mentioned. The specific research procedure is shown in Table 3.

Table 3. Research procedures and details.

Stage	Procedure	Details
Stage 1	Data collection	Selection of data collection channel: top three portal sites (Naver, Daum, and Google)
		↓ Amount of news data collected in the years 2020–2021
Stage 2	Text cleansing	Removal of the repeated news and advertisements
		↓ Deletion and combining of unnecessary words and similar words in a different form
		↓ 12,107 keywords (repeated refining using Textom)
Stage 3	Keywords extraction	Extract top 50 keywords according to frequency appearance and TF-IDF
		↓ Wordcloud visualization
Stage 4	Semantic network analysis and visualization	TF-IDF and degree centrality analysis using Textom
		↓ Generate dendrogram
		↓ CONCOR analysis using UNICET and visualization using NetDraw
Stage 5	Results analysis and meaning derivation	

4. Results

4.1. Keyword Frequency Analysis

The top 50 keywords are listed in Table 4. In 2020, the keyword with the highest frequency is “Virtual reality” (1832 times), followed by “Party Royale” (986 times), “Games” (708 times), “Fortnite” (563 times), “Launch” (513 times), and “Social” (440 times). In 2021,

the keywords with the highest frequency appearance were “Platform” (897 times), “Virtual reality” (534 times), “NFT” (531 times), “ETF (Exchange Trade Fund)” (526 times), “AI” (336 times), and “Game” (322 times).

Table 4. Frequency appearance of the top 50 keywords by year.

Rank	Year of 2020		Year of 2021	
	Keyword	Frequency	Word	Frequency
1	Virtual Reality	1832	Platform	897
2	Party Royal	986	Virtual Reality	534
3	Game	708	Non-Fungible Token	531
4	Fortnite	563	Exchange Traded Fund	526
5	Launching	513	AI	336
6	Social	440	Game	322
7	AI	324	Investment	307
8	Experience	316	Utilize	278
9	Plan	275	Business	276
10	Evolution	272	Company	276
11	COVID19	253	Industry	264
12	Consideration	208	Global	244
13	Technology	186	Service	242
14	Introduction	185	Digital	232
15	Meaning	179	Build	226
16	Future	164	Market	220
17	Content	163	Content	216
18	Industry	143	Stock Exchange Listing	193
19	Concept	141	ZEPETTO	190
20	Platform	140	Com2uS	165
21	NRP (New Reality Partners)	132	Naver	164
22	Lecture	131	Future	162
23	Global	129	e- commerce	156
24	Epic Games	121	Blockchain	139
25	Blockchain	120	Non-contact	137
26	Robot	119	Education	131
27	User	118	Online	131
28	Online	115	Avatar	124
29	Digital	110	Sexual Assault	123
30	Event	107	Outlook	106
31	AR	99	Business agreement	104
32	Non-contact	91	Stock Price	103
33	Development	88	Full-fledged	87
34	Connection	86	Ecosystem	87
35	Trends	86	Growth	85
36	XR	75	Student	79
37	Graduation Ceremony	75	Creator	78
38	NETMARVLE	74	IFLAND	77
39	Virtuality	72	Campus	75
40	Concert	68	Fever	75
41	Prospect	65	AR	74
42	Avatar	64	Startups	73
43	KT (Korean Telecom)	61	Monetization	68
44	Asia’s Silicon Valley	57	XR	65
45	Gamer	55	Trends	63
46	Digital District	52	Generation MZ	54
47	Startups	41	New Technology	51
48	Ethics	27	Gather Town	49
49	Zuckerberg	27	BTS	44
50	Facebook	14	Worry	37

To facilitate a clear comparison between the two years, the results were visualized in a wordcloud. In the year 2020, the term “Virtual reality” exhibited the highest frequency, indicating its pivotal role within the discourse on the metaverse. This prominence suggests that “Virtual reality” played a central role in defining the concept of the metaverse or served as a key descriptor understood by the public. The term “introduction” held the 14th rank, which implies that efforts to introduce the concept of the metaverse were relatively less prominent. Instead, the gaming aspect of the metaverse gained greater attention in that year, with “Party Royale”, “Game”, and “Fortnite” ranking 2nd, 3rd, and 4th, respectively. This focus on gaming may have influenced by the impact of “COVID-19”, which held the 11th position.

4.2. Keyword Centrality Analysis

Based on the top 50 keywords, network centrality was calculated to analyze the semantic network, as shown in Tables 5 and 6. In 2020, keywords with high TF-IDF values included “Party Royale”, “Games”, “Fortnite”, and “Virtual Reality”. A high TF-IDF value suggests that a word is more likely to determine the entire meaning of the document and is highly influential. In terms of degree centrality, “Virtual reality”, “Party Royale”, “Fortnite”, and “Launching” are keywords with a high degree of direct connection to the word metaverse in a document.

Table 5. Network centrality of keywords in 2020.

Rank	Keyword	TF-IDF	Degree Centrality	Rank	Keyword	TF-IDF	Degree Centrality
1	Virtual Reality	762.862	0.138	26	Robot	314.020	0.003
2	Party Royal	1617.852	0.118	27	User	358.922	0.012
3	Game	1050.369	0.050	28	Online	310.140	0.006
4	Fortnite	897.871	0.075	29	Digital	300.148	0.004
5	Launching	731.750	0.062	30	Event	276.958	0.016
6	Social	703.236	0.061	31	AR	277.880	0.007
7	AI	664.763	0.009	32	Non-contact	253.333	0.006
8	Experience	530.162	0.046	33	Development	245.987	0.007
9	Plan	452.224	0.040	34	Connection	244.445	0.005
10	Evolution	454.304	0.040	35	Trends	256.672	0.006
11	COVID19	509.592	0.011	36	XR	235.056	0.006
12	Consideration	400.126	0.031	37	Graduation Ceremony	238.776	0.007
13	Technology	396.426	0.013	38	NETMARVLE	221.892	0.007
14	Introduction	457.640	0.016	39	Virtuality	230.456	0.007
15	Meaning	380.451	0.014	40	Concert	234.910	0.005
16	Future	372.409	0.010	41	Prospect	221.720	0.004
17	Content	403.218	0.013	42	Avatar	215.641	0.003
18	Industry	363.609	0.011	43	KT (Korean Telecom)	246.583	0.001
19	Concept	326.057	0.010	44	Asia’s Silicon Valley	214.588	0.003
20	Platform	336.429	0.010	45	Gamer	178.964	0.006
21	NRP (New Reality Partners)	372.051	0.011	46	Digital District	172.119	0.004
22	Lecture	318.711	0.010	47	Startups	146.466	0.003
23	Global	313.845	0.009	48	Ethics	107.065	0.001
24	Epic Games	302.385	0.017	49	Zuckerberg	107.065	0.000
25	Blockchain	369.840	0.012	50	Facebook	65.747	0.001

Table 6. Network centrality of keywords in 2021.

Rank	Word	TF-IDF	Degree Centrality	Rank	Word	TF-IDF	Degree Centrality
1	Platform	1066.328	0.124	26	Education	419.274	0.025
2	Virtual Reality	889.620	0.084	27	Online	382.352	0.021
3	Non-Fungible Token	1208.035	0.079	28	Avatar	391.233	0.019
4	Exchange Traded Fund	1266.551	0.086	29	Sexual Assault	523.207	0.025
5	AI	931.430	0.079	30	Outlook	323.273	0.028
6	Game	718.049	0.058	31	Business agreement	352.792	0.026
7	Investment	736.008	0.085	32	Stock Price	313.099	0.029
8	Utilize	615.074	0.040	33	Full-fledged	295.124	0.017
9	Business	653.195	0.046	34	Ecosystem	297.610	0.022
10	Company	625.373	0.053	35	Growth	285.978	0.019
11	Industry	601.824	0.048	36	Student	265.792	0.012
12	Global	630.987	0.061	37	Creator	311.325	0.008
13	Service	558.489	0.031	38	IFLAND	275.458	0.006
14	Digital	558.631	0.043	39	Campus	301.299	0.015
15	Build	578.823	0.044	40	Fever	262.202	0.011
16	Market	535.603	0.047	41	AR	297.282	0.016
17	Content	540.351	0.040	42	Startups	280.922	0.029
18	Stock Exchange Listing	526.439	0.044	43	Monetization	251.849	0.014
19	ZEPETTO	537.054	0.031	44	XR	248.707	0.007
20	Com2uS	548.490	0.024	45	Trends	224.316	0.013
21	Naver	487.536	0.052	46	Generation MZ	211.531	0.008
22	Future	429.457	0.025	47	New Technology	204.883	0.012
23	Commerce	538.235	0.057	48	Gather Town	191.945	0.008
24	Blockchain	399.735	0.033	49	BTS	198.854	0.013
25	Non-contact	390.572	0.018	50	Worry	151.684	0.011

The keywords “Party Royale”, “Game”, and “Fortnite” exhibit high values in both TF-IDF and degree centrality. This suggests that the Party Royal event played a significant role in promoting the word metaverse to the public. On May 9, 2020, Fortnite, a third-person shooter game made by Epic Games, established a socializing space within its 3D game world and hosted a Party Royale featuring live performances and movie screenings, branding it as the “metaverse”. This digital game publicized the concept of metaverse in South Korea and sparked the metaverse craze. It was because people sought new forms of entertainment amidst the cancellation of in-person concerts due to COVID-19 quarantine measures.

In 2021, keywords with both high TF-IDF and degree centrality included “EFT”, “NFT”, and “Investment”. The term “metaverse ETF” refers to a portfolio that combines metaverse-related stocks including AR-, VR-, and mixed reality (MR)-related hardware and platforms. In October 2021, the first four “metaverse ETFs” were listed in South Korea and quickly became leaders in cumulative returns [44]. The emergence of these different keywords compared to those in 2020 indicates a shift in social interest toward profit-making and the commercialization of the metaverse as a new business opportunity.

4.3. CONCOR Analysis and Visualization

CONCOR analysis was conducted to visually derive and group the network connectivity and patterns of the top 50 keywords. The analysis was conducted using UCINET 6 and the NETDRAW tool. Based on the grouping of the 50 keywords located adjacent to each other, three clusters were identified in the year 2020 as shown in Figure 3A and four clusters in the year 2021 as shown in Figure 3B.

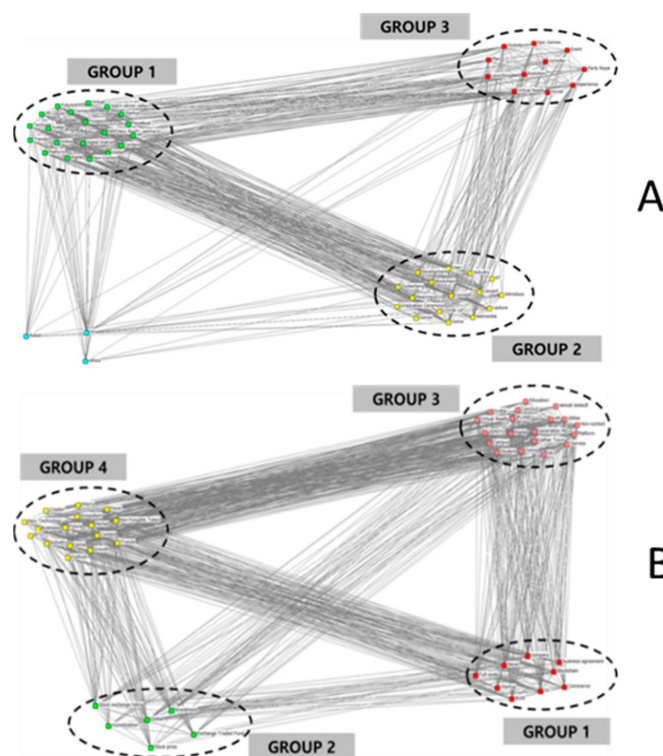


Figure 3. Visualization of CONCOR analysis for the years 2020 (A) and 2021 (B).

CONCOR is a technique that repeatedly examines how words are connected by assessing their relationships. It categorizes these words into groups based on the strength of their links, using the correlation coefficient [45].

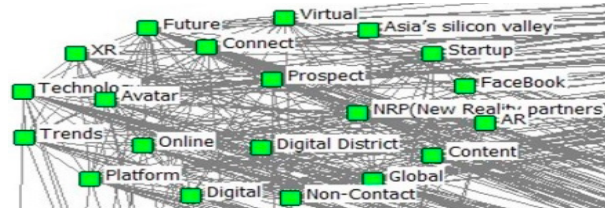
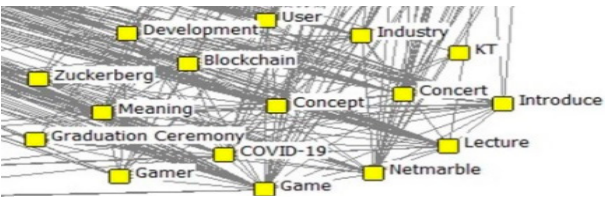
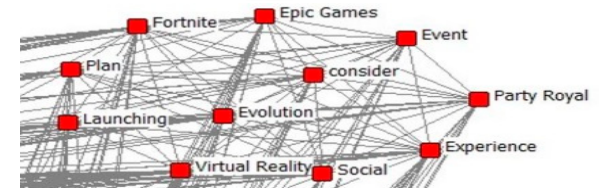
As shown in Table 7, The CONCOR analysis for 2020 presented three distinct clusters that were named “Digital Technology and the Future of the metaverse in the non-face-to-face era” (Group 1), “Introduction to the metaverse” (Group 2), and “Metaverse Experience through social events” (Group 3).

The prevalent words in the cluster “Digital Technology and the Future of the Metaverse in the non-face-to-face Era” were “non-contact”, “online”, “connected”, “digital”, and “virtual”, indicating that the metaverse was perceived as a new way to interact without being physically present. Words like “XR”, “AR”, and “avatar” suggest discussions on technology providing immersive experiences. It was also viewed as a platform for creating and sharing content. Lastly, the cluster highlights the potential of the metaverse to create new economic opportunities and underscores the role of Asia Silicon Valley in its development. The words “NRP (New Reality Partners)” and “Facebook” imply their central role in metaverse development. The terms “Prospects” and “future” hint at optimism for the metaverse’s potential to transform people’s lifestyles and work.

In the group “Introduction to Metaverse”, the keywords “concept”, “meaning”, and “introduction” indicate that the content within was related to the concept and meaning of the metaverse, providing an overview or definitions of what the metaverse is. Keywords like “Gamer”, “User”, and “Game” suggest a strong association with the gaming aspect of the metaverse. In addition, terms such as “concert”, “lecture”, and “graduation Ceremony” suggest a focus on various types of events or entertainment that may take place within the metaverse. The inclusion of terms such as “NetMarvel”, “KT”, “Blockchain”, “Industry”, and “Development” could imply a keen interest from companies in the metaverse and contemplation of employing blockchain technology for its development. The presence of “COVID-19” suggests discussions about how the pandemic influenced or accelerated developments in the metaverse. The mention of “Zuckerberg” likely refers to Mark Zuckerberg, who had been associated with discussions about the metaverse, especially in his role at

Meta Platforms (formerly Facebook). This could imply discussions about leadership or influential figures in the metaverse space.

Table 7. CONCOR analysis and list of clusters in 2020.

Group Characteristics	Subcluster	Keywords
(Group 1) Digital Technology and Future of metaverse in the non-Face-to-Face Era (20 nodes)		Non-contact, online, connected, digital, virtual, technology, XR, AR, avatar Content, Global, Platform, Trends, Startups, Digital District, Asia Silicon Valley, NRP, Facebook, Prospects, Future
(Group 2) Introduction to metaverse (16 nodes)		Concept, Meaning, Introduction, Gamer, User, Game, Concert, Lecture, Graduation Ceremony, NetMarvel, KT, COVID-19, Blockchain, Development, Industry, Zuckerberg
(Group 3) Metaverse experience through social events (11 nodes)		Epic Games, Fortnite, Party Royale, Social, Events, Virtual Reality, Experience, Evolution, Release, Plan, Distress
Excluded for analysis (3 nodes)		AI, Robot, Ethics

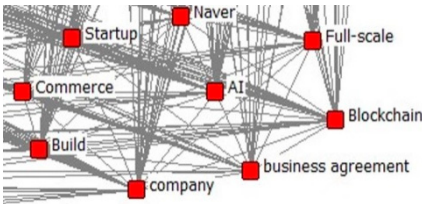
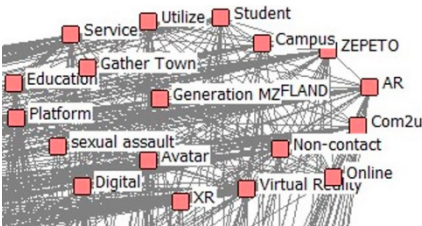
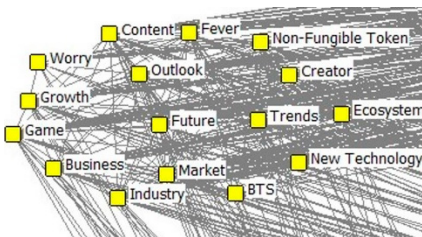
In the third group, “Metaverse experience through social events”, the metaverse was seen as a means of social interaction as indicated by the keywords “Epic games”, “Fortnite”, “Party Royale”, “Social”, “Events”, and “Virtual Reality”. South Koreans were particularly interested in virtual reality and creating unique experiences. The keywords “evolution” and “release” suggest that people in South Korea are looking forward to the new features and experiences. However, challenges with development and deployment were also discussed. Keywords “plan” and “distress” suggest companies were facing obstacles in bringing the metaverse to life in South Korea.

The CONCOR analysis for 2021 presented four distinct clusters as shown in Table 8 named “Virtual Economy”, “Metaverse Monetization”, “Metaverse Platform”, “MZ Generation Education”, and “Metaverse Ecosystem Prospects and Concerns”.

The group “Virtual Economy” suggests a focus on the business and technology aspects of the metaverse in the year 2021 with the prevalence of words such as “e-commerce”, “blockchain”, and “AI” as well as the involvement of the metaverse in businesses with words like “Naver”, “startups”, “enterprises”, and “business agreements”. The term “full-fledged” emphasizes that these activities are becoming more comprehensive and established within the metaverse ecosystem.

In the second group, “Metaverse Monetization”, prevalent keywords include “Investment”, “Monetization”, “Global”, “Listed”, “ETF”, and “Stock Price”, indicating that, in 2021, discussions on the metaverse revolved around attracting investment, strategies for monetizing metaverse activities, the global reach of the metaverse, the listing of metaverse-related assets on stock exchanges, the role of ETFs, and the performance of metaverse-related stocks in financial markets. This cluster indicates that online news began discussing the metaverse in terms of financial and investment opportunities in the year 2021.

Table 8. CONCOR analysis and list of clusters in 2021.

Group Characteristics	Subcluster	Keywords
(Group 1) Virtual economy (9 nodes)		E-commerce, Blockchain, AI, Naver, Startup, Enterprise, Business Agreement, Full-fledged
(Group 2) Metaverse Monetization (6 nodes)		Investment, Monetization, Global, Listed, ETF, Stock Price
(Group 3) Metaverse Platform and MZ Generation Education (19 nodes)		Platform, Service, Gather Town, IFLAND, Com2us, ZEPETTO, Avatar, Generation MZ, Student, Campus, Education, Utilize, Virtual Reality, Non-contact, Digital, Online, XR, AR, Sexual Assault
(Group 4) Metaverse Ecosystem Prospects and Concerns (16 nodes)		Content, trends, game, creator, BTS, ecosystem, market, industry, business, new technology, non-fungible token, growth, outlook, future, fever, worry

The third cluster “Metaverse Platform and MZ Generation Education” showed similar words as the first group of the year 2020 such as “Non-contact”, “Digital”, “Online”, “XR”, and “AR”, indicating similar trends as in the year 2020 but with the inclusion of additional words such as “Platform”, “Service”, “Education”, and “Utilize”. This suggests a growing interest in using metaverse platforms and services to deliver education, possibly because these platforms offer a more immersive and engaging learning experience than traditional educational platforms [46]. The keywords “Generation MZ” and “Student” suggest that Generation MZ students are the primary users of metaverse platforms and services for educational purposes. It reflects their comfort with technology and tendency to be early adopters [47]. The appearance of the word “Sexual Assault” suggests discussions about safety and ethical concerns in online and virtual environments. The inclusion of terms like “Gather Town”, “IFLAND”, “Com2us”, and “ZEPETTO”, which are companies or platforms within the metaverse mentioned in the news data, indicates people’s interest in them [48].

The fourth group, “Metaverse Ecosystem Prospects and Concerns”, highlights words such as “Content”, “trends”, “game”, and “creator”, in relation to virtual experiences, entertainment, and cultural trends in the metaverse as well as the creation of virtual games and experiences by independent creators or studios. The inclusion of “BTS” likely refers to the popular South Korean boy band and its involvement in the metaverse [49]. Words like “Ecosystem”, “Market”, “Industry”, and “Business” suggest the involvement of the metaverse in various industries and businesses, market dynamics, and opportunities. The term “New Technology” implies discussions about emerging and innovative technologies integrated into the metaverse. This may include advancements in VR, AR, or blockchain technology. The inclusion of “Non-fungible token” suggests discussions about the use of

NFTs in the metaverse with a focus on digital assets associated with ownership of virtual or digital items. The terms “Growth” and “Outlook” imply discussions about the anticipated expansion and prospects of the metaverse with a sense of enthusiasm and high interest in its potential. The presence of “Worry” indicates that not all discussions about the metaverse are entirely positive. Concerns and worries about various aspects, such as privacy, security, or ethical issues, may be part of the discourse.

5. Discussion

Numerous studies have been carried out on the recent use and implementation of the metaverse in South Korea; these have highlighted the extent of metaverse enthusiasm in the country. These studies cover a range of topics from the interest shown among younger generations to the involvement of governments in creating policies around the metaverse. The potential impact of the metaverse on the country’s economy, society, and culture has been examined [50]. Choi [51] emphasized the importance of metaverse offices which can offer opportunities for remote work and enable individuals to access job opportunities without relocating to megacities, thereby easing population pressure in such areas. Ko et al. [52] found that the metaverse can host diverse cultural events rooted in Korean heritage to facilitate the transfer of valuable books and works from libraries and art galleries to virtual spaces.

South Korea has actively embraced the metaverse across various sectors including government, healthcare, private industry, culture, politics, and employment [53]. This proactive approach reflects the country’s recognition of the transformative potential of the technology and its commitment to harnessing its benefits while addressing associated challenges.

Some studies continuously have focused on the developments and changes in the metaverse landscape in South Korea; bibliometric studies have been conducted to understand the impact of metaverse-related research and publications in the digital era [17,54]. This study aims to explore the current discourse on the metaverse among individuals who are interested in reading online news. The study employs semantic network and concordance analysis to investigate how the perception and status of the metaverse are evolving in South Korea, as reflected in online news.

The results of the study indicate a growing interest and engagement with the metaverse in South Korea. People have been actively exploring and embracing the virtual world for various applications, viewing it not only as a gaming platform but also as a medium for social interaction, education, and business opportunities [55,56]. The analysis of the two years 2020 and 2021, during the pandemic, reveals an acceleration in adoption of the metaverse. As people sought alternative ways to connect, learn, and experience events in virtual settings [57], major technology companies played a significant role in shaping the metaverse landscape in South Korea.

The metaverse, particularly in the context of game-based learning, virtual environments, and related technologies, shows promise in enhancing student engagement, motivation, and learning outcomes in educational settings. It provides a flexible and immersive platform for education, with potential benefits in various academic fields [58,59]. Social benefits for younger users have been reported; these assert that these technologies allow students to interact with their peers efficiently [60]. There was a shift from interest in gaming and entertainment to financial and investment-related topics, as reflected in the keywords searched for between 2020 and 2021. This shift may be due to the involvement of older adults in the metaverse [61,62]. A survey conducted in December 2021 revealed that around 74 percent of US citizens were interested in adopting or joining the metaverse [63].

The CONCOR analysis of 50 keywords in the study indicates three clusters in 2020 and four in 2021. In 2020, the discourse focused on the emergence of the metaverse as a new way of interacting without physical presence. The news and media aimed to explain the concept and meaning of the metaverse with primary discussions being related to gaming and events. The analyses also highlighted the metaverse’s role in social interaction, with a particular focus on virtual reality and unique experiences. In 2021, the presence and

development of the metaverse expanded into various fields like business and technology in South Korea. The discourse was multifaceted and predominantly revolved around financial opportunities and educational purposes along with virtual experiences, entertainment, and cultural trends.

The appearance of the keyword “COVID-19” in 2020 indicated that the discourse on the metaverse gained popularity again, possibly due to the COVID-19 pandemic. This sparked an increased interest in virtual spaces that go beyond the limits of physical space and time [61]. The metaverse has been recognized as a potential new business model in the virtual economy, drawing attention from investors as a lucrative investment opportunity [64]. Furthermore, the metaverse is linked to advancing technologies such as XR, AR, and blockchain [65].

The analysis also indicates the involvement of all age groups in this discourse [66]. Initially, primary users were young gamers in their teens and twenties who were already very comfortable with digital spaces and virtual socializing. However, with the listing of metaverse-related stocks on the market, individuals in their thirties and older have also begun to take notice of the metaverse.

Based on this text-based analysis of the online news data, it can be assumed that the metaverse has passed the first stage—the “Innovation trigger”—among the five stages and has entered the curve of the second stage, “The peak of Inflated Expectations” in Gartner’s Hype Cycle. Gartner’s Hype Cycle provides a graph that reflects how market expectations and acceptance of new technologies mature over time [67]. The X-axis represents the passage of time, and the Y-axis shows the public’s expectation measured through the news volume, news sentiment, and web and market research data indicators [68]. The metaverse, a combination of innovative technologies such as XR, AI, Blockchain, IoT, etc., has generated high expectations among the public. However, the rapid increase in expectations has also raised concerns that they may decrease just as quickly when faced with technical limitations during commercialization. It is possible for a technology to quickly enter the third stage, the “Trough of Disillusionment”, in the hype cycle. This happens when market expectations drop due to negative public opinion, often signaled by the use of terms such as “buzzword” and “temporary fad” [68].

It is crucial to consider the impending challenge of the lack of institutional, legal, and ethical guidelines to address virtual crimes. Notably, in 2021, Group 3—“Metaverse Platform and Education of the MZ Generation”—already included the keyword “Sexual assault”. Several news reports have emerged regarding digital sexual harassment, which involves actions such as forcibly abusing or similarly violating an opponent’s avatar in the metaverse platform [69]. Nevertheless, there is a noticeable absence of discourse addressing follow-up measures that should be taken in this regard.

6. Conclusions

This study employed big-data-driven approaches with text mining and SNA to investigate the evolving social issues related to the new concept of the metaverse in South Korea. Following the refinement of online news portal text, the extraction of 50 keywords, and the implementation of CONCOR analysis and visualization, notable shifts were observed in social issues, public interests, and the age groups associated with the metaverse in South Korea. These changes span from the initial introduction of the concept to the public during the non-contact era imposed by COVID-19 restrictions to the expanded stage marked by the launch of various metaverse platforms and service providers.

However, as public expectations for new technologies have surged, there is also a sense of concern regarding the continuous growth and management of the metaverse. To ensure the sustainable growth of the metaverse, medium- and long-term support for both the private and government sectors is deemed essential. This support is crucial for the advancement of various devices related to technologies such as 5G, AI, big data, XR, and digital twins. Also, attention must be directed towards policy making concerning digital ethics, cybercrimes, and other social problems. In conclusion, the metaverse is experiencing

significant traction in South Korea, driven by technological advancements, evolving social trends, and the potential for diverse applications.

7. Research Challenges and Limitations

The present study offers valuable insights into the metaverse discourse during the two years 2020 and 2021, but it is essential to acknowledge its possible limitations. A challenge in contextual disambiguation arose, given that certain words could have multiple meanings and interpretations. Although efforts were made to ensure accurate connections during the analysis, some words may have been subject to misinterpretation. Also, relying on online news data introduces inherent biases as online news resources may prioritize specific characteristics of popular topics and potentially be filled with biases [70,71]. The relatively short period used for this study may limit its ability to capture long-term trends and historical context related to the metaverse in South Korea. The findings from this study may not be easily generalized beyond the South Korean context, as cultural, regional, and demographic factors can influence the discourse and public engagement with the metaverse.

8. Future Implications

As publicly generated media channels diversify and gain a wider dominance, future investigation approaches can be designed to explore other SNS channels of big data such as blogs, YouTube, and more. In addition, it is important to carry out more in-depth analyses along with data analytics including empirical research such as interviews or surveys with the users who actively engage in the virtual world of the metaverse. In addition, given the dynamic and evolving nature of the metaverse [24], continuous follow-up research is needed to track its social impacts and challenges over time. It would be intriguing to compare the popularity of the term metaverse with other search terms to determine the interest in it among the population as compared to other digital transformation areas. This comparison will provide valuable insights into the level of public interest in the metaverse relative to other important digital trends.

Author Contributions: E.J.K. and J.Y.K. contributed toward data analysis, drafting and revising the paper, and agreed to be responsible for all aspects of this work. All authors have read and agreed to the published version of the manuscript.

Funding: This research is supported by Ministry of Culture, Sports and Tourism and Korea Creative Content Agency (Project Number: R2020040243).

Data Availability Statement: The data available in this study can be found on request from the corresponding author.

Conflicts of Interest: The authors declare no conflict of interest.

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