

## Analyzing XR(eXtended Reality) Trends in South Korea: Opportunities and Challenges

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### Abstract

*This study used text mining, a big data analysis technique, to explore XR trends in South Korea. For this research, I utilized a big data platform called BigKinds. I collected data focusing on the keyword 'XR', spanning approximately 14 years from 2010 to 2024. The gathered data underwent a cleansing process and was analyzed in three ways: keyword trend analysis, relational analysis, and word cloud. The analysis identified the emergence and most active discussion periods of XR, with XR devices and manufacturers emerging as key keywords.*

**Keywords:** XR, eXtended Reality, Text Mining, BigKinds, Keyword Trends, Associated Word Analysis, Word Cloud

### 1. INTRODUCTION

The XR market is forecasted to grow from \$18.96 billion in 2021 to \$100.77 billion by 2026, with an expected annual growth rate of 39.7% [1]. This market is segmented into entertainment (including gaming and social applications), education and industry, as well as the emerging personal and experiential use. The interest in XR content has grown following the COVID-19 pandemic, which has led to an increase in remote living and subsequently, the market growth. Recently, Apple released the 'Apple Vision Pro', equipped with a range of advanced technologies, and the sharing of real user experiences online has further increased interest in XR.

XR refers to all combined real and virtual environments and human-machine interactions created through computer technology and wearable devices [2]. It encompasses Virtual Reality (VR), Augmented Reality (AR), Mixed Reality (MR), and other virtual interactive environments [3].

The XR technology is being utilized in various fields, with notable advancements in the medical sector. Recent technological developments have led to the use of robots in therapy and VR in rehabilitative activities [4]. VR-based rehabilitation, in particular, is recognized as an effective intervention method for improving upper limb functions in stroke patients, and it's found to be more effective when combined with traditional methods [5]. Moreover, VR training is reported to be more effective than conventional training in enhancing overall cognitive functions, concentration, and executive functions [6].

XR has the advantage of enhancing realism, infinitely expanding virtual spaces, and enabling free expression. This has prompted global companies and governments to invest in research and development to expand the XR ecosystem [7]. This underscores the significance of research on XR, capable of infinitely expanding space and time. This study aims to identify key points of interest in XR within the South Korean market and predict future trends and opportunities using text mining techniques. This will allow for a deeper consideration of the trends and opportunities in the XR market.

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## 2. UTILIZING TEXT MINING FOR TREND ANALYSIS

Text mining is a technology for extracting useful information from large volumes of unstructured text data. This allows for the identification of changes and characteristics in XR trends[8]. It enables a more in-depth analysis of trends based on objective data. Text mining assists in quantitatively identifying the key characteristics and changes in XR, and is also beneficial in considering the direction of the XR content market[9]. This is because text mining leverages natural language processing and machine learning algorithms to identify core themes, patterns, and relationships.

The scope of text mining applications is broad, encompassing sentiment analysis, topic modeling, trend analysis, content summarization, clustering, and more. Among these applications, there are three principal techniques vital for understanding interactive content. The first is 'topic modeling', a process that uncovers fundamental topic structures by examining the weights and frequencies of extensive data available online. In this process, topic identification hinges on selecting the most frequently used topics and analyzing the usage history of content users. However, for the accurate collection of data through this method, setting precise search terms is crucial. Excessive search terms may lead to redundant topics, while too few can oversimplify the extracted data. Topic modeling delves into and categorizes vast text data to simplify information comprehension, although it demands user discernment to interpret the data's meaning. Following this, 'trend analysis' is a technique that gathers information to identify specific patterns or trends based on the collected data. It's an instrumental tool for comprehending market dynamics and consumer behavior, thereby enhancing future predictability. This technique finds application in various sectors such as marketing, advertising, retail, e-commerce, fashion, beauty, technology, IT, and the travel and hotel industries. By pinpointing trends, businesses can develop strategic plans and allocate resources efficiently based on these trends. Lastly, 'clustering' is an unsupervised learning approach in machine learning and data mining, which groups data points into clusters based on their similarities. Hierarchical clustering generates trees to facilitate understanding of the hierarchical relationships among data points. It methodically organizes substantial amounts of unstructured text data, enabling intuitive recognition of related information and allowing observers to infer the primary topic or theme.

Collectively, these technologies enhance the understanding of XR trends and characteristics, providing profound insights into market trends and consumer reactions. Consequently, text mining proves to be an invaluable tool, offering data-driven insights to content creators in the XR content market.

## 3. RESEARCH SUBJECT AND METHODOLOGY

### 3.1 Keyword Extraction

This study draws on data amassed over approximately 14 years, from February 2010 to February 2024, a period marking the emergence of the term 'XR' in South Korean media. XR has been utilized in the context of the growing use of virtual and augmented reality technologies via electronic devices. Initially, XR was linked to the necessity for a more encompassing concept that would amalgamate virtual and augmented reality, despite their distinct features.

Utilizing text mining techniques, Big Kinds provides the capability to analyze roughly 70 million online articles supplied by a total of 54 entities, including daily newspapers, broadcasters, and specialized magazines. In this study, BigKinds served as the analytical tool for extracting pivotal keywords. 'XR' was the chosen search term for keyword extraction. To bolster the reliability of the findings, the integrated categorization was confined to IT skills. The search terms underwent morphological analysis, and six keywords, namely AR, VR, device, Samsung, Apple, and Meta, were incorporated to preserve result validity. Furthermore, the precision of the base data was enhanced by eliminating redundant content and advertising articles encountered during the search.

### 3.2 Data Analysis

The analysis of the study data encompassed three primary phases. The initial phase was the research data

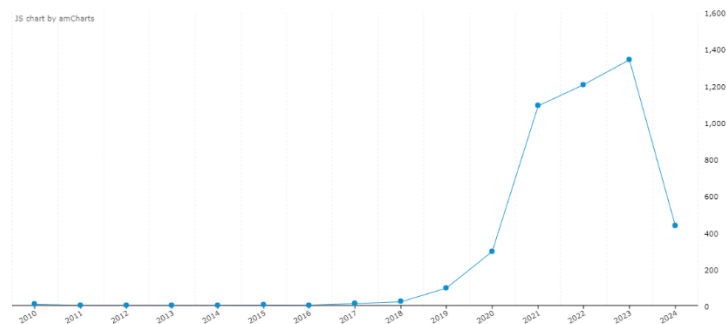
collection stage. In this stage, media outlets were selected, key keywords established, and corresponding words determined, followed by data collection through online web scraping. The second phase involved the data cleansing process, where data that had low relevance to the main keywords were excluded from the collection. The third and final phase was data visualization. This phase included a keyword trend analysis, which graphically represented the extracted keywords over time, and a relationship analysis, which visually depicted the network connections by categorizing the extracted data into groups like people, places, organizations, and keywords. Additionally, a word cloud was utilized to visually display the words with the highest frequencies and weights.

## 4. RESEARCH FINDINGS

From February 1, 2010, to January 31, 2023, a total of 3,170 records were initially collected. However, after filtering out data with low relevance, the study proceeded with an analysis based on 2,854 refined records. This refined data was then visualized through keyword trends, relational analysis, and word cloud. Such visualization techniques help in gaining a clearer understanding of the key characteristics and patterns in the data.

### 4.1 Keyword Trends

XR, first mentioned by a domestic media outlet in February 2010, did not attract much attention for about a decade. During this period, while online and gaming content grew with the development of smartphones, XR remained relatively under the radar. However, as illustrated in Figure 1 below, interest in XR began to increase with the onset of the COVID-19 pandemic. It seems that as discussions about the metaverse became more active, XR also started gaining attention.



**Figure 1. Chang of Keyword Trend**

During the COVID period, XR consistently received attention and reached a peak with the launch of innovative products like Samsung's XR device and Apple's 'Apple Vision Pro'. However, these devices haven't brought significant changes in real-life applications, and a trend of decreasing interest in XR is observed, following the continuous flow of negative user reviews.

### 4.2 Relational Analysis

Relational analysis visualizes the network of connections between entities extracted from the top 100 accurate news analyses in the search results. In this context, 'weight' represents the importance of each connection, and in this case, the weight was set at 9 based on the number of related articles. Based on this setting, the results are as following figures.

In the relational analysis, it's interesting to note that manufacturers like Samsung Electronics, Meta, and Apple have formed significant connections in relation to XR. This suggests that XR devices are still not widely used in general, indicating an early stage in the effort to boost device distribution. The media has been paying much attention to new product launches by these manufacturers, especially the releases of Meta's budget-friendly XR device 'Meta Quest 3' and Apple's 'Apple Vision Pro' which have garnered significant interest.

Furthermore, a notable point in this analysis is the national focus related to XR, predominantly centered around the United States, China, and Japan. The U.S. holds a key position in the current XR trend, reflecting its role as a major driver in the XR market for both devices and content. This information is crucial in understanding the global trends of the XR market and identifying the leading players in the field.

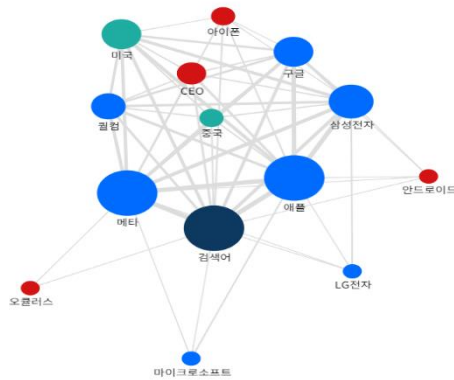


Figure 2. Relationship Analysis Result

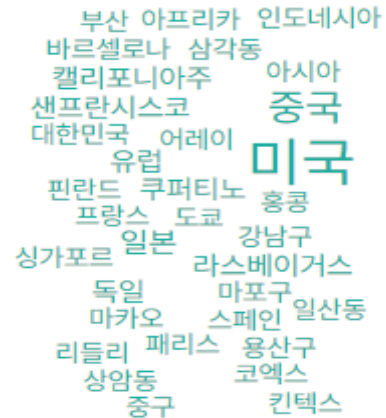


Figure 3. Results of Location-Centric Relational Analysis

### 4.3 Word Cloud

Using a word cloud to assess the significance of keywords exposed in the media, based on their weight, is a highly effective analytical method. XR ranking first in the word cloud indicates that this term is receiving significant attention in the current market. Given that XR is still a relatively new and unfamiliar term, it's likely that there has been considerable media exposure around it.

Table 1. Word Cloud Result Ranking

순위	키워드	가중치	빈도수	순위	키워드	가중치	빈도수	순위	키워드	가중치	빈도수
1	XR	449.2	4936	11	페이스북	34.7	266	21	LG	16.0	1107
2	퀄컴	69.8	881	12	eXtended	32.6	77	22	Virtual	13.44	31
3	LG유플러스	61.3	524	13	VRAR	31.2	393	23	가상공간	13.43	208
4	스마트폰	59.3	739	14	CES	24.7	309	24	OLED	13.3	392
5	AI	59.0	1141	15	업무협약	21.6	95	25	기업들	11.9	391
6	헤드셋	49.8	1025	16	신기술	21.5	210				
7	구글	48.4	788	17	MWC	19.7	176				
8	인공지능	45.3	291	18	LG이노텍	17.9	175				
9	Reality	44.4	184	19	MSIT	17.6	104				
10	가상세계	36.7	285	20	MS	16.2	228				

The high ranking of companies like Qualcomm, LG Uplus, and Google suggests their various activities to gain a foothold in the XR market, as well as their business collaborations and strategic alliances like the 'XR Alliance', have been extensively reported. This indicates that these companies play an important role in the XR market and points to increasing competition in this field.



**Figure 4. Word Cloud Result**

The word cloud from the research results clearly reflects the current state and important trends of the XR market in three major categories. Firstly, there's the XR device manufacturers category. The prominence of keywords related to global companies like Qualcomm, LG Uplus, Google, and Facebook indicates their key role in the development and distribution of XR technology. The high weight and frequency of these companies underscore their influence in the market and the significance of XR technology. Secondly, the XR technology category is noteworthy. Given that XR is still a relatively new concept to the general public, the attention drawn to various technologies that make up XR, such as virtual worlds, VRAR, and virtual reality, in the word cloud is significant. This highlights the diverse exploration of XR technology and plays a crucial role in enhancing understanding and awareness of related technologies. Lastly, the XR-related technology category. The increasing focus on AI and Artificial Intelligence, and their use in overcoming the technological limitations of XR by designing virtual worlds with generative AI, is particularly noteworthy. This points to the future direction of XR technology, demonstrating an exploration of new possibilities through technological innovation.

## 5. CONCLUSION

This research utilized BigKinds based on news data from South Korean media outlets to analyze trends in XR. Through keyword trends, relational analysis, and visualization via word cloud, this study was able to discuss when and in what aspects XR is gaining attention, and the importance of XR devices.

The research led to the following implications. Domestic interest in XR began around 2010, primarily focusing on AR functionalities using smartphones. However, due to a lack of practical applications, it did not gain significant public attention for the next decade. This changed with the COVID-19 pandemic, as XR, closely linked to the socially popular metaverse, began to attract attention. Additionally, following the emergence of ChatGPT, the connection between popular AI technologies and XR led to increased attention for XR as a future technology. This indicates that XR is recognized as a forward-looking technology in Korea, yet it still lacks widespread public awareness and has not become a dominant device in everyday life like smartphones.

In the domestic market, Samsung and LG play significant roles in the XR market, building alliances with global companies. As the devices evolve, the use of XR is increasing, highlighting the growing importance of XR content. Currently in the device development stage, XR content is expected to play a central role in the future. This underscores the need to strengthen content capabilities.

The XR market is continuously growing, and global companies and national governments aim to achieve

new innovations through the development of XR devices and technology. This research is intended to assist in understanding the current state of XR and contemplating its future direction.

## REFERENCE

- [1] KDI, “Global Trends and Policy Implications in the XR Device Industry”, 2023, pp.53~54. [www.kiet.re.kr](http://www.kiet.re.kr)
- [2] F. Asa, L. Gong, D. Li, “Testing and validating Extended Reality technologies in manufacturing”, *Procedia Manufacturing*, 25, 2018, p. 32. <https://doi.org/10.1016/j.promfg.2018.06.054>
- [3] D. Reiners, et al., “The Combination of Artificial Intelligence and Extended Reality: A Systematic Review”, *Frontiers in Virtual Reality*, 2, 2021, p. 2. <https://www.frontiersin.org/articles/10.3389/frvir.2021.721933/full>
- [4] W. Park, J. Boo, B. Kim, “The Effect of Virtual Reality Rehabilitation Program on Upper function, Cognition and Activity of Daily of Living in the with Stroke Patients”, *JCCT*, 2024, p.196. <https://dx.doi.org/10.17703/JCCT.2023.9.4.195>
- [5] A. Turolla, M. Dam, L. Ventura, P. Tonin, M. Agostini, C. Zucconi, L. Piron, “Virtual reality for the rehabilitation of the upper limb motor function after stroke: A prospective controlled trial”, *Journal of Neuroengineering and Rehabilitation*, 10(1), 2013, pp.1~6.
- [6] A. Faria, A. Andrade, L. Soares, S. Badia, “Benefits of virtual reality based cognitive rehabilitation through simulated activities of daily living: A randomized controlled trial with stroke patients”, *Journal of Neuro Engineering and Rehabilitation*, 13 (1), 2016, pp.1~11.
- [7] H. Kim, “A Study on Optimization of User Interaction through the Analysis of Artificial Intelligence Art in Extended Reality”, *Cartoon & Animation Studies*, 72, 2023, pp.500~501. DOI : 10.7230/KOSCAS.2023.72.499
- [8] S. Lee, “Analysis of Miryang Tourism Trend Using News Big Data”, *APJCRI*, 9(9), 2023. <http://dx.doi.org/10.47116/apjcri.2023.09.21>
- [9] S. Lee, “Analyzing OTT Interactive Content Using Text Mining Method”, *JCCT*, 9(5), pp.859~861. <https://doi.org/10.17703/JCCT.2023.9.5.859>