

Progress of Research and Trend of China Digital Exhibition Space—Based on CiteSpace Visual Analysis of Chinese Journal Literature from 1999 to 2023

Jiarui Chen^a, Yao Liu^b, Pengjun Wu^{c,*}

Daegu University, Daegu City, South Korea

^achenjiarui423@163.com, ^b52313786@daegu.ac.kr, ^cwupengjun@daegu.ac.kr

*Corresponding author

Keywords: Citespace; Digital; Exhibition Space; Knowledge Graph

Abstract: This paper studies the development of Chinese digital exhibition space and the construction of knowledge graph. Through the metrological analysis of 499 related documents of CNKI, the historical development and current trend of digital exhibition space are discussed. The research method used CiteSpace data visualization analysis software to analyze the number of literature publications from 1999 to 2023, and found two significant stages of development: the exploration stage from 1999-2010 and the rapid development stage from 2010-2023. Research has shown that the digital exhibition space can significantly improve the exhibition experience and promote cultural communication, but attention should also be paid to avoid excessive digitalization to keep the exhibition interesting and artistic[1]. With the introduction of digital technology, the information acquisition of the exhibition space has become more intelligent and convenient, providing an immersive and interactive experience for the audience. This study provides an important reference for the digital design and application of the exhibition space in the future.

1. Introduction

1.1 Digitalization Becoming the Mainstream of the Current Development

With the promulgation of the 14th Five-Year Plan of China, the goal of "accelerating the construction of digital China and promoting the digital strategic development of cultural industry" is put forward. The digital trend of cultural industry is not only the trend of world development, but also an important direction of China's future development[2].

Due to the development of science and technology and the improvement of people's consumption level, the era of digital technology has arrived. It constantly facilitates us in life, such as smarter chips with stronger computing power, self-driving cars that can provide auxiliary driving functions, and smart wearable devices connecting virtual and real things. Similarly, digital technology also brings different vitality to the exhibition space, which makes it significantly different from the traditional exhibition space in terms of information acquisition experience and immersive atmosphere. The functions of domestic art exhibition halls are lack of digital design.

Compared with the West, it started late in the use of digital technology, and digital exhibition has become a trend. With the support of this technology, the audience can not only enjoy the classic works of art, but also experience the latest holographic projection art. This immersive experience and interactive design enables the audience to better communicate and interact with the art. For example, visitors can access the world of paintings through virtual reality devices, or even "talk" with the people in the work. In his research, Zhang Zikang (2022) proposed the digital intervention exhibition space, which can to some extent help the visitors to spread their thinking, expand their imagination and establish a connection with the exhibition collection[3]. These digital elements not only enrich the content of the exhibition, but also greatly improve the exhibition experience.

1.2 The Introduction of the Digitalization of the Exhibition Space

Exhibition space refers to the space for the display and display of items. Through the design, people can better obtain cultural information and emotional value in such a space. The introduction of digital technology makes the information acquisition in the exhibition space more intelligent and convenient. Viewers can quickly access the information they need through smart devices, getting rid of the dependence on paper tour guides. For example, in a museum or exhibition hall, visitors can use a mobile app to scan a QR code to immediately obtain detailed information, historical background and multimedia materials. This method not only improves the efficiency of information dissemination, but also enhances the audience's sense of participation and interaction.

The advantages of digital exhibition space are also reflected in its flexibility and scalability. Due to the limitation of physical space in the traditional exhibition space, the display content is often limited. However, digital technology can break through these limitations and display more content through the extension of the virtual space. Ge Yan (2000) put forward the comparison between the virtual exhibition space and the traditional exhibition space in his research, and put forward the digital exhibition space, which has the characteristics of strengthening the reality of viewing the exhibition[4]. For example, in a themed exhibition, the organizer can use virtual reality technology to display the exhibits from several different locations, so that audiences can experience the works of art around the world in a space.

In addition, the digital exhibition space also provides a new way for academic research and data analysis. Through digital means, the audience's behavior and feedback can be more accurately recorded and analyzed, so as to provide important data support for the exhibition planning and design. For example, by analyzing the trajectory of the audience's behavior and the residence time in the exhibition, we can understand which exhibits are the most popular, so as to optimize the layout and content of the exhibition.

2. Review of the Digital Literature of the Exhibition Space

2.1 Showing the Value of Digital Space

With the addition of digitalization, the exhibition space also embodies different values. Mao Wenlin (2023) put forward the relationship between digitalization and art museums with a strategy on how to use art museums for innovation[5]. Centering on the research of digital technology equipment, digital information management, digital art collection, and drawing the conclusion that using digital empowerment to bring innovative value to the space.

2.1.1 Increasing interactivity and engagement

In the design and operation of the modern exhibition space, the introduction of digital technology

has greatly enhanced the interactivity and participation. With the development of science and technology, the exhibition space is gradually changing from object-centered to people-centered, and the application of digital technology has significantly improved the audience's experience. Peng Jing (2023) pointed out in relevant research that the future development direction of exhibition space will be changed from "things" as the center to "people" as the center, and put forward the importance of human experience in the exhibition space, and digital technology should be used to intervene in the aspect of experience. The addition of digital technology can effectively improve the interaction between the visitors and the digital art space. Wang Zhaohui, et al. (2023) proposed in the research that in the exhibition space, they would combine immersive experience space with new media video technology, interactive experience space and virtual reality technology, and two combination ways to improve the experience sense of the visitors[6]. Through virtual reality technology and augmented reality technology as a bridge, and the audience to link. LuSha scholars (2021) in the research on the digital space design of digital equipment application, on the equipment selection provides advice, such as: multi-channel ring curtain projection technology, phantom imaging technology, 360 degrees holographic imaging technology is widely used, and this kind of intelligent equipment, brings the difference from general exhibition space immersive experience, can make the exhibition crowd more intuitive understand the content of exhibition space want to show[7]. Zhao Liyuan (2023) discussed the application of digital museum exhibition in his research, put forward suggestions on using multimedia, AR, VR and holographic technology to improve the effect of museum exhibition, and emphasized the role of digitalization in enhancing the experience and cultural value between visitors and artworks. Visitors can interact with the exhibition space through devices such as the digital exhibition space[8]. In these ways, it increases the interest and enhances the sense of participation of the visitors. Because of the addition of digital, it brings unexpected surprises to the whole space.

2.1.2 Improving the display efficiency and display effect

Digital exhibition space has significant advantages in improving the display efficiency and display effect. First of all, compared with the traditional exhibition mode, the digital exhibition is more efficient and convenient. By collecting, processing and displaying the collection information of physical museums, the efficiency of information dissemination can be greatly improved, the difficulty of audience obtaining information can be reduced, and the overall display efficiency can be improved.

In terms of the display effect, the application of digital technology makes the display mode more diversified and innovative. For example, by introducing the concept of multi-dimensional spatial display such as object display, three-dimensional simulation and animation production, the audience can stimulate their thinking and improve the exhibition experience. Digital art display combined with photoelectric technology can not only better play the cultural value of exhibits, but also create emotional changes that attract, expectation, shock and aftertaste through reasonable allocation of digital equipment. In addition, the digital technology can also provide an immersive experience and interactive design through virtual reality and holographic projection, allowing viewers to interact and communicate with the exhibits at a deeper level. This not only enriches the exhibition content, but also greatly improves the exhibition experience.

Therefore, compared with the traditional exhibition method, the digital exhibition space has obvious advantages in improving the exhibition efficiency and effect, which not only improves the efficiency of information dissemination, but also enhances the audience's sense of participation and interactivity.

2.1.3 Cost and resource saving and sustainable development

Digital ZhanChen space in addition to the offline form of digital technology experience, but also can be based on the Internet as the carrier of online exhibition form, ming-ming zhao (2023) in the study of digital online exhibition mode, online exhibition mode can not only save cost, also can become the entity ZhanChen space to create the next economic growth point[9]. Reduce the cost of offline entity site and artificial need, for the purpose of cost saving, under the background of the era of new crown outbreak, due to the epidemic blockade, the new way of home office also popular, people at home can work, through online can learn, and meet the entertainment, the emergence of these behavior, also proved the feasibility of online digital display space. Visitors will go through online channels, and this trend will develop with the development of the Internet era, with the ability of sustainable development. In her research on digital museum, Liang Baoying (2021) proposed the intelligent system with the intervention of digitalization and the combination of "people", "things" and "data", and proved the role brought by digitalization as the link between the three[10]. Combined with the research content and the description of the three parts of this paper, the above three parts reflect the advantages of digital exhibition space compared with the traditional exhibition space, as well as the value of digital exhibition space after digital transformation.

2.2 Show out the Development of Digital Space

With the emergence of digital collections and the development of digital art, the content of the exhibition is no longer limited to the traditional material form, but is presented in the vision of the visitors in the form of digital. Compared with the traditional exhibition space, the addition of digital significantly enhances the interactivity and experience of the whole space. The digitalization of exhibition space is an inevitable trend of future development. With the intervention of digital technology, traditional art museums and museums, can prolong their vitality and maintain sustainable development. Guo Qiaoqiao (2020) takes the Taiyuan Art Museum of China as an example, combined with the research content of digital exhibition space. It puts forward the leading advantages of traditional art museums and digital art museums in exhibition content, time, space utilization and so aspects[11].

There is usually a certain sense of distance and boundary between the collections in the traditional exhibition space and the visitors, and the audience can only appreciate and understand these collections through the vision. But the advent of digital collections has broken this limitation, allowing visitors to not only see the exhibits, but also "touch" them through interactive devices. Tao Chen (2023) emphasized the importance of improving the interaction of the visitors in the exhibition space, which can provide emotional value and deepen the memory point of the visitors for the displayed objects[12]. Combined with the above content, it shows that the application of digital technology not only improves the interactivity of the exhibition, but also increases the sense of participation and immersion of the audience.

Digital exhibition space can also create an unprecedented viewing experience through virtual reality, augmented reality and other technologies. Jia Wenjing (2024) studies the combination of digital media, analyzes the relationship between dynamic and static media links in the digital space through human spontaneity and initiative, so as to enhance the interaction between visitors and the digital exhibition space[13]. Combined with the research content, the importance of intelligent equipment for digital exhibition space is proved. For example, visitors can enter a completely virtual exhibition world through wearing VR glasses and have deep interaction with digital collections. Ren Fei, Sui Nan (2024) pointed out in their research that there is the problem of insufficient space inside the traditional exhibition space, and digital intervention can extend the exhibition space in three-dimensional space, thus improving the utilization rate of space[14]. The

development of digitalization has injected new vitality into the exhibition space, making the exhibition content more rich and diversified, and also enhancing the audience's sense of participation and experience, and breaking the limitations of the traditional exhibition space.

2.3 Digital Utilization of Exhibition Space

ZhanChen the development of digital space, exists in digital intervention ZhanChen space intelligent management and operation mode, inside the entity space, through the digital Internet and big data analysis, the entire exhibition space data monitoring, such as the digital lighting brightness inside the exhibition hall, and specific exhibition hall temperature humidity, and the whole exhibition space air quality, by the digital calculation, to adjust the best state of the digital exhibition space, in order to provide the best experience for the exhibition. Chen Jian (2022) considered the importance of digitization in the use of exhibition space, proposed the human-led use of space, and emphasized the importance of human spiritual and physiological needs in the space [15].

The digital intervention helps in the data push of the exhibition content in the exhibition space, visitors can not only through the digital information to understand the exhibition content, can also according to personal preferences to free, Sun Hongxia (2023) in the research on the study of sustainable development, and points out in the design of exhibition space, to consider the design life periodic changes, and reduce the damage to the environment for aesthetic design, emphasize the sustainable development of design. Compared with the traditional exhibition space, the digital exhibition space gets rid of the paper introduction and reduces the waste of resources[16]. Compared with the traditional exhibition space tends to be simple design, with sustainable development, and this design can also improve the exhibition efficiency of the visitors.

However, there are also problems that need to be paid attention to in the problem of digital utilization. The design of the digital exhibition space cannot pursue excessive digitalization, and excessive digital design will lead to the loss of interest of the display space, which should be combined with the view of artistic design. In the exhibition space, reduce the digital design of transition, how to reasonably use digitalization in the space, on the premise of increasing interest and giving play to the advantages of digitalization, and avoid excessive digitalization, is the problem that needs to be paid attention to in the transformation process of the traditional exhibition space.

3. Data sources and study methods

3.1 Data Sources; Sources of Date

In this article, we will study, With "digital exhibition space" as the theme keyword, Advanced search of academic journals mainly on CNKI (CNKI), Set the document source as "CSSCI", "SCI", "EI", "AMI", "CSCD", "EI", "Peking University Core", By ranking the correlation with keywords and core content, Read it carefully, Exclude meeting notice, Irrelevant content entries such as news reports, A total of 499 usable research articles were obtained, Using the literature from CNKI (CNKI), And exported as the Refwork format for the study, These include: key words, author, Research units and other first clearance content. The above contents were imported into the study samples and analyzed, and the search time was up until December 30, 2023[17].

3.2 Research Technique; Research Method

The research method used in this article is the Cite Space data visualization analysis software

written by Professor Chaomei Chen from the Institute of Computer and Intelligence Science, Drexel University. About the main functions of Cite Space include bibliometric analysis, bibliometric analysis refers to the visual research method, show the required knowledge structure and discipline knowledge distribution and distribution, and generate visual knowledge map, so as to better explore scholars need to understand the field of research hotspot, research of frontier information integration, related content of the main author and institutions and other related information data induction.

4. Visual Analysis of the Bibliometric Results

4.1 Analysis of post volume

According to the above steps, 499 selected articles with the theme of "digital exhibition space" were input into CiteSpace data visualization analysis software for the amount of the digital exhibition space research. It can be seen that the earliest related literature of "digital exhibition space" was released in 1999, which shows that the research on the concept of "digital exhibition space" had been produced before 2000. Combined with the content of "timeline and related literature publication trend", this study divides the 24-year time line from 1999 to 2023 into two parts to analyze the development of "digital exhibition space", which is shown in Figure 1 and Figure 2[18].

(1)The exploration stage of "for the application of digital technology"

(2)During the time line span of 1999-2010, This timeline interval spans 11 years, During this time eline, The overall number of documents showed a stable trend, This time period, Is about the exploratory phase of the application of digital technology research, However, in 2004, the number of relevant documents was obviously prominent compared with the previous one, Combining the background of this time period for the analysis, In 2004, The State Council of China held the second meeting of the government work report, Among them, the fourth point of the future development direction points out that " continue to implement the strategy of rejuvenating the country through science and education, Adhere to the road of sustainable development. " China has increased its investment in digital technology resources, Promoting the integration of digital science and technology with industrial culture, The related industries to get rapid development[19].

(3)The development stage of "for the application of digital technology"

The time line span is from 2010 to 2023, and the interval span is 13 years. In this time line interval, the overall number of documents shows an upward trend. This time period is about the rapid development stage of the application of digital technology. In 2023, the number of relevant documents reached the highest point in the 24-year time line interval. Combined with the background of the time analysis, in 2023 Chinese countries issued the digital China construction overall layout planning, in the planning of the policy, China once again affirmed the support of digital technology application, and released more policy support for digital science and technology, visible in 1999-2010 exploration phase process obtained the results, confirmed the importance of digital development, prompted the rapid development of digital science and technology, and make it the cause of the future development direction[20].

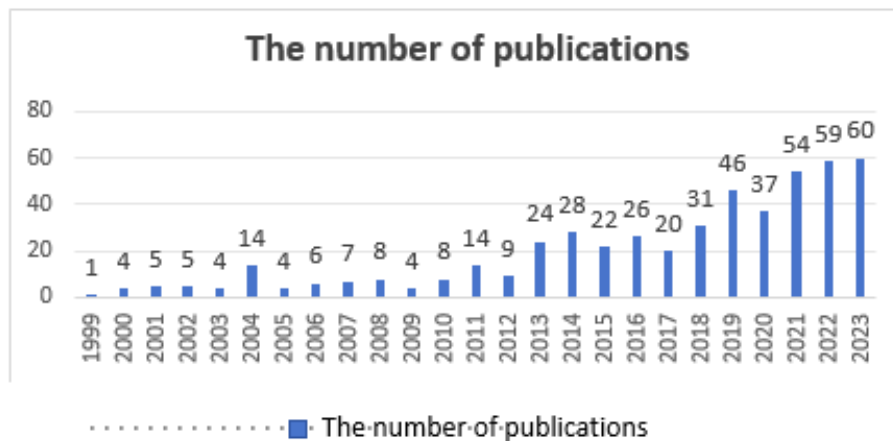


Figure 1: Timeline and amount of related documents (Photo source: author)

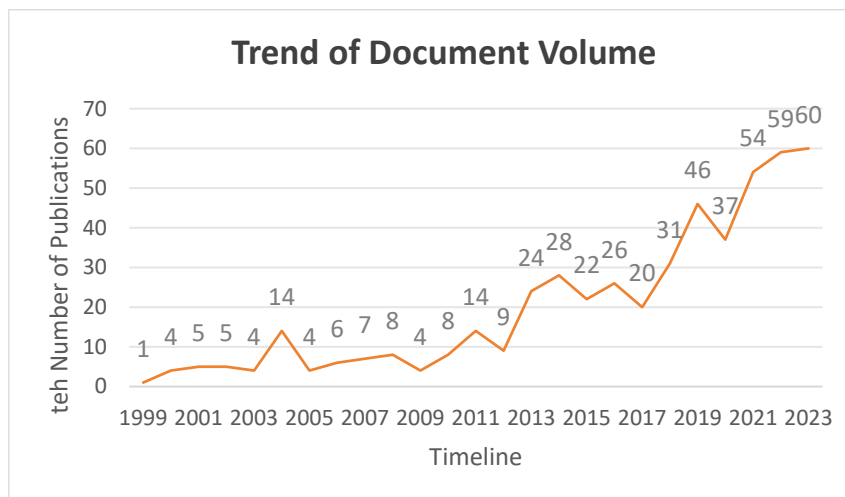


Figure 2: Time line and trend of related documents (Photo source: author)

4.2 Visual Analysis of Keyword Co-Occurrence

According to the CiteSpace data visualization software, Can get the required keyword information display, According to the following (Figure 3), you can clearly get the required keyword information, Where N represents the number of keywords obtained from this visualization study, E represents the number of linked line segments between the keywords, Density Numerical content is expressed as the network distribution density, According to the above content analysis, There are 325 keywords ($N=325$), The total number of links between keywords is 679 ($E=679$). It can be seen that this research direction covers a wide range of areas. There are many majors and disciplines involved. And it had a connection with it. The value of network density is 0.0129 ($Density=0.0129$). It can be seen that in this field, although there are links between keywords, the field of keyword distribution is relatively scattered.

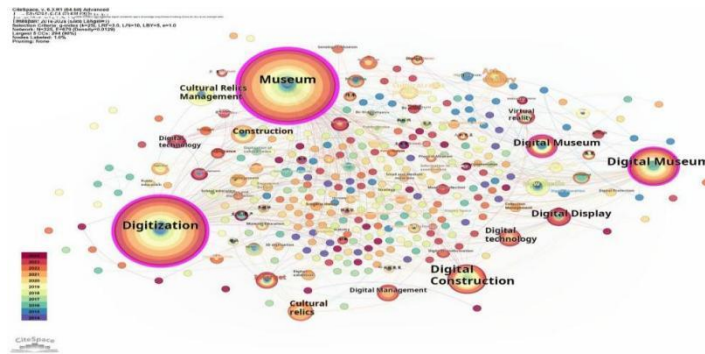


Figure 3: Cluster map of "digital exhibition space" (photo source: author self-drawn)

In this study, using CiteSpace to visualized the digital exhibition space, as detailed in Table 1. We obtained the top 16 keywords by frequency. And the frequency of use from high to low order arrangement, Key words are: the first "museum" (use frequency of 148 times, The centrality degree was 0.7, Year: 2014), The second "digital" (133 times, The centrality degree was 0.59, Year: 2014), The third "digital museum" (used 40 times, A centrality degree of 0.33, Year: 2014), The fourth "digital construction" (use frequency of 30 times, The centrality is 0.07, Year: 2014), The fifth "Digital museum" (used 14 times, The centrality degree was 0.13, Year: 2014), The sixth "cultural relics management" (use frequency of 12 times, The centrality is 0.02, Year: 2014), 7th "digital display" (11 times, The centrality is 0.08, Year: 2014), The eighth "cultural relic" (used for 11 times, A centrality degree of 0.01, Year: 2016), The ninth "construction" (10 times, The centrality is 0, Year: 2014), "Digital technology" (9 times used, A centrality degree of 0.01, Year: 2019), "New media" (used 9 times frequently, The centrality is 0.02, Year: 2014), "Art gallery" (8 times used frequently, The centrality is 0.02, Year: 2015), Digital Management (7 times, The centrality is 0, Year: 2020), "Internet" (7 times, The centrality is 0.03, Year: 2014), "Virtual reality" (6 times used, The centrality is 0.04, Year: 2016), "Digital technology" (use 6 times more frequently, The centrality is 0.03, Year: 2019) The above is the top 16 keywords. Among the 16 keywords used at high frequency, 11 are related to digitalization, which are embodied in the application of digital technology in the exhibition space.

Table 1: Keyword frequency and centrality table

frequency	Centrality	year	keyword
148	0.7	2014	museum
133	0.59	2014	Digitalization
40	0.33	2014	Digital museum
30	0.07	2014	Digital construction
14	0.13	2014	Digital museum
12	0.02	2014	Cultural relics management
11	0.08	2014	Digital display
11	0.01	2016	cultural relic
10	0	2014	construct
9	0.01	2019	Digital technology
9	0.02	2014	new media
8	0.02	2015	art gallery
7	0	2020	Digital management
7	0.03	2014	Internet work
6	0.04	2016	virtual reality
6	0.03	2019	Digital technique

4.3 Keyword clustering and visualization analysis

According to the CiteSpace data visualization software, through the conversion of keywords visualization clustering map options, can get "digital exhibition into space" keywords clustering analysis visualization map (figure 4), through the map can be more clear keywords clustering information distribution, through the operation control panel, into the Clusters, and choose Largest k, set index is 9, to get the first nine keywords clustering nouns. According to the keyword cluster map obtained in this study, where Modularity represents the module value Q, Silhouette represents the average contour value S, the data in the keyword cluster visualization map used in this study: (Modularity Q) = 0.5852 > 0.3, indicating that the cluster structure in the cluster map used in this study is significant, (Silhouette S) = 0.9189 > 0.7, which indicates that the cluster results in the cluster map used in this study are reasonable in terms of reliability.

Through the above operation, 9 cluster keywords in the map can be obtained, the order from 1 to 9 are: "digital", "digital Museum", "mobile terminal", "digital display", "digital construction", "museum digital", "digital museum", "school education" and "library". From the above 9 cluster keywords can be obtained, other scholars and research articles on the research direction of the topic of "digital exhibition space". Among them, the two cluster keywords of "digital" and "digital museum" are relatively independent, and they contain the largest number of related keywords. The rest of the cluster keywords is divided into two keywords cluster word group, keywords use interaction between is more frequent, respectively is "digital construction" "digital museum" "museum digital" three cluster keywords keywords word cluster: 1, to "library" "mobile terminal" "digital display" of "school" four cluster keywords cluster word group: 2. From the general correlation class analysis, it can be concluded that the cluster size in the cluster map is determined by the number of related keywords of the cluster keywords. The larger the cluster, the more related keywords contained, and the smaller the versa. The cluster map is divided into four large clusters, namely "digital", "digital museum", "key word cluster 1" and "key cluster word cluster 2". Among them, the keywords of "keyword cluster word cluster 1" are more closely related to "key cluster word cluster 2", while "digital" and "digital museum" contain more keywords, but they are less connected with other cluster keywords, and the cluster keywords are more independent.

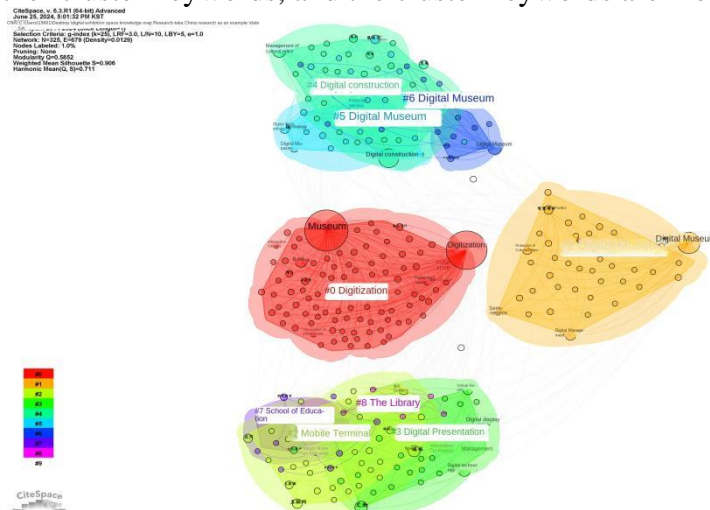


Figure 4: Keyword cluster analysis and visual map of "digital exhibition space" (photo source: author self-drawn)

4.4 Visual analysis of sudden keywords

According to the CiteSpace data visualization software, through the control panel into the Burstness function interface, adjust the required domain value γ (Gamma) is 0.1, into the View interface to select the number of keywords is 25, get "digital into space" keywords appear visualization analysis atlas (Figure 5), according to the content of the display from 2014 to 2024 25 representative emergent keywords. According to the emerging keyword information (Strength = emergent index), it shows that in the time line of the emergent keywords, it is highly valued by scholars and social guidance, and becomes a hot topic during this time period.

Begin in the figure indicates the time when the keyword emergence starts, and End indicates the time when the keyword emergence ends. The red part of the atlas indicates the duration of the emergent time. Combined with the above content, according to the following atlas analysis can know that "Internet of things" (Strength = 1.19), "mobile terminal" (Strength = 1.24), "digital art" (Strength = 0.66) the three sudden keywords, the longest duration for 3 years, that the three sudden keywords as "digital exhibition space" hot keywords, in research has important significance in the field, and become a popular orientation, attention compared to other emerging keywords. "Exhibition space" (Strength = 2.24), "innovation" (Strength = 0.97), "innovative design" (Strength = 0.89), "meaning" (Strength = 1.45), the duration of the four sudden keywords has continued, still become the popular discussion and research direction, is also many scholars and academic articles about the "digital space" in the field of research content.

Top 25 Keywords with the Strongest Citation Bursts				
Keywords	Strength	Begin	End	2014-2024
National Costumes	0.98	2014	2016	
Internet Plus	1.52	2015	2017	
Internet of Things	1.19	2015	2018	
Development	2.16	2016	2017	
Mobile Terminal	1.24	2016	2019	
Cultural Relics Protection	1.83	2017	2020	
Public Service	0.78	2017	2019	
Cultural Relic Management	2.39	2018	2019	
Strategy	1.1	2018	2019	
New Media	1.01	2018	2019	
Exploration	0.9	2018	2019	
Exhibition	0.65	2018	2019	
Management	1.58	2018	2019	
Public Education	0.94	2019	2021	
Cultural Relics	2.41	2019	2020	
Post-Pandemic Era	1.36	2020	2022	
Curator	0.9	2020	2021	
Analysis	0.86	2020	2021	
Digital Art	0.66	2021	2022	
Inheritance	0.6	2021	2024	
Appliance	0.51	2021	2022	
Exhibition Room	2.24	2021	2023	
Significance	1.45	2022	2024	
Innovation	0.97	2022	2024	
Innovative Design	0.89	2022	2024	

Figure 5: "Digital exhibition space" keywords highlight visual analysis map (picture source: author painting)

4.5 Keyword development path analysis

According to the visual analysis map of the development timeline path of the keyword "digital exhibition space" below (Figure 6), the research shows the development trend and mutual relationship of different keywords in this field. From the early stage to the recent stage, the development path of keywords goes through several key stages.

In the early stage (before 2000), the research mainly focused on infrastructure and technology preparation, and keywords such as "information technology" and "multimedia display" appeared frequently, indicating that the research focus at that time was on the application of technology and

the diversification of display means[21].

In the middle stage (2000-2010), the research gradually turned to content and experience, and keywords such as "interactive display", "user experience", "virtual reality" began to appear, reflecting that the research gradually paid attention to the audience's sense of participation and interaction, and the scope of the research expanded, involving more application scenarios and specific implementation methods [22].

In the recent stage (from 2010 to now), with the further development and popularization of digital technology, keywords such as "artificial intelligence", "big data" and "intelligent guide" have become research hotspots, indicating that the research has penetrated into a higher level of intelligence and data-driven. Through the analysis of the keyword development path, it can be seen that in the field of "digital space" research gradually transition from technology application to the user experience, eventually developed to intelligent and data driven, the development path not only reflects the progress of technology, also shows the academia and industry innovation of space and exploration.

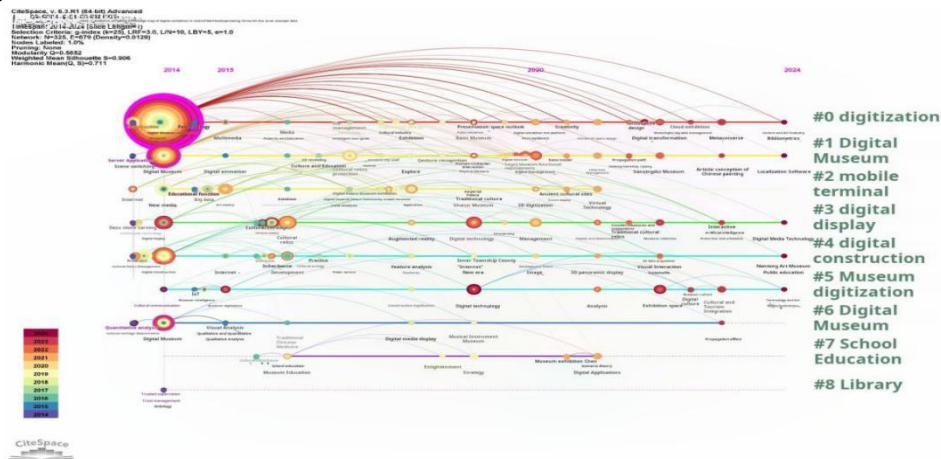


Figure 6: "Digital exhibition into space" keyword development timeline path visual analysis map (photo source: author self-drawn)

5. Conclusion

In the future design direction, exhibition space should conform to the trend of digital technology, and carry out digital enabling upgrade according to the current situation of use, so as to improve the use efficiency of exhibition space and the exhibition experience of visitors. At present, there are still a large number of traditional exhibition Spaces in China. These exhibition Spaces only retain the most basic exhibition function in design, but there are problems such as aging infrastructure, poor exhibition experience in the space, and weak carrying capacity of exhibition space. The transformation of this kind of traditional exhibition space is urgent. The following research will put forward suggestions for the upgrading and transformation of the traditional exhibition space from the following aspects: digital information collection and control within the exhibition space, digital information dissemination in the exhibition space, and digital technology to improve the exhibition experience.

(1) In the aspect of digital information collection and control within the exhibition space

Digital exhibition space has a strong ability to adjust the "space micro-environment" of the internal exhibition space. It can adjust the micro-environment inside the space with the change of the exhibition collection types, so as to provide the most suitable temperature environment and light environment for the exhibition collection, and provide the best environment for the protection of the

exhibition collection. The information acquisition and intelligent control in the overall exhibition space will be calculated and regulated by the "digital information algorithm matrix" in the digital exhibition space. Such digital technology intervention, compared with the traditional way of obtaining information through people, and then adjusting through people. In the convenience, and efficiency to be far ahead, can effectively reduce the influence of human factors, greatly improve the efficiency. In terms of information acquisition and control in the exhibition space, it has advantages compared with the traditional exhibition space through the empowerment of digital technology.

(2) In the exhibition space of digital information dissemination

Compared with the information dissemination mode of digital exhibition space, it is relatively backward in the information dissemination of traditional exhibition space. Digital exhibition space uses digital information editing to spread on the Internet. The advantage of this is to use the convenience of Internet technology to improve the scope of information dissemination. In addition, the exhibition information can be targeted at the audience interested in the exhibition to improve the efficiency of information. This action, to some extent, can help the exhibition space to increase the number of visitors and improve the economic income value of the exhibition space. In terms of the guided information dissemination within the space, different from the paper publicity and exhibition space, digitalization is used to organize and disseminate the guided information., For example, in the exhibition collection booth near join "two-dimensional barcode (Quick Response)" and "near field communication (Near Field Communication)" technology to achieve, exhibition art guide information dissemination, make exhibition personnel can through intelligent devices, establish connection with exhibition art information, from exhibition personnel personal digital equipment, can be more intuitive collection information. The information dissemination method through digital intervention is different from the traditional information dissemination method of the exhibition space, so as to reduce the use of paper guide information by visitors, which can reduce the waste of resources and improve the social responsibility of the exhibition space. Through the digital transformation and upgrading of the traditional exhibition space, the exhibition space can reflect its advantages in the information dissemination of the guide party.

(3) In the digital technology to improve the exhibition experience

In this aspect can use the digital intelligent wearable devices, for example, in the process of exhibition, can use "virtual reality technology (Virtual Reality)" to the exhibition collectibles "contactless interactive experience" using the intervention of digital technology, promote exhibition experience, different from the traditional ZhanChen space, such transformation, can make the exhibition process become more vivid, make "exhibition crowd" and "art collection" interactive, and establish emotional connection, but also can bring interest to exhibition space, enhance the value of space. This is also the advantage that the intervention and transformation of digital technology can bring to the traditional exhibition space.

To sum up, in the context of the digital era, the necessity of the exhibition space for the digital intervention, and the benefits brought by the exhibition space after the digital intervention are very considerable. Through the research direction proposed by many scholars, we believe that the future development potential of digital exhibition space, as well as the new development direction of digital exhibition space under the continuous progress of digital technology in the future.

References

- [1] Mao Wenlin. (2023). *Application of digital technology in art galleries*. Ginseng (bottom) (08), 38-40.
- [2] Jia Wenjing. (2024). *Research on the media combination of the exhibition space in the background of digital technology*. Design Art Research (01), 19-24.
- [3] Guo Qiaobao. (2022). *New media, let the cultural inheritance of the endless—the inevitable trend of building a*

digital art museum. *Fashion Design and Engineering* (04), 59-62.

[4] Liang Baoying. (2021). Museum exhibition space design under the introduction of new media art. *Time-honored Brand marketing* (07), 65-66.

[5] Chen Jian. (2022). *Master of Space Scene Design and Research* (Thesis, Central South University). Master

Rusasha, to keep ying & Yu Xingxing. (2020). Exploration on the design method of modern museum exhibition space. *Oriental Collection* (21), 105-106.

[6] Zhou Fangxiang. (2012). Virtual reality display system based on stereoscopic projection technology. *Journal of Zhongzhou University* (04), 114-116.

[7] Jiang Ye & Han Fan. (2019). Application of phantom imaging in museum display design. *The House of Theatre* (36), 107-108.

[8] Guo Yan. (2014). *Master of New Interactive Concept Research in Hologram Technology* (dissertation, Shenyang University of Aeronautics and Astronautics). Master

[9] Huang Qiuye. (2008). *Master of Digital exhibition and exhibition technology research in the Museum* (dissertation, Jiangnan University). Master

[10] Yan Fan. (2003). Into the digital space—art design concept of new thinking. *Journal of Shandong Education Institute* (01), 80-81.

[11] Sun Hongxia. (2022). Circular thinking: a study on the sustainability of exhibition space design. *Art Work* (01), 102-104.

[12] Zhao Liyuan. (2023). Research on the application of modern digital technology in the museum exhibition. *Oriental Collection* (04), 85-87.

[13] Zhang Juan & Zhu Wei. (2021). Analysis the artistry and modernity in the digital exhibition space. *Research in Art Education* (14), 84-85.

[14] Li Jialin. (2019). The application of the new media interaction design in the modern exhibition space. *Electronic Technology and Software Engineering* (04), 253

[15] Zhao Mingming. (2020). Application of 3 D virtual reality technology in online exhibition hall design. *Cultural industry* (30), 12-13.

[16] Zhang Wenting. (2015). The exhibition space and exhibition form are designed under the perspective of information digital view in the popular science exhibition hall. *Art Education* (01), 248-249.

[17] Peng Jing. (2016). Research on the spatial characteristics of museum cultural relics exhibits. *Art Review* (14), 180-182.

[18] Ren Fei & Sui Nan. (2018). The application of the new media interaction design in the modern exhibition space. *Mass Literature and Art* (02), 63-64.

[19] Tao Chen. (2022). Analysis of the formation elements of interactive communication in the exhibition space. *Research in Art Education* (07), 98-99.

[20] Wang Zhaohui, Zhao Long & Sun Kuili. (2023). Research on exhibition space design driven by modern technology. *Chinese Building Decoration* (12), 64-66.

[21] Lu Hong. (2014). The social role of digital art galleries. *Art Observation* (05), 7-9.

[22] Wu Jingying. (2021). Zhang Zikang: Creativity drive and intellectual system—Curatorial challenges in the digital age. *Art Observation* (12), 8-11.