

Research on the Trends and Features of Enterprise Digital Transformation: Based on the WOS Database

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Abstract

In the context of the digital economy, in order to systematically understand the overall characteristics of the digital transformation of Chinese enterprises, this article conducts a statistical analysis of hotspots and trends in this field, which can provide a useful directional reference for subsequent scholars. Using literature statistical methods, processing literature data based on CiteSpace software, using data mining thinking to analyze scientific metrology knowledge graphs, selecting the enterprise digital transformation research papers published in the Web of Science database from 2008 to 2021 as the research object, Analyze the changes in the volume of articles, research institutions, authors, and keywords. The research shows that after 2018, it is a period of rapid development of enterprise digital transformation; paper publishing institutions are mainly concentrated in institutions and universities that are excellent in engineering and management. Most institutions conduct corresponding research independently, but cooperative research is Future trends; five author research communities constitute the main research strength; the research mainly focuses on digital government, intelligent manufacturing, industrial Internet and supply chain management, and has important theoretical reference value for the development of digital transformation of Chinese enterprises.

Key words: Digital transformation; Knowledge graph; CiteSpace; Hots pot

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PREFACE

The 2020 Central Economic Work Conference pointed out that “we must vigorously develop the digital economy” and required “promote the digital industrialization and industrial digitization, promote the deep integration of the digital economy and the real economy, and create an internationally competitive digital industry cluster”. In the same year, the State-owned Assets Supervision and Administration Commission of the State Council issued the “Notice on Accelerating the Digital Transformation of State-owned Enterprises”, aiming to actively give play to the exemplary and leading role of state-owned enterprises, promote the all-round, all-angle, and full-chain digital transformation of traditional industries, and enhance the national industrial basic capabilities and capabilities. The level of modernization of the industrial chain and further clarification of the important position of digital transformation in traditional industries have provided top-level support for third-line military enterprises to carry out digital strategic transformation.

1. RESEARCH DESIGN

1.1 Data Source

In order to ensure the accuracy and validity of the analysis, the data in this article comes from the Web of Science database (including SSCI, SCI-expanded, A&HCI), and the Web of Science Core Collection is selected. Published, which covers international mainstream academic journals covering public health emergencies and emergency

management research papers. The search time is set from 2003 to 2020, the document type is “Article”, and the corresponding documents are searched separately with “Enterprise digital transformation” as the key word. In order to improve the visualization effect and reduce unnecessary clustering, this article conducts the search on the documents searched. After screening, 744 pieces were obtained. Using Citespace’s deduplication function, the collected data was processed, and finally 516 pieces of data were obtained.

1.2 Research Methods

This article mainly uses CiteSpace information visualization application software (developed by Professor Chen Chaomei in the United States in 2004). This software has multiple, time-sharing, and dynamic characteristics. It is especially suitable for complex network analysis. It is the most distinctive in scientometrics at home and abroad in recent years. And influence visualization software. It shows the research frontiers of a certain research field at different stages through a time chart, and also shows the relationship between the research frontiers and the knowledge base. Co-occurrence processing of countries, institutions, cited documents and keywords can obtain a scientific and intuitive visual map. Highly cited literature refers to two (or more papers) being cited by one or more subsequent papers at the same time, and it is said that these two papers constitute a co-citation relationship. Based on this, we can find that they are important in this field. Influential papers and authors, sort out a clear research context, and find the research foundation of other scholars. Through this series of research and analysis, it can help us understand the overall status of the current research results in the field of digital transformation of foreign enterprises, and obtain research hotspots and frontier areas in this field, which has an important guiding role in the study of digital transformation of enterprises.

2. VISUALIZED STATISTICAL ANALYSIS PROCESS AND RESULTS

2.1 The Distribution of Literature by Age

With the rapid development of a new generation of network information technology, human society is gradually moving from the age of industrial economy to the breakthrough and integration of new digital technologies such as mobile Internet, Internet of Things, big data, cloud computing, artificial intelligence, and blockchain. Features of the era of digital economy. The report of the 19th National Congress of the Communist Party of China pointed out that “promote the deep integration of the Internet, big data, artificial intelligence, and the real economy” to cultivate new growth points and form new driving forces; accelerate technological innovation to build a network power, a digital China,

and a smart society. 2018 officially kicked off the digital transformation of traditional Chinese enterprises. Since then, research in related fields around the world has entered a golden period of development. The digital transformation of enterprises has very high requirements for the management system and personnel capabilities of enterprises. There is a long history of research in the traditional publishing and printing industry at home and abroad, and rich practical and theoretical results have been accumulated. Trend research in this field can be a manufacturing-oriented digital transformation. To provide reference, we select the literature in these two fields in the WOS database from 2008 to 2021 for research. The total amount of global research on digital transformation of enterprises has shown a trend of increasing year by year (as shown in Figure 1), showing a clear rapid growth in specific terms. As a whole, it can be divided into two stages: before 2018, the volume of postings was relatively flat; after 2018, the volume of postings and growth trends showed explosive growth; on the whole, the digital transformation of enterprises has become a hot area of research. Global economic development and technological progress will continue to increase the requirements for the digitalization of enterprises in Chengdu, and there will be more scholars focusing on research in this field.

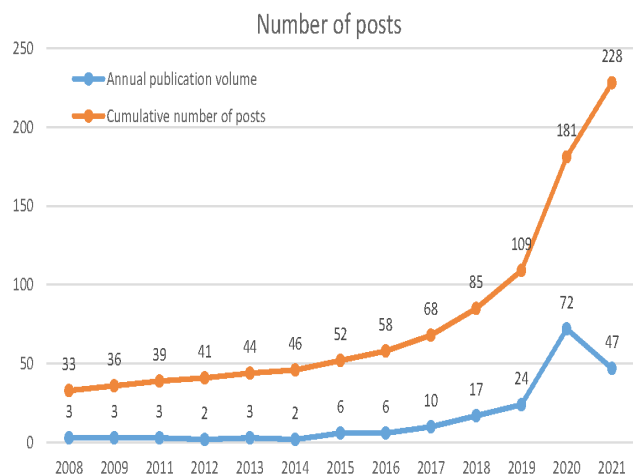


Figure 1 Trending graph of post volume

2.2 Statistics on the Distribution of Scientific Research Forces

The gap in the amount of publications between regions can clearly reflect the different scientific research processes of countries or regions. Analyzing the amount of publications by different institutions in each country can understand the core strength of research (Figure 2). As can be seen from the figure, the prominent countries in the field of corporate digital transformation are mainly distributed in developed countries such as North America, Europe, and Oceania. China is a better country among developing countries. In detail, the United States,

Germany, and the United Kingdom play a more important role in the field of corporate digital transformation. Other countries have conducted research on these countries, which shows that these countries have relatively rich theoretical foundations and practical experience. On the whole, there are relatively close ties between various countries, indicating that the digital transformation of enterprises is a cross-disciplinary, cross-field and cross-regional study.

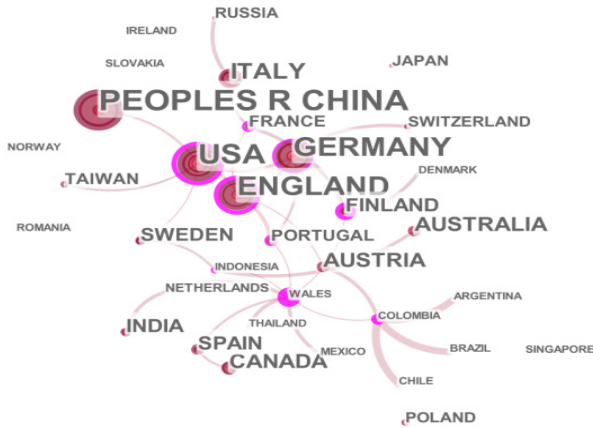


Figure 2
Country co-occurrence map

2.3 Distribution of Research Institutions

Use CiteSpace software to carry out research on the indicator of “institutional cooperation network”, divide 2003-2021 by year as a unit, and in each time slice according to the principle of “extract the top 50 and the minimum number of articles issued by the institution is 3” After conducting analysis and research, the study found that: the number of research institutions is 21, and the number of cooperative relationships is 8. Overall, the research institutions of enterprise digital transformation show the characteristics of large dispersion and less cooperation (as shown in Figure 3). In detail, the University of Uppsala in conjunction with the State University of New York (SUNY), The University of Manchester and University College London constitute the largest In the research group, other schools and institutions basically conduct independent related research.

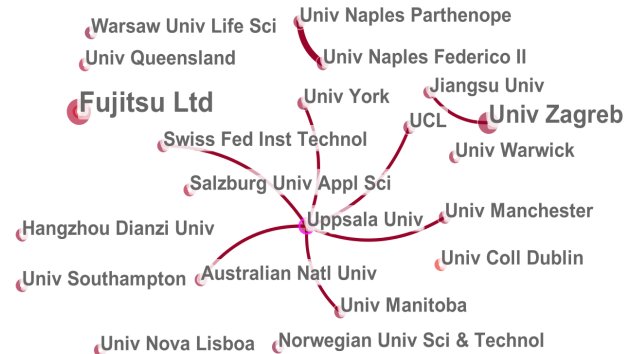


Figure 3
Co-occurrence diagram of institutional cooperation

2.4 Distribution of Authors' Collaboration in Research on Public Health Emergencies

Based on the study of the literature age and the distribution of research institutions, the author's cooperation in the enterprise digital transformation research is analyzed, and the author's authority in this field can be analyzed based on the number of articles published by the author and the intensity of cooperation. The time is set from 2003 to 2021. And set the node type to “Authors”, set it to “Top50” after debugging, and use the minimum spanning tree simplification algorithm to generate the author's cooperation network. After screening, 204 authors are obtained, and the number of author cooperation relationships is 108 (as shown in Figure 4).



Figure 4
Author's co-occurrence diagram

Through the author's co-occurrence network diagram, it is found that authors such as JOSIP STJEPANDIC, MANLIO DEL GIUDICE, and CARLOS AGOSTINHO constitute a larger research group, representing the main research force in the field of enterprise digital transformation, and have formed a relatively fixed research exchange group. The cooperation has a deeper impact on the field of enterprise digital transformation. But on the whole, relatively few scholars conduct cooperative research, and most scholars still conduct independent research.

2.5 Keyword Co-occurrence Map Analysis

Keywords can effectively reflect the content of the article, which is one of the more important judgment indicators. Therefore, this article conducts a co-occurrence analysis on the keywords of the digital transformation of enterprises, choosing keywords as nodes, dividing time segments in years as a unit, and choosing the minimum spanning tree reduction algorithm MST (Minimum

Spanning Tree) for pruning. Finally, a domestic public health emergencies research high-frequency keyword co-occurrence network map is generated, which is standardized and processed to form 122 keywords. Among them, a circle represents a keyword. The larger the circle, the higher the frequency of the keyword. The color changes with time, increasing from the inside to the outside. The more the keyword connection, the more obvious the mediation effect of the keyword.

From 2003 to 2019, keywords such as digital transformation, innovation, technology, system, and management and information technology appeared frequently. These keywords are very clearly indicated the main research directions and trends in the field of digital transformation of enterprises, and innovation in technology, systems and management is the basis for enterprises to carry out digital transformation.



Figure 5 Keyword co-occurrence diagram

Table 1 Keyword statistics table

Frequency	Centrality	Keywords	Frequency	Centrality	Keywords
45	0.12	digital transformation	16	0.13	performance
27	0.2	innovation	16	0.18	model
24	0.17	technology	14	0.11	information technology
22	0.04	system	13	0.29	internet
20	0.26	management	13	0.2	big data
19	0.32	sme	12	0.02	industry 40
18	0.15	industry	11	0.01	firm performance
17	0.05	transformation	11	0.09	strategy
16	0.36	enterprise	10	0.1	design
16	0.33	future	10	0.22	capability

On the basis of keyword co-occurrence, in order to better judge the research trend of digital transformation of enterprises, use citespace to make a keyword timeline chart (Figure 6), which can help us intuitively analyze the time when keywords appear. Let's study and judge the changes in the research direction in the digital transformation of enterprises. It can be seen from the figure that in 2017, digital transformation, big data, and dynamic capability appeared at the same time. Big data provided a data foundation for enterprises to realize digital transformation, and at the same time, it intensified the development of communication and storage technologies; in 2018, system, The emergence of keywords such as enterprise and information technology indicates that digital transformation has changed from a certain department or a single field to a systematic transformation; in 2021, the emergence of keywords such as digitalization, digital technology, and framework indicates that the enterprise has been digitally transformed from the bottom to the top.

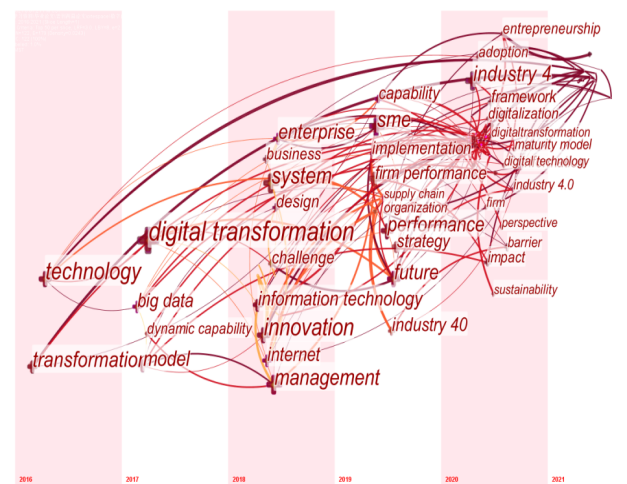


Figure 6 Keyword timeline diagram

Perform a cluster analysis on the standardized 122 keywords (as shown in Figure 7), the keywords are divided into sustainability, dynamic capabilities, indus-

trial internet of things , digital government, intelligent manufacturing, supply chain management and industry 4.0 and other 9 categories, the research found that: #0, #1 and #2 are all related to the digital transformation. On the one hand, the research on the digital transformation is a complex dynamic process with sustainable characteristics; #3, #4, #5, #6, and #7 are clusters of government, enterprise and industry perspectives in the digital transformation, indicating that the government Digital transformation is carried out from top to bottom to improve its own service level and capabilities. Industry, manufacturing and supply chain are the foundation of national development and are the key areas of research; #8 and #9 are clusters of the entire industry. 4.0 is the development direction and focus of the manufacturing industry for a long period of time in the future.

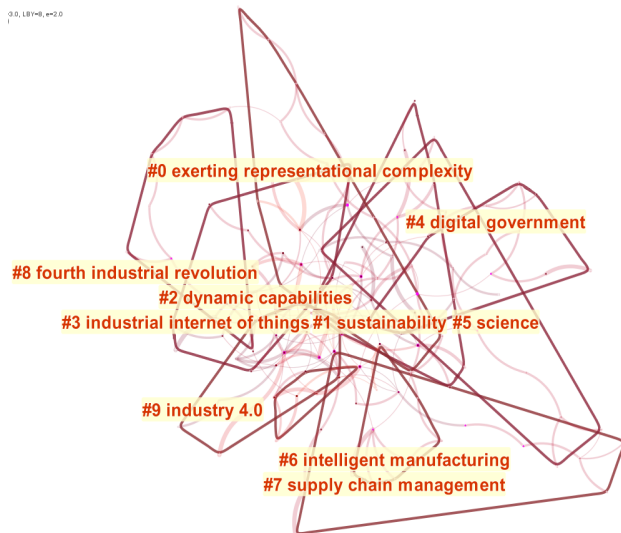


Figure 7
Keyword cluster map

CONCLUSION

This paper adopts scientific measurement methods to visually analyze the relevant documents in the Web of Science database, and analyzes the research directions and themes of the company's digital transformation in the past 17 years. This article concludes as follows:

(1) Statistical distribution of scientific research articles and strengths: The number of articles published in the past 17 years has generally shown an upward trend. With the attention of various countries, it has gradually become a key area of government, enterprise and scholar research. Research countries on digital transformation of enterprises are widely distributed. Developed countries such as the United States, Canada, the United Kingdom, and Germany have contributed major scientific research results and lead the development of digital transformation. However, as a developing country, China still has a huge

contribution and I believe it will be more prominent in the future Achievement

(2) From the perspective of research institutions, universities are still the main scientific research forces. International organizations, government agencies and multinational companies have gradually shown their strength. From the co-occurrence diagram among authors, it can be seen that the digital transformation of enterprises is a Cross-disciplinary and cross-field research requires the teamwork of scholars from all walks of life to achieve rapid development. Therefore, the government should provide corresponding support for cooperation and exchanges between scholars to accelerate the digital transformation of enterprises.

(3) The research context and trends highlighted by keywords: Digital transformation, innovation, technology, system, management and information technology are keywords that have appeared more frequently in the past 10 years. After clustering, the keywords are divided into 9 categories, such as sustainability, dynamic capabilities, industrial internet of things, digital government, intelligent manufacturing, supply chain management, and industry 4.0. From the clustering, it can be clearly seen that there are capabilities and capabilities to the enterprise at the micro level. Sustainability studies are also conducted from the overall macro perspective, focusing on more comprehensive research on the government's digital transformation, industrial Internet of Things, and smart manufacturing, to create a good technology and business environment for companies from the micro and macro perspectives, and to help companies carry out Digital transformation, but there is a lack of research on the actual transformation path of enterprises in current research.

This article is based on the relevant literature on the digital transformation of enterprises in the Web of Science database, and only analyzes international academics and some domestic and foreign research results, but does not analyze domestic and foreign. In the follow-up research, the relevant documents in CNKI and Wan fang database will be added to compare the development status and future trend research at home and abroad, so as to propose new theoretical reference and practical enlightenment.

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