Domestic Enterprise Digital Transformation Field Bibliometric Research — Based on CiteSpace Visualization Analysis

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Abstract. The rapid development of information technology has transformed society. The continuous development of digital transformation has become an important characteristic of the global economic system, This paper uses bibliometric research methods and the visualization literature analysis tool CiteSpace to analyze the literature on enterprise digital transformation in the China National Knowledge Infrastructure (CNKI) and Web of Science collections, systematically sorting out the research hotspots, frontiers, and development laws in this field from the aspects of literature annual distribution, keyword analysis, and keyword clustering analysis. The study found that there is no high-productivity author group formed yet, institutional cooperation is relatively rare, led by colleges and universities, and research institutions are geographically dispersed; keywords mainly include digital economy, financing constraints, enterprise innovation, as well as small and medium-sized enterprises, and digital-related content.

Keywords: Enterprise Digital Transformation; Research Trends; Research Progress; CiteSpace.

1   Introduction

In the report of the 20th National Congress of the Communist Party of China[1], goals such as accelerating the development of the digital economy and promoting the deep integration of the digital economy and the real economy, and creating internationally competitive digital industry clusters were proposed. To achieve this goal, digital transformation has become key. Vial (2019)[2] summarized the meaning of digital transformation, regarding it as a combination of information technology, computing technology, communication technology, and connectivity technology, causing significant changes in the attributes of entities, thereby improving the process of entities. this study uses CiteSpace knowledge mapping for visual analysis of enterprise digital transformation, detecting the development status since the rapid development of digital transformation. Through the analysis of the author distribution, research institutions, and keyword clustering of enterprise digital transformation, this study provides references

for future in-depth research, practical exploration, and industrial promotion of enterprise digital transformation.

2   Comparative Analysis of Domestic and International Visual Research on Enterprise Digital Transformation

2.1   Research Method

This paper employs the CiteSpace statistical software to conduct a literature analysis of the knowledge map in the field of corporate digital transformation. CiteSpace is an information visualization tool specifically designed for academic literature analysis, developed by Professor Chaomei Chen at Drexel University in the United States, and it operates on the Java programming language. Based on the analysis of a vast amount of bibliometric data, it stands out among many visualization software tools[3].

2.2   Data Source

Select the China National Knowledge Infrastructure (CNKI) database and the "Web of Science Core Collection". CiteSpace 6.2.R2 version is used as the research tool, and the Pathfinder algorithm is used for visual analysis of the filtered literature data. The time threshold (Time Slicing) is set from 2011 to 2023, and the time slice (Year Per Slice) is 1 year. The node type (Node types) uses the Author, Institutions, Country, and keywords functions of CiteSpace to analyze the research hotspots, cycles, content, and frontiers of enterprise digital transformation strategy, and to summarize and conclude the current research status of enterprise digital transformation, and to propose suggestions and opinions.

   To ensure the quality and quantity of the papers, in the domestic research, the advanced search method of the China National Knowledge Infrastructure (CNKI) is selected, with the theme set to "Enterprise Digital Transformation", and all SCI, EI, Peking University Core, CSSCI, CSCD, AMI academic journals in the source category are checked. The sorting is changed to ascending order by time, and the search results show that the earliest literature is from 2011, so the time range is finally set from 2011 to 2023, a total of 937 academic journals, and these 937 articles are exported and saved in RefWorks format. The search time is April 27, 2024.

2.3   Literature Time Distribution

The change in the number of papers published can intuitively see the changes in the research heat of a discipline within a certain period of time, which is an important indicator to measure the development trend of the discipline within that period of time, and is of great significance for analyzing development dynamics and predicting future trends. From Fig. 1, it can be seen that the annual number of papers published is at an average annual increase level, and the overall trend is upward. The number of papers published abroad in the field of enterprise digital transformation is generally more than

that in China. Domestic research on enterprise digital transformation started from 2011. The graph shows that from 2020 to 2023, the annual number of papers published showed a sharp upward trend. There may be two reasons for this: firstly, the outbreak of the new crown pneumonia may make it difficult for enterprises to manage in all aspects, and enterprises and governments are eager to undergo online management digital transformation; secondly, during this stage, due to the development of emerging technologies, the country's attention and support for technologies such as blockchain and cloud computing have led to a sudden surge in research on management digital transformation, becoming a hot topic for scholars.
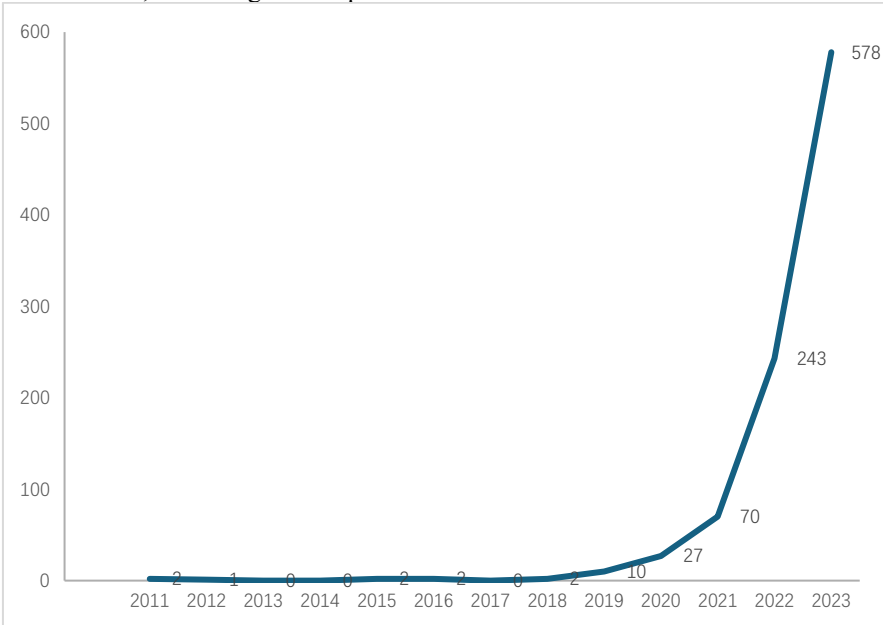

Fig. 1. Domestic Paper Output

2.4   Enterprise Digital Transformation Research Author Cooperation Network Analysis

The node count of the domestic enterprise digital transformation research author graph is 79, with 43 lines, and the network density is 0.014. Q=0.8038 (>0.3), S=0.9183 (>0.7) (see Fig. 2). The node count is obviously greater than the number of connecting lines, indicating that the cooperation of Chinese enterprise digital transformation research authors is generally dispersed. Authors have different degrees of cooperation, and the cooperation between core authors is not dense, with a small number of high-frequency authors and relatively scattered research content, and some authors' cooperation is in a closed loop.

Fig. 2. Domestic Enterprise Digital Transformation Field Research Author Cooperation Network

2.5   Institutional Cooperation Network Analysis

The cooperation network of institutions in the field of enterprise digital transformation research in China has 73 nodes, with 33 connecting lines, and a network density of 0.0126, Q=0.8038 (>0.3), S=0.9183 (>0.7) (see Fig. 3), and the number of nodes connected by publishing institutions is obviously greater than the number of connecting lines. The institution with the most papers published is the School of Economics and Management of Tsinghua University, with a total of 17 papers. Institutions with more than 4 papers are basically colleges and universities. There is a strong institutional cooperation network group among the School of Economics and Management of Tsinghua University, Wuhan University, Beijing University of Chemical Technology, Jilin University, and Shandong University of Finance and Economics, and there is also some cooperation between other institutions, but most are still scattered and not closed. It indicates that the cooperation trend among Chinese enterprise digital transformation research institutions is not obvious and remains scattered, and the exchange and cooperation platform across regions has not been fully established, so the scale of cooperation among Chinese enterprise digital transformation research institutions should be expanded.

Fig. 3. China's Enterprise Digital Transformation Field Institutional Cooperation Network

3   Frontier Hotspots and Development Trend Analysis of Enterprise Digital Transformation Field Research

3.1   High-Frequency Keyword Analysis

Analyzing the keywords in the domestic data and setting the Node Type to Keyword, the rest default, the enterprise digital transformation research field research literature keywords are obtained (see Figure 4). The color and thickness of the annual ring in the figure represent the time and quantity of the keywords appearing, the size of the node represents the frequency of the keywords appearing, and the color of the line between the nodes represents the earliest time when two keywords appear together, and the thickness of the line represents the height of the keywords appearing together.
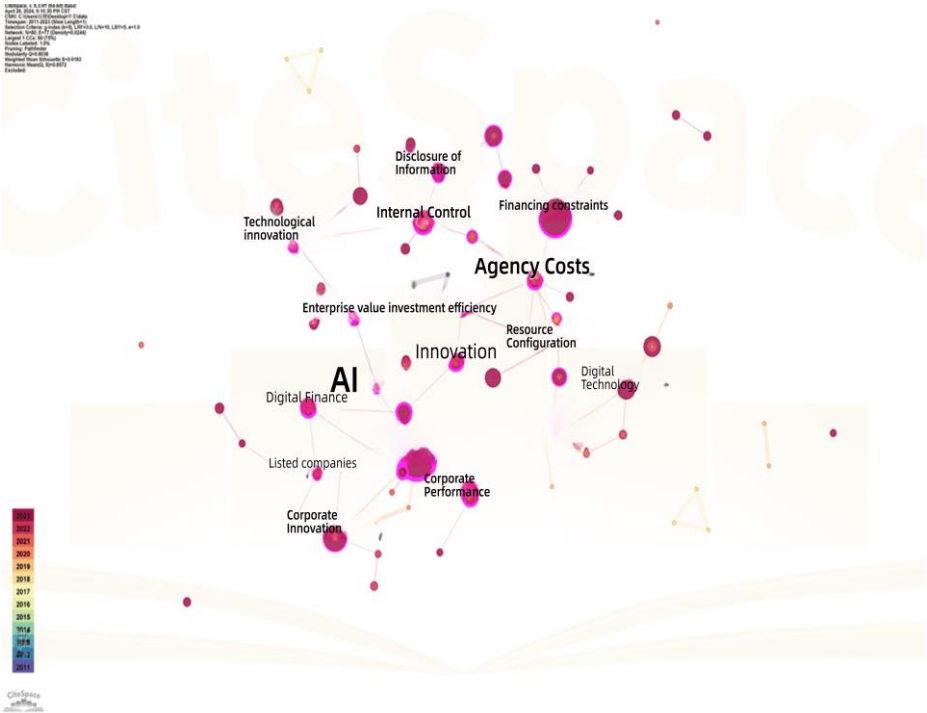
Fig. 4. China's Enterprise Digital Transformation Field Research Literature Keyword Knowledge Graph

From Fig. 4, it can be seen that the current research on enterprise digital transformation in China is mainly concentrated on "digital economy", "financing constraints", "enterprise innovation", etc. Li Chuntao et al. (2020) [4]explained from a specific application perspective the two ways to alleviate the innovation effect of financial technology promoting enterprise innovation, which are the financing constraints and tax rebates of enterprises. Li Hui (2020)[5] believes that the digital economy promotes enterprises to complete transformations in many aspects such as transaction costs, management models, and organizational environments, which greatly promotes the transformation of enterprises to high-quality development and lays a solid foundation. Xu Meng (2020)[6] believes that enterprise digital transformation and enterprise innovation are complementary and mutually reinforcing relationships. He believes that digital transformation is the internal driving force for enterprise innovation, and enterprise innovation is the internal demand for achieving digital transformation. Wang Chunying, Chen Hongmin (2021)[7] analyzed the specific connotation of the digital economy, and also pointed out that the digital transformation of enterprises must conform to policy guidance and the need for enterprises to achieve industrial upgrading and improve efficiency.

Fig. 5. China's Enterprise Digital Transformation Field Research Literature Keyword Clustering Network Display

3.2   Enterprise Digital Transformation Field Research Keyword Clustering

Keyword clustering obtained the domestic enterprise digital transformation research literature keyword clustering network display graph, a total of 7 clusters were obtained (Fig. 5). Including: digitalization (#0), enterprise performance (#1), investment efficiency (#2), etc. The indicators for measuring clustering are the Q value and the average silhouette value (S value). It is generally believed that Q>0.3 indicates a clear clustering structure, S>0.5 indicates a reasonable clustering division. S>0.7 indicates a convincing clustering. Therefore, this clustering, Q=0.8038, S=0.9183, indicates that the clustering results are significant and convincing.

According to the specific content of the 7 clusters, the research focus of China's enterprise digital transformation has been on three major themes: the digital economy, financing constraints, and internal control. Overall, China's enterprise digital transformation research has initially taken a network shape. On the one hand, the clustering network is significant, and on the other hand, there have been strong and weak connections between the themes of each cluster. The vertical and horizontal connections of these keywords constitute the knowledge network of China's enterprise digital transformation field research. Wu Fei et al. (2021)[8] used web crawling technology to collect the "digital transformation" in the annual report, depicted the intensity of digital transformation, and proved the impact of enterprise digital transformation on stock liquidity and its channel mechanism through empirical testing. Zhang Zhengang et al. (2022)[9] introduced knowledge management and entrepreneurial orientation variables based on organizational change theory and knowledge-based view, discussed the impact mechanism and situational effects of enterprise digital transformation on business model

innovation, and proved through empirical research that digital transformation significantly promotes business model innovation. Huang Lihua et al. (2021)[10] focused on the development model of platform enterprises and how to build and maintain digital business ecosystems.

4   Conclusions

This paper uses scientific measurement methods, based on the "Web of Science Core Collection" and CNKI academic journal literature sources, to conduct a visual analysis of enterprise digital transformation research. It can be known that in terms of research hotspots, according to the distribution of keyword frequencies, keyword bursts, and keyword clustering analysis, enterprise digital transformation research all pay attention to the application of modern digital technologies such as big data, cloud computing, artificial intelligence, etc. in the strategy of enterprise digital transformation. In terms of research cycles and content, according to the comparison of domestic and foreign paper outputs, affected by the new coronavirus, the research on enterprise digital transformation at home in the three years of the epidemic is relatively rich, and the number of papers has also increased significantly compared to previous years. In terms of research trends, it can be seen that the domestic is catching up with developed countries, and there is a clear improvement.

It is evident that there is still room for improvement in the digital transformation of Chinese enterprises. Currently, we need to tackle the challenges of digital technology, deepen collaborative innovation mechanisms, and further fill the gaps in our foundational technologies. The government should strengthen the construction of domestically developed chips, incubate leading enterprises in the field of cloud computing software, and build new types of digital infrastructure that are suitable for China's national conditions, while attracting and retaining talent from various industries.

Acknowledgment

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