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# A Systematic Literature Review of digital transformation of manufacturing enterprises: Bibliometric Analysis and Knowledge Framework

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## 1. INTRODUCTION AND RESEARCH QUESTIONS

The main part of the real economy is the manufacturing industry, and the digital transformation of industrial enterprises is quite significant. But digital transformation is a complicated process that involves not only technical issues but also organizational and management changes (Verhoef et al., 2021), which is both an opportunity and a challenge for manufacturing companies. At this point, both business managers and scholars are interested in how manufacturing enterprises can achieve digital transformation.

In the existing research on the digital transformation of manufacturing enterprises, scholars have focused on technology adoption (Agostini and Nosella, 2020), digital (Abou-foul et al., 2021), business model (Chen et al., 2018; Caputo et al., 2021) and ecosystems (Kohtamäki et al., 2019) from different perspectives. In general, the research results of digital transformation of manufacturing enterprises are rich, and the research topics are diverse, but it is still necessary to systematically summarize previous achievements, build a relatively complete knowledge framework, and provide support for subsequent research.

Systematically summarizing previous research results, identifying research frontiers and hotspots, and establishing a knowledge framework for the digital transformation of manufacturing companies will help researchers understand the field from a more complete point of view and find new directions for future research.

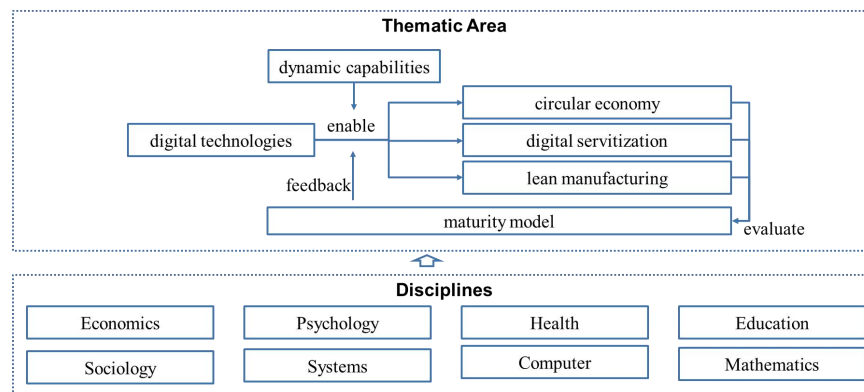
## 2. RESEARCH METHODS

The method of knowledge map is used to visualize the literature in the field of digital transformation of manufacturing enterprises, and a series of diagrams can be used to show the development process and structural relationship of knowledge. In this paper, the software CiteSpace 6.1R6 is used as a bibliometric and visual analysis tool in the field of digital transformation of manufacturing enterprises, to build a knowledge framework by Web of Science core database.

## 3. RESULTS AND MAJOR FINDINGS

This paper uses CiteSpace to conduct a visual analysis of the literatures on the digital transformation of manufacturing enterprises from 2011 to 2021, and from the perspectives of cooperation network, co-citation analysis and co-occurrence analysis, and to a certain extent comprehends the research frontiers and hotspots in this field. This paper draws the following findings from the analysis: (1) The research in this field is interdisciplinary. The author cooperation network is still relatively scattered, and the core author group has not yet formed; (2) Through the analysis of reference co-citation clustering and summarizing 6 research themes of maturity model, circular economy, lean manufacturing, dynamic capability, digital servitization and digital technologies; (3) Through keyword co-occurrence analysis, it is found that smart manufacturing, dynamic capability, business model, circular economy, digital technology and logistics are the research hotspots. “Service innovation” is the keyword of strongest burst in recent years, and it will be a major focus of future research. The themes and directions of research that came out of the co-citation analysis and the keyword co-occurrence analysis are mostly the same. (4) Finally, a knowledge framework for the digital transformation of manufacturing enterprises is proposed. The framework includes 6 research topics, including maturity model, circular economy, lean manufacturing, dynamic capability, digital servitization and digital technology, which can be used to discover knowledge linkages for future research (see Figure 1.).

The knowledge framework of the digital transformation of manufacturing enterprises reflects the interdisciplinary characteristics of this field, and presents the key research topics and contents. Generally speaking, the digital transformation of manufacturing enterprises is a process in which digital technology continuously empowers the management and business of manufacturing enterprises (such as circular economy, lean management, digital servitization, etc.). Whether the transformation can be successful depends on whether the manufacturing enterprise can build dynamic capabilities; during the transformation process, it is necessary to constantly evaluate the level of digital maturity, and dynamically feedback and adjust.



**Figure 1. Knowledge framework for digital transformation of manufacturing enterprises.**

#### 4. CONTRIBUTIONS

This research is innovative to a certain extent. First, it classifies the research topics of digital transformation of manufacturing enterprises, laying a knowledge base for subsequent research; secondly, it identifies the research hotspots of digital transformation of manufacturing enterprises, and makes suggestions for future research directions; Finally, a knowledge framework for the digital transformation of manufacturing enterprises is integrated.

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