

Bibliomatrix Analysis of Digital Economic Transformation and Macroeconomic Competitiveness with VosViewer

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ABSTRACT

Digital economic transformation is a key driver of changes in competition structure and global growth. In the context of the high volume of published knowledge, this study aims to conduct a systematic bibliometric analysis of literature from 2020–2025 (sourced from Scopus) to map how TED is positioned in the context of macroeconomic competitiveness by identifying thematic clusters, interconceptual relationships, and evolving topic trends. Using VOSviewer, the quantitative analysis results indicate a significant increase in the number of publications and identify five main thematic clusters. The Red Cluster focuses on the core of 'digital transformation,' connected to 'digital strategy' and Industry 4.0. The Blue Cluster highlights 'digital economy,' competition, and the need for 'cybersecurity.' The Green Cluster shows attention to 'sustainable development' and the socio-economic impacts of technology. Meanwhile, the Yellow Cluster connects digitization with the 'manufacturing enterprise' and 'supply chains' for efficiency improvement, and the Purple Cluster emphasizes the role of 'competition' and 'economic growth.' Collectively, these findings conclude that the TED literature is a holistic field, encompassing business strategy, technology, macroeconomics, and sustainability issues. This study contributes by providing a comprehensive landscape map of knowledge as a basis for formulating research agendas and policy recommendations in the fields of digital economy and national competitiveness.

Key words: digital economic transformation, macroeconomic competitiveness, Bibliometrics

INTRODUCTION

The acceleration of digital economic transformation from 2020 to 2025 has reshaped growth and competition structures at the national level. The expansion of digital platforms, artificial intelligence, big data analytics, and financial technology has altered how firms create value, interact with consumers, and integrate into global value chains. Literature shows that digitalization is not merely a technological phenomenon but an ecosystem that reorganizes production processes, innovation, and market coordination, influencing aggregate productivity and national competitive advantage (Kraus et al., 2023). In this ecosystem, digital infrastructure, regulatory frameworks, and human capital readiness interact dynamically to determine the pace and inclusiveness of transformation.

Recent comprehensive studies map the evolution of the digital transformation theme and emphasize its connection to innovation dynamics, business models, and policies that support macroeconomic competitiveness. These findings position digital transformation as a key driver for recovery and growth acceleration post-pandemic (Dabbous et al., 2023). In many economies, digital adoption has accelerated structural shifts toward knowledge-intensive sectors, remote work systems, and platform-based entrepreneurship. This structural change not only increases efficiency but also modifies competitive positioning at both regional and global levels.

At the macro level, cross-country evidence shows that improvements in information and communication technology (ICT) indicators positively correlate with economic growth and strengthen national entrepreneurial capacity, two pillars often associated with competitiveness (Škare & Soriano, 2021). Studies on European countries suggest that a conducive environment for digitalization and investment plays a significant role in driving entrepreneurial activity and competitive indicators of a country. Such an environment typically includes strong digital infrastructure, access to financing, innovation-friendly regulation, and effective governance mechanisms. Conceptually, digitalization can enhance efficiency, expand market access, and trigger innovation, which in turn strengthens macro performance (Galindo-Martín et al., 2023). It also facilitates knowledge diffusion, reduces transaction costs, and improves resource allocation efficiency across sectors.

Although the impact of digitalization on macro performance is not entirely uniform across regions, panel studies on OECD countries and the MENA region show that the ICT indicators' impact on GDP growth is real but varies based on development levels, institutional quality, and digital readiness. These differences highlight the importance of understanding the configuration of research themes discussing the mechanisms of digitalization affecting competitiveness, such as total factor productivity, innovation diffusion, human resource quality, and trade openness (Simatupang, 2024). Variations in policy implementation, digital divides, and structural economic characteristics further explain why digital transformation generates uneven outcomes across countries.

Amid the rapid spread of knowledge publications on digital economic transformation, key terms and approaches are scattered across disciplines, including economics, management, information systems, and public policy. This fragmentation has created the need for a systematic scientific mapping to identify topic evolution, key knowledge actors, and research gaps at the intersection of digitalization and macroeconomic competitiveness (Lim et al., 2024). Without structured mapping, it becomes difficult to capture dominant paradigms, emerging debates, and underexplored areas within the expanding body of literature.

A bibliomatrix approach or structured bibliometric analysis of article metadata is ideal for this purpose as it can organize scientific evidence on a large scale, track theme dynamics, and map prospects for evidence-based research agendas (Donthu et al., 2021). Bibliometric techniques such as co-occurrence analysis, co-citation mapping, and thematic evolution analysis enable researchers to visualize intellectual structures and identify influential publications, authors, and institutions. In response to this need, this study designs a bibliomatrix analysis of literature from 2020 to 2025 to map how digital economic transformation is positioned within macroeconomic competitiveness (Kraus et al., 2023). Specifically, this study assesses thematic clusters, interconceptual relationships, and evolving trends linking digitalization indicators with macro outputs such as growth, productivity, and competitiveness, identifying areas that remain underexplained (Galindo-Martín et al., 2023).

The expected contribution is a comprehensive knowledge landscape map that can serve as a basis for formulating research agendas and evidence-based policy recommendations in the fields of digital economy and national competitiveness (Donthu et al., 2021). By clarifying conceptual linkages and highlighting research gaps, this study aims to support scholars and policymakers in designing more integrated strategies that align digital transformation initiatives with sustainable macroeconomic development objectives.

METHOD

Bibliometrics is a quantitative approach used to map and evaluate scientific knowledge through the analysis of publications and citations. The modern definition of bibliometrics is often traced in conceptual elaborations regarding its boundaries and scope, with an emphasis on the application of statistical methods in analyzing scientific documents. In this context, bibliometrics serves as an important tool for exploring the structure and dynamics of scientific development, as well as for understanding collaboration patterns, trends, and the evolution of topics in the literature (Broadus, 1987). One of the most popular software tools in the application of bibliometric methods is VOSviewer. Early reviews of this software highlight its ability to display large maps clearly, making it a widely used tool in knowledge mapping studies (Waltman et al., 2010). VOSviewer offers three complementary display modes to analyze and visualize knowledge networks. First, network visualization allows users to see the nodes and direct connections between elements in a knowledge network. Second, overlay visualization provides color-coding based on specific scores, such as the average year of appearance or citation impact, helping users to identify temporal trends in the literature. Third, density visualization highlights topic density, making it easier for users to recognize core and peripheral areas within a field of knowledge.

Methodologically, VOSviewer employs VOS mapping techniques and a clustering approach related to modularity, which enables the separation and grouping of elements based on similarity and connectivity. Thus, this tool not only provides a clear visual map of the structure of knowledge but also facilitates the identification of significant patterns in the development of scientific research. The combination of bibliometric methods and the visual analysis capabilities of VOSviewer makes it a highly valuable tool in knowledge mapping studies, assisting researchers in identifying relationships, trends, and the scope of research in a more structured and informative manner. This study uses international publication data on the topics of Digital Economic Transformation and Macroeconomic Competitiveness from 2020 to 2025 sourced from the Scopus database (www.scopus.com). Data collection is carried out by searching Scopus publications using the keywords Digital Economy, Digital Transformation, E-Economy, Macroeconomic, Innovation, National Economy, within the article title, abstract, and keywords categories for the period 2020–2025. The data, including the number of publications per year, journals publishing the articles, authors, author affiliations, and subjects, are analyzed using Microsoft Excel. Meanwhile, trends in the development of international publications are analyzed using VOSviewer software.

RESULTS AND DISCUSSION

The development of publication data on Scopus related to the topic of Digital Economic Transformation and Macroeconomic Competitiveness shows a significant upward trend in the number of published articles, reflecting growing interest and attention to this topic among researchers.



Diagram of Articles: Bibliomatrix of Digital Economic Transformation and Macroeconomic Competitiveness

The bar chart above illustrates the development of article publications each year from 2020 to 2025. As seen, there is a clear upward trend year after year, with a significant surge in 2025, reflecting consistent and increasing growth in publications related to this research topic. This chart provides a strong visual representation of the importance of this topic in academic research over the years.

Based on the search results with the keywords Digital Economy, Digital Transformation, E-Economy, Macroeconomic, Innovation, National Economy, there are 103 publications in Scopus from 2020 to 2025. Of these, the highest number of publications came from the *Journal of Industrial Engineering and Engineering Management* with 4 articles, *Financial and Credit Activity Problems of Theory and Practice* with 4 articles, and *Lecture Notes in Information Systems and Organisation* with 3 articles, followed by three other journals with 2 articles each. The image below shows research regarding the development of risk analysis and decision-making, with at least 3 published articles from eight journals.

No.	Nama Jurnal	Jumlah Publikasi
1	Journal of Industrial Engineering and Engineering Management	4
2	Financial and Credit Activity Problems of Theory and Practice	4
3	Resources Policy	3
4	Lecture Notes in Information Systems and Organisation	3
5	Economies	3
6	Wseas Transactions on Business and Economics	2
7	Transformations in Business and Economics	2
8	Technology in Society	2

Image Table of Articles: Bibliomatrix of Digital Economic Transformation and Macroeconomic Competitiveness

The bibliometric analysis conducted using VOSviewer successfully identified five main clusters that form the literature network on digital transformation. The core of this research is concentrated in the Red Cluster, where "digital transformation" is strongly linked to "digital strategy" and the concept of "Industry 4.0". This area becomes the main focus in discussions about how organizations should adapt and implement the right digital strategies, supported by related concepts such as "digital innovation" and "digitalization". In parallel, the Blue Cluster places the "digital economy" at the center of discussion, encompassing the impact of digital technology on market competition ("competition") and the essential need for "cybersecurity". Additionally, research also shows a shift in focus toward sustainability aspects. This is evident in the Green Cluster, which connects "sustainable development" and "sustainability" with the socio-economic effects of technological advancements, emphasizing the role of digital innovation in supporting sustainable development. The practical relevance of digital

transformation is expanded through the Yellow Cluster, which highlights the industrial sector, linking digitalization with "manufacturing enterprises" and "supply chains", as well as its impact on "efficiency" and "economic growth". Finally, the Purple Cluster emphasizes the role of "competition" and "economic growth" in the context of the evolving digital economy, highlighting how "efficiency" and "competitiveness" become critical success factors for organizations. Collectively, these five clusters depict that the literature on digital transformation is a holistic field, encompassing dimensions of business strategy, technology, macroeconomics, and social sustainability.

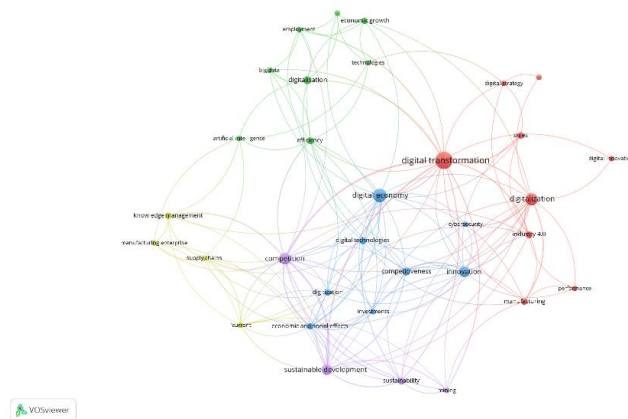


Image Network Visualization: Bibliometric of Digital Economic Transformation and Macroeconomic Competitiveness

CONCLUSION

The bibliometric analysis of the literature on Digital Economic Transformation and Macroeconomic Competitiveness from 2020 to 2025 highlights that Digital Economic Transformation has become a fundamental force that systematically reshapes the structure of global growth and competition. This study finds that the literature on digitalization is not monolithic, but rather divided into a network of five holistic thematic clusters. Digital transformation itself serves as the central core (Red Cluster), emphasizing the need for the right digital strategies for organizations to adapt to Industry 4.0. At the macro level, the literature focuses on the "digital economy" (Blue Cluster), where growth and competition are inseparable from the importance of "cybersecurity." At the same time, research trends show a shift towards sustainability issues, as represented in the Green Cluster, which connects digital innovation with the goals of "sustainable development" and socio-economic impacts. Furthermore, the digitalization of the real sector, such as "manufacturing enterprises" and "supply chains" (Yellow Cluster), is emphasized as a crucial pathway to improving efficiency and driving broader economic growth. Collectively, these findings conclude that the entire discourse in the literature is oriented towards enhancing "competitiveness" and macroeconomic performance, underscoring that success in the digital era requires an integrated approach between technology strategy, operational excellence, and social responsibility. This conclusion provides a comprehensive map of the knowledge landscape that is crucial for formulating future research agendas and evidence-based policy recommendations in the field of national competitiveness.

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