




Bibliometric Computational Mapping Analysis Of Publications On Digital Transformation In Business Using VOSviewer

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Abstract. This academic paper seeks to investigate and evaluate publications related to digital transformation in the business sphere through the application of bibliometric methods, placing particular emphasis on employing the modern computational mapping tool, VOSviewer. The research comprised distinct stages: first, gathering publication data using the Publish or Perish program; second, processing bibliometric data of articles collected through Microsoft Excel. Following that, computational mapping analysis of bibliometric publication data was executed using VOSviewer, and the findings of this analysis were subsequently analyzed. The results showed that the categories of "digital" and "digital transformation" can be utilized to classify research on digital transformation. The word "digital transformation" is connected to by 63 different sources, totaling 997 links. The term "Digital Transformation" has 220 links and a link strength of 4107. The findings of this study will be used as a guide by other researchers who are researching the subject of digital transformation.

Keywords: Computational Mapping Analysis, Digital Transformation, VOSviewer.

1 INTRODUCTION

Digital transformation (DT) is fundamentally reshaping businesses globally. Well-established [1]. Academic research on digital transformation has increased with its practical implementation and can thus provide essential guidance to enterprises [2]. Digital transformation is not merely a trend but a necessity for organizations seeking to remain relevant and competitive in an ever-evolving market. The process of digital transformation offers a distinctive chance to refine current BPM (Business Process Management) logic and expand it beyond its conventional theoretical boundaries [3]. In response to the increasing complexity of the business environment, researchers and business practitioners alike have turned their attention to gaining an in-depth understanding of the impact and evolution of digital transformation. Business process stakeholders need to grasp the concept and significance of every adopted technology and understand the importance of digital transformation as technology evolves and undergo transformations [4]. Hence, organizations, particularly those within the pub-

lic sector, are actively investigating the potential offered by emerging technologies in digital transformation. This exploration aims to improve organizational agility and flexibility, essential for adapting to dynamic environments and fulfilling the requirements of both government and customers [5]. The emergence of the digital transformation phenomenon appears to offer an opportunity (and a requirement) to progress the current understanding of organizational change [6].

Scientific research in this domain has grown exponentially, creating a need to systematically detail and analyze existing literature. In this context, bibliometric research and computational mapping analysis have become invaluable tools. This scholarly article aims to explore and analyze publications on digital transformation in the business context using a bibliometric approach, with a primary focus on the utilization of the contemporary computational mapping tool, VOSviewer.

Through bibliometric analysis, this study identifies key contributions, the most influential research, and collaborative networks among researchers in this domain. This understanding not only provides profound insights to researchers, practitioners, and business policymakers but also helps shape the direction and priorities for future research. Thus, this research contributes not only to academic knowledge but also offers valuable practical guidance for strategic decision-making in tackling the challenges of digital transformation in the contemporary business world.

2 METHOD

Quantitative bibliometric methodologies objectively sidestep the sample selection bias associated with systematic reviews. Additionally, these methodologies are adept at recognizing trends in journal performance, co-authorships, co-citations, and the classical research streams within specific fields [7]. The research from articles that were published in journals that were indexed by Google Scholar served as the basis for the article data used in this study. In this study, we chose Google Scholar because its database is open source. A management reference tool called Publish or Perish was employed to gather study data. A literature review on the subject we chose was done with the help of the program Publish or Perish.

The research was conducted in stages, including:

- (i) utilizing the publish or perish program to gather publication data
- (ii) processing of article bibliometric data collected using Microsoft Excel
- (iii) using the VOSviewer, computational mapping analysis of bibliometric publication data, and
- (iv) analysis of the findings of computational mapping analysis

Publish or Perish article data search is used to filter publications using the keyword "digital transformation" based on the title criteria of the publications. The papers that were used were released between 2012 and 2022. Everything was collected in September 2022. Research information system (.ris) and comma-separated value (*.csv) files were used to export the articles that were gathered and met the requirements for

analysis in this study. Bibliometric maps were also employed with VOSviewer to examine and assess trends. After that, the article data from the original database was mapped. Utilizing network visualization, density visualization, and overlay visualizations based on the network (co-citation) between existing items, VOSviewer was used to produce several mapping publications.

3 RESULT AND DISCUSSION

3.1 Publication Data Search Result

Based on the data search, 993 data articles that fit the criteria for the research were found utilizing the application reference manager publish or perish data search. The information was gathered in the form of metadata, which included the name, title, year, journal name, publisher, citation count, article links, and associated URLs for each author. Bibliometric analysis enables the examination of the structure and evolving trends of a journal's publications, and scholars have increasingly favored a systematic investigation of journals in recent years [8]. Several samples of published data are shown in Table 1. The 5 top publications with the most citations were used as the data samples.

Table 1. Bibliography paper sequenced by highest to lowest its citation

Authors	Title	Year	Cites
LD Xu, EL Xu, L Li	Industry 4.0: state of the art and future trends	2018	2146
NJ Foss, T Saebi	Fifteen years of research on business model innovation: How far have we come, and where should we go?	2017	1717
S Saberi, M Kouhizadeh, J Sarkis...	Blockchain technology and its relationships to sustainable supply chain management	2019	1639
N Donthu, A Gustafsson	Effects of COVID-19 on business and research	2020	1455
S Erevelles, N Fukawa, L Swayne	Big Data consumer analytics and the transformation of marketing	2016	1256

3.2 Publication Data Search Result

Figure 1 displays the evolution of research on the topic of digital transformation that has been published in a journal that is indexed by Google Scholar.

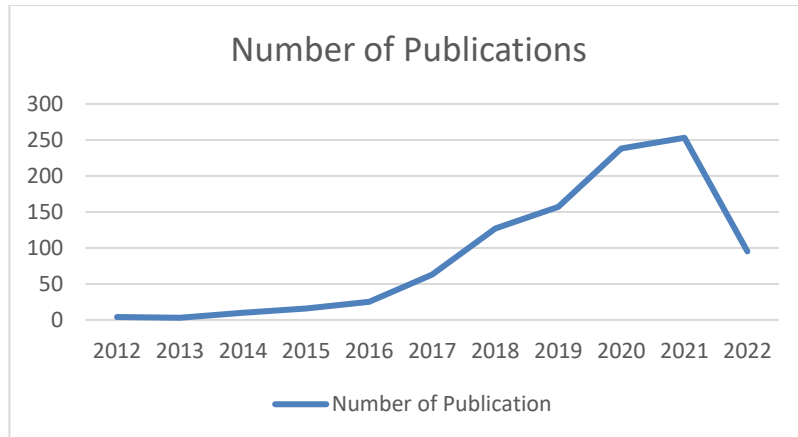


Fig. 1. Number of Publications in Digital Transformation research. Source: Author Data

Based on the information, it is clear that 993 publications related to digital transformation research were published between 2012 and 2022. There were 4 articles in 2012. There were 3 articles in 2013. There were 10 articles in 2014. There were 16 articles in 2015. There were 25 articles in 2016. 2017 saw 63 papers published. 2018 saw 127 articles published. There were 157 articles published in 2019, 238 articles in 2020, 253 articles in 2021, and 95 articles in 2022. It is clear from the number of publications that research on digital transformation was less common between 2012 and 2017 and more prevalent between 2018 and 2022. Its growth continues to accelerate from year to year.

3.3 Visualization digital transformation topic area

The data from the article was subjected to computational mapping. Computational mapping makes use of VOSviewer. 222 objects were discovered from the computational mapping findings. Data mapping divides each thing relevant to digital transformation into 8 clusters, including:

1. Cluster 1 has 31 items and is marked in analytic, application, barrier, big data, blockchain, blockchain technology, business analytics, business model, business transformation, business world, circular economy, cloud, cloud computing, concept, etc. Altering business models and operational procedures, optimizing the utilization of contemporary information technology (IT), necessitating adaptations to organizational culture and behavior, and adjusting expectations and roles of the workforce have become the new norms in the business environment [9].
2. Cluster 2 has 33 items and is marked in Challenges, change, competency, covid, digital, digital economy, digital government, digital literacy, digital transformation, education, effectiveness, employee, fourth industrial revolution, function, government, higher education, higher education institution, idea, impact, institution, integration, pandemic, etc. Prominent stakeholders in the market, in-

cluding customers and investors, are expressing growing concerns about climate change. This trend has been further accelerated by the ongoing pandemic [10]. The pandemic also offers the world a transformative chance to integrate its sustainable development trajectory with digitalization [11].

3. Cluster 3 has 32 items and is marked in Age, benefit, capability, challenge, china, country, customer, demand, digital business model, digital disruption, digitization, driver, dynamic capability, COVID-19, etc. With digitalization permeating every aspect of our lives, particularly highlighted during the COVID-19 pandemic or even earlier, it is crucial to underscore the significance of our field in supporting and comprehending digitalization, especially from human, organizational, and business standpoints [12].
4. Cluster 4 has 29 items marked in red, the 29 items are area, artificial intelligence, bank, banking, banking sector, business, business leader, business value, case study, consumer, creation, crisis, digital ecosystem, digital era, digital innovation, digital technology, digital transformation, entrepreneurship, etc.
5. Cluster 5 has 26 items and is marked in green, the 26 items are analysis, case, determinant, digital maturity, digital platform, digital servitization, digital supply chain, digital transformation era, digital transformation initiative, digital transformation project, digital transformation strategy, etc.
6. Cluster 6 has 23 items marked in blue, the 23 items are business strategy, collaboration, company, construction, decision, digital age, digital business, digital business strategy, digital leader, digital leadership, etc.
7. Cluster 7 has 22 items marked in orange, the 22 items are adoption, approach, art, business process management, context, culture, dynamic, effect, enterprise, Europe, evolution, healthcare, model, order, paper, practice, role, SMEs, state, study, theory, and transition. The integration of technological innovations, such as wearable devices and health applications, has primarily influenced internal processes and the positioning of patients [13].
8. Cluster 8 has 18 items and is marked in chocolate, the 18 items are automation, business environment, business function, business model innovation, business process, development, digital entrepreneurship, digital marketing, etc. The belated digital transformation of established international SMEs might pose greater challenges due to resource limitations when compared to the adaptability of digitally native companies. Those re-internationalizing through digital transformation may encounter additional hurdles, including managing the overlap between new knowledge and prior international experience [14].

The cluster innovation system's digital transformation constitutes a crucial element in the overall digital development of enterprises. Its primary objective is to enhance the innovative productivity of the enterprise, elevate the market competitiveness of innovative products, embody the user value-oriented development concept, augment the added value of products, and propel the establishment of the enterprise's digital innovation ecosystem [15]. Each existing cluster demonstrates the connections between individual phrases. A colored circle denotes the label for each phrase. The size of the circle varies for each term depending on its frequency. The label circle's size is positively correlated with how frequently the term is used in the abstract and title. As the

word is used more often, the label size grows. The mapping visualization that was looked at in this study consists of three elements: network visualization (see Fig. 2a), density visualization (see Fig. 2b), and overlay visualization (see Fig. 2c). Figure 2 illustrates the connection between the ideas. The link between terms is depicted as an interconnected network. Each area that is often researched and related to the study of digital transformation is clustered together in Figure 2. The clusters in the network visualization show that there are two main areas of research into digital transformation.

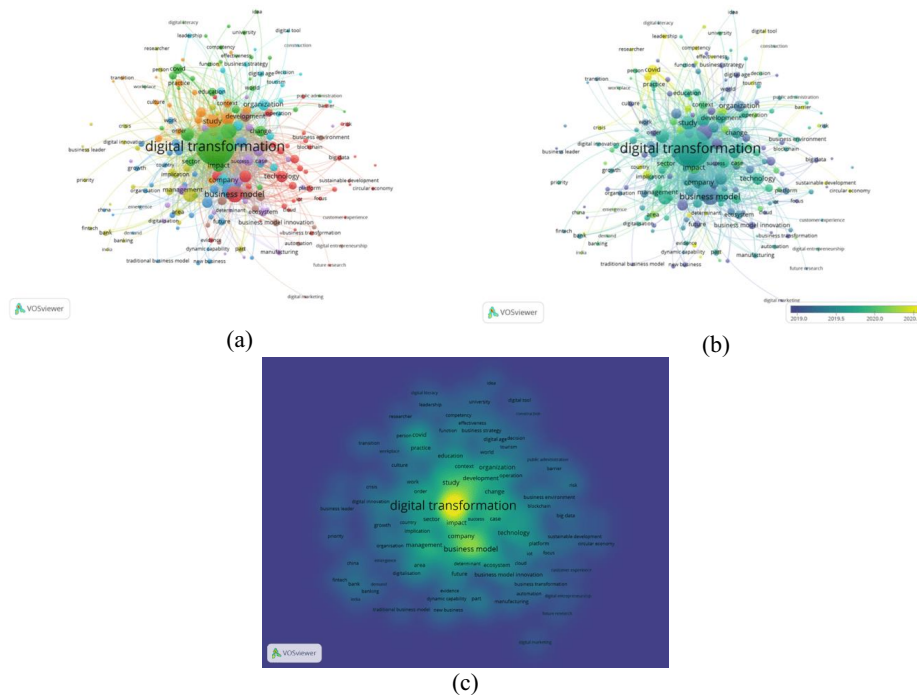


Fig. 2. Mapping of digital transformation keyword. (a) network visualization, (b) density visualization and (c) overlay visualization. Source: Author Data

The depiction of density is shown in Figure 2b. According to density visualization, a phrase will occur more frequently the yellow color is brighter and the circle that contains its labels is larger in diameter. This indicates that extensive research has been done on the subject. In contrast, there isn't much research on the term if the color of the term fades close to the color of the background. According to Fig. 2b, there have been a lot of studies done on the topics of digital transformation, business models, technology, and company changes.

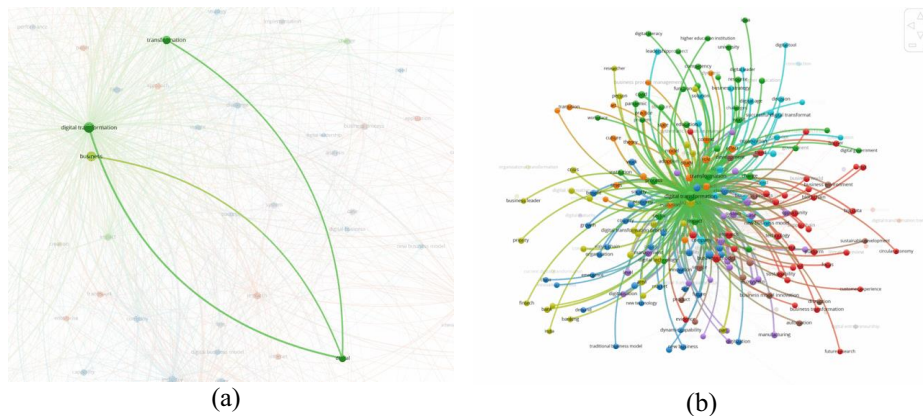


Fig. 3. Mapping of term. (a) digital, (b) digital transformation. Source: Author Data

The first of these is the digital term, which is included in cluster 2 and has 63 total links, 97 total link strength, and 18 occurrences (see Fig. 3a). The second term, "digital transformation," is a part of cluster 2, with 773 occurrences, 220 total linkages, and a total link strength of 4107. The overlay visualization used in studies on digital transformation is shown in Figure 4. This overlaying graphic demonstrates the uniqueness of research on linked terms. Figure 4, which is made clear in Figure 3b, demonstrates that the majority of the study on digital transformation was done from 2019 to 2020. The term "digital transformation" has reached the height of its use in research. As a result, conducting fresh research on digital transformation is simple.

Figure 3a depicts a network of concepts related to digital, including business, transformation, and digital. Figure 6 depicts the network of connections between existing concepts and digital transformation, including management, process, impact, business process, business model, system, society, economy, sector, adoption, and innovation. The mapping of the data from the articles that were collected shows that the keyword "digital transformation" has been the subject of the most investigation. The majority of studies have referenced digital transformation or related disciplines. We can seek for more recent and relevant research on digital transformation in the current year based on the findings of this study.

4 CONCLUSION

The results showed that research on digital transformation may be categorized using the terms "digital" and "digital transformation." The term "digital transformation" is connected to by 63 different sources, with a total link strength of 997. With 220 links, the term "Digital Transformation" has a link strength of 4107. A ten-year study of the development of digital transformation publishes machinery demonstrates a yearly growth. 993 elements were determined to be relevant in total. The last 10 years' worth of publications that Google Scholar has indexes are the research era taken into account for the study (2012 to 2022). The results showed that the categories of "digital" and "digital transformation" can be utilized to classify research on digital transformation. The word "digital transformation" is connected to by 63 different sources, totaling 997 links. The term "Digital Transformation" has 220 links and a link strength of 4107. There has been a yearly growth in digital transformation publica-

tions machinery, according to studies on the subject during the previous ten years. The findings of this study will be used as a guide by other researchers who are researching the subject of digital transformation.

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