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DIGITAL TRANSFORMATION IN THE SERVICES INDUSTRY: A BIBLIOMETRIC ANALYSIS OF TRENDS AND FUTURE PERSPECTIVES ON DIGITAL PLATFORM BUSINESS MODELS

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Abstract:

The rapid evolution of digital technologies has brought about a profound shift in service industries, ushering in an era defined by digital transformation. As businesses increasingly rely on digital platforms for service delivery, understanding the complexities of this digital landscape becomes paramount. This article aims to analyze the research landscape of digital transformation in the service sector, offering insights into noteworthy studies, journals, authors, emerging trends, and potential avenues for future research. However, although interest in this field grows, there is still a noticeable gap in comprehensive research on this subject, which is highlighted by an inadequate number of in-depth studies and a lack of understanding within the relevant areas. Leveraging the Scopus database, the study scrutinizes 559 articles related to digital transformation in the service industry. Utilizing VOSviewer software for analysis, the study explores the organization and connections within publications and citations, considering bibliometric factors such as co-authorship, co-citation networks, keywords, and co-occurrence networks. Findings elucidate valuable insights from highly cited articles, clarifying their significant contributions. The study evaluates publication patterns, author influence, and key trends within the service sector. Emphasizing the need for further investigation, the article suggests expanding the scope of publications to include databases like WoS, Dimensions and PubMed alongside Scopus. While proposing this enhancement, the article acknowledges the associated limitations.

Keywords:

Digital Transformation, Services Industry, Digital Platform, Business Models.

Introduction

In the ever-evolving landscape of the modern service industry, the transformative emergence of digital platform business models, as indicated by Gatautis, (2017); Zhao et al., (2020), and Essen et al., (2023); has significantly reshaped conventional approaches. This transformation is not only pervasive but also has significant implications for industries worldwide. Forecasts for 2025 suggest that digital platforms will encompass more than 30% of the global economy, regardless of company size, underscoring their growing influence (Schallmo & Hasler, 2021a). Furthermore, Gatautis, (2017b), discovered that the digital platform business model is dominantly used by leading companies in various regions. Examining best practices in the Business-to-Consumer (B2C) market, Apple Inc.'s digital platform business model, as mentioned by Steur & Bayrle, n.d., serves as an exemplary case.

Thus, as digitalization advances, businesses are increasingly implementing digital platforms in the Business-to-Business (B2B) market, recognizing it as an essential strategy to stay competitive and adapt to market developments (Shree et al., 2021). However, the transition from a service-centric to a platform-oriented business model is not merely a conceptual shift but a systemic reconfiguration that has far-reaching implications for global industries (Chirumalla et al., 2022; Kohtamäki et al., 2021; Kolagar et al., 2022). Furthermore, the existing business development processes, tailored for pipeline business models, often fall short of comprehending the intricacies of digital platform business models, as highlighted by (Brecht et al., 2023). Hence, as businesses increasingly leverage digital technologies to create ecosystems that connect producers and consumers, understanding the scholarly discourse on this transformative journey becomes imperative (Täuscher & Laudien, 2018).

Therefore, this bibliometric analysis will highlight prominent themes, key contributors, and pivotal journals that have shaped the scholarly landscape in this field. As we embark on this bibliometric journey, the intent is to distill existing knowledge and identify gaps, emerging trends, and potential avenues for future research. In addition, this study aims to help scholars, practitioners, and policymakers navigate the complex environment of business model transformations in the service industry by synthesizing the findings and discussion. Hence, the objective of this paper is to examine the subsequent research question:

Research Question

RQ1: What are the research trends related to digital platform business model?

RQ2: Who are the experts in this area, based on the number of publications and citations?

RQ3: Which area is the most researched?

RQ4: Which are the top contributing publications? Who writes the most-cited articles?

RQ5: What are the relevant key areas?

RQ6: What are the prominent countries where these studies were conducted?

RQ7: What are the prominent research applications that stem from studies in digital platform business models?

Evolution Of Digital Platform Business Model

According to Srinivasan, n.d., a platform is a business model that enables connections between different user groups, such as passengers and trains. Srinivasan n.d. (2021), highlights the unique feature of the platform business model, that differentiates it apart from the pipeline business model. Unlike the pipeline model, the platform model functions as a network and acts as an intermediary, facilitating direct interaction between users (Zhao et al., 2020).

However, in the service sector, the transition to platform-based models has faced certain limitations (Ahmad Dahlan et al., 2018; Kim et al., 2022). Unlike digital products, services often involve complex, offline interactions that may be challenging to replicate in a purely digital environment (Rösch & Baccarella, 2022). The integration of platform dynamics in the service industry requires addressing various challenges, including trust-building, standardization of services, and the establishment of effective online-offline interfaces (Su et al., 2022).

Delved into the profound influence of digital technologies on Business Model Innovation (BMI), Vaska et al., (2021); discovered pervasive impacts across value creation, delivery, and capture in diverse industries. This underscores the transformative nature of digitalization, shaping the core elements of how businesses operate.

In a related vein, Su et al., (2022); focused on the sharing economy within digital platforms, emphasizing the paramount role of trust and guarantee mechanisms. Their findings underscored the critical need for platforms to establish a foundation of trust among participants, which is essential for the sustainable growth of the sharing economy. Insights the logistics sector, Turienzo et al., (2023) provided insights into the evolution of business models, urging companies to adapt to digital transformation to maximize opportunities thoughtfully. This highlighted the strategic imperative for businesses to align their logistics models with the possibilities presented by digitalization.

Shifting the focus to customer entrepreneurship on digital platforms, Park et al., (2021) revealed a revenue-generation strategy involving both advertising and transaction fees. This illustrated the nuanced approaches that platform providers employ to sustain and monetize their digital ecosystems.

Lastly, Ardolino et al., (2020) contributed a framework describing digital Multisided Platforms (MSPs), highlighting their capacity to facilitate diverse user interactions through information and communication technologies. This highlights the pivotal role of digital MSPs in fostering connectivity and collaboration across different user segments. In summary, these studies provide insights into the impact of digital transformation on business models and the characteristics of digital platforms in various industries.

Methodology

Bibliometrics involves systematically collecting, organizing, and analyzing bibliographic data derived from scientific publications, employing a quantitative framework to assess, monitor, and describe research outputs (Sobral, 2021). Furthermore, this process encompasses basic descriptive elements such as publishing journals, publication years, major author categorization Stefano et al., (2010), and advanced methodologies like document co-citation analysis. Therefore, to conduct a comprehensive literature review, it is imperative to follow a meticulous process involving the use of appropriate keywords, conducting literature searches, and analyzing the findings, as emphasized by Fahimnia et al., (2015).

This bibliometric analysis aims to identify and illustrate research gaps within digital transformation and the platform business model, with a specific focus on the service industry. This method is chosen for its ability to represent extensive bibliographic data visually. Moreover, co-occurrence analysis, which involves counting paired data within the collection

unit to explore patterns and structures of the underlying network, is employed (Buzydlowski, 2015). In addition, VOSviewer, a tool facilitating the construction and visualization of bibliometric data, is utilized in this research, aligning with the approach employed by Schallmo & Hasler, (2021b) to identify underrepresented research areas and derive a research agenda.

For data collection, the Scopus database is selected as the primary source, following the recommended approach by Stefano et al., (2010) and Tan et al., (2014). This ensures a comprehensive and reliable compilation of scholarly articles relevant to the research focus. The study exclusively considers articles from rigorously peer-reviewed and high-quality academic journals, excluding books from the review process (Liu et al., 2015). Accordingly, data spanning from 2019 to December 2023 is gathered and merged into a dataset for analysis, reflecting a selective approach aimed at maintaining a high standard of scholarly rigor and relevance in the sources considered for the literature review.

Data Search Strategy

The study utilized a screening sequence to identify search terms for retrieving articles. Initially, the Scopus database was queried, resulting in the compilation of 989 articles. Subsequently, the query string was modified to prioritize the search terms "digital platform" OR "platform business" in relation to "business model" OR "business model innovation," as indicated in **Table 1**. A total of 559 articles were selected for bibliometric analysis after the final search string refinement.

Table 1: The Search Strings.

Scopus	TITLE-ABS-KEY (("digital* platform*" OR "Platform* business") AND ("Business Model*" OR "Business Model Innovation")) AND (LIMIT-TO (DOCTYPE, "ar") OR LIMIT-TO (DOCTYPE, "cp")) AND (LIMIT-TO (LANGUAGE, "English")) AND (LIMIT-TO (SRCTYPE, "j") OR LIMIT-TO (SRCTYPE, "p")) AND (LIMIT-TO (PUBYEAR, 2019) OR LIMIT-TO (PUBYEAR, 2020) OR LIMIT-TO (PUBYEAR, 2021) OR LIMIT-TO (PUBYEAR, 2022) OR LIMIT-TO (PUBYEAR, 2023))
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Table 2: The Selection Criterion is Searching.

Criterion	Inclusion	Exclusion
Language	English	Non-English
Timeline	2019 – 2023	< 2018
Literature type	Journal (Article)	Book

Data Analysis

Data sets comprising information on the title, publication year, author, journal, citation, and keywords, presented in PlainText format, were obtained from the Scopus database, spanning the timeframe from 2019 to December 2023. Subsequently, these datasets go through analysis using VOSviewer software version 1.6.19. The application of VOSviewer involved employing

its clustering and mapping methods to generate visual representations and analytical insights. VOSviewer serves as an alternative to the Multidimensional Scaling (MDS) approach, as explained by Van Eck & Waltman, 2010). Notably, VOSviewer shares a parallel objective with MDS, focusing on the placement of items within a low-dimensional space. This strategic placement ensures that the accurate reflection of relatedness and similarity between any two items is represented by the distance between them, aligning with the principles of MDS (Appio et al., 2014). This software choice enhances the analytical capabilities, effectively visualizing relationships, and patterns within the dataset, ultimately contributing to a more nuanced and accurate understanding of the underlying data structure. In contrast to MDS, which centers on computing similarity measures like Jaccard indexes and cosine, VOS employs a more appropriate technique for normalizing co-occurrence frequencies, as outlined by (Van Eck & Waltman, 2010). This technique involves utilizing the Association Strength (AS_{ij}), and it is calculated as follows:

$$AS_{ij} = \frac{C_{ij}}{W_i W_j}$$

Here, C_{ij} represents co-occurrence frequency, while W_i and W_j are normalization weights. This nuanced approach enhances the accuracy and precision of co-occurrence frequency normalization in VOS (van Eck & Waltman, 2010). This enables a more detailed analysis of relationships in the dataset by considering the observed co-occurrences of i and j in comparison to the expected co-occurrences, assuming that co-occurrences of i and j are statistically independent (Van Eck & Waltman, 2010). therefore, by utilizing this index, the VOSviewer displays items in the form of a map by minimizing the total weighted sum of the squared distances between all pairs of the items, Appio et al., (2016), implemented the LinLog/modularity normalization, as indicated. Additionally, by analyzing the data set using visualization techniques through VOSviewer, it will reveal patterns based on mathematical relationships and included keyword co-occurrence, citation analysis, and co-citation analysis. Besides that, the emergence of research areas throughout a period of time can be discovered by keyword co-occurrence analysis (Yun et al., 2017), which effectively identifies popular topics in various fields (Li et al., 2016). Meanwhile, citation analysis serves the purpose of identifying trends, key research issues, and methodologies, while also delving into the historical relevance of a discipline's primary subject of interest (Allahverdiyev & Yucesoy, 2017). Additionally, document co-citation analysis is one of the commonly used bibliometric methods (Appio et al., 2016; Fahimnia et al., 2015; Liu et al., 2015), that relies on the network theory to determine the relevant structure of data (Liu et al., 2015).

Result And Finding

The study reveals seven significant findings. To begin with, it examines the evolution of research on digital transformation in the service sector. Additionally, it determines the authors who have achieved the highest level of contribution in this particular field. Furthermore, it precisely identifies the main areas of research focus. The fourth outcome focuses on analyzing the top 10 most cited documents and productive authors in the field. Progressing further, the fifth and sixth results delve into the analysis of keyword co-occurrence, co-authorship patterns, and keywords. Lastly, the seventh result encompasses a co-citation analysis of co-cited references, providing a comprehensive overview of the intellectual connections within the studied literature. The following subsections discuss the findings in accordance with the research questions.

Research Trends

RQ1 concerns the trends in research related to digital platform business model. **Figure 1** illustrates research publication productivity concerning digital transformation in the service industry, showing a noticeable increase in recent years. The term "digital transformation" has been brought about by its emergence in 2012, revolutionizing the operations, manufacturing processes, and marketing strategies of businesses (Kumar et al., 2023). The publication trends in digital platform business from 2019 to 2023 reveal a dynamic landscape. The number of publications indicated a gradual increase with a significant surge observed during the period of 2019–2021. This growth trend culminated in 2021, with the publication of 146 research papers, constituting 29.14% of the total. This peak reflects a significant uptick in research activity within the digital platform business, suggesting a period of heightened engagement and productivity.

The increase in 2021 surpassed the previous years and demonstrated a remarkable leap forward in scholarly output. However, the subsequent years, 2022 and 2023, exhibit a minor decline in both absolute numbers and percentage distribution. In 2022, there were 138 publications, accounting for 27.54% of the total, and in 2023, the figure stood at 135 publications, constituting 26.95%. While these numbers represent a slight decrease from the peak in 2021, they still maintain a substantial percentage share of the overall output. Moreover, this percentage distribution provides valuable insights into the proportional contribution of each year to the cumulative research output. Despite the fluctuations, the data underscores the relative stability in research productivity. Nonetheless, the decline in absolute numbers from 2021 to 2023 does not diminish the significance of these years, as they continue to contribute a significant portion of the overall scholarly output.

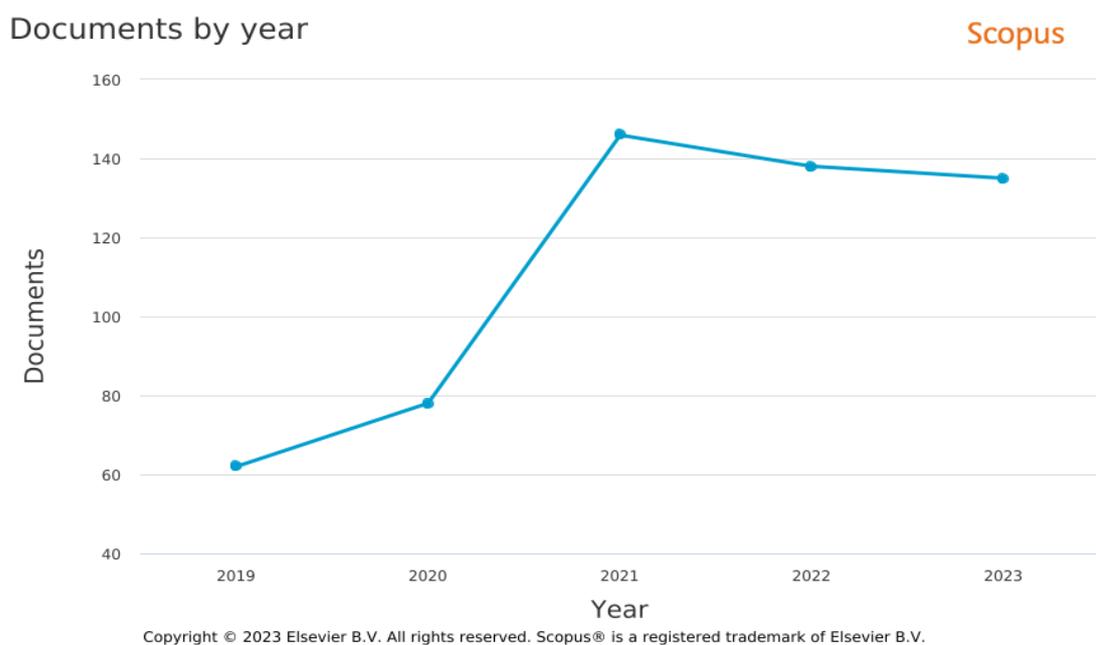


Figure 1: Documents Produced by Year.

Table 3: Number of Publications by Year and Percentage

YEAR	Number of publications	Percentage %
2023	135	26.95
2022	138	27.54
2021	146	29.14
2020	78	15.57
2019	62	12.38

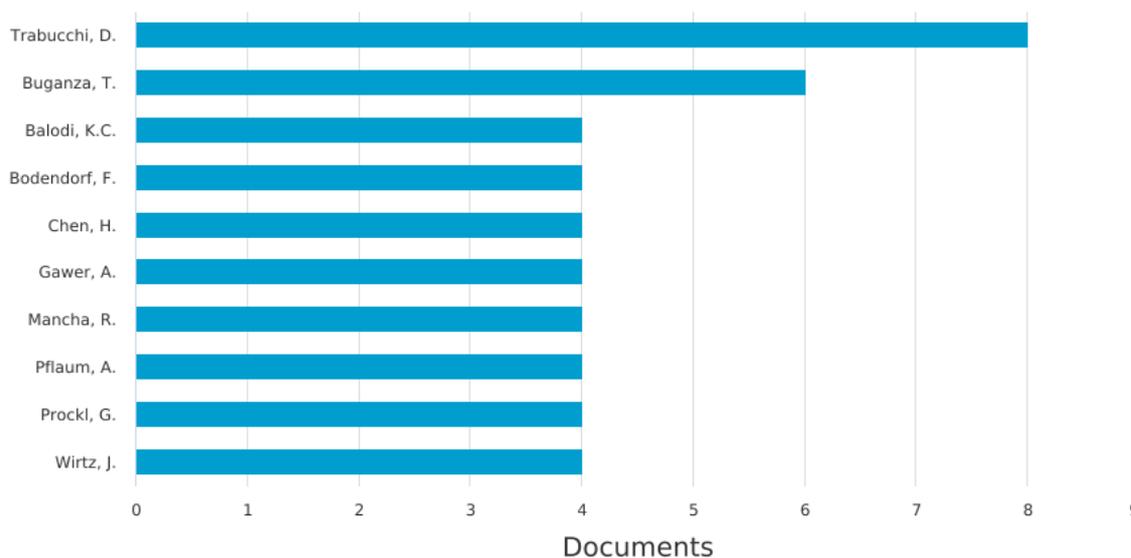
Experts Within The Area

RQ2 relates to the expert who has written the most research paper and whose research is well cited. The first part of RQ2 focusses on the number of publications by each individual authors. Upon examining the list of highly productive authors presented in **Figure 2**, it is evident that Trabucchi, D., stands out with an impressive total of eight publications. Meanwhile, authors such as Buganza, T., and Balodi, K.C., have made significant contributions to the field by publishing six and four papers, respectively. Their work demonstrates a strong dedication to advancing knowledge in this rapidly changing field. Examining the list further, it is interesting to note the wide range of authors, which comprises Bodendorf, F., Chen H, Gawer, A., Mancha, R., Pflaum, A., Prockl, G., and Wirtz, J., each having authored four publications. To summarize, the examination of the most productive authors in the field of digital transformation uncovers a diverse group of scholars making significant contributions to advancing understanding in this area.

Documents by author

Scopus

Compare the document counts for up to 15 authors.



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Figure 2: The Highest Documents Produced by Authors.

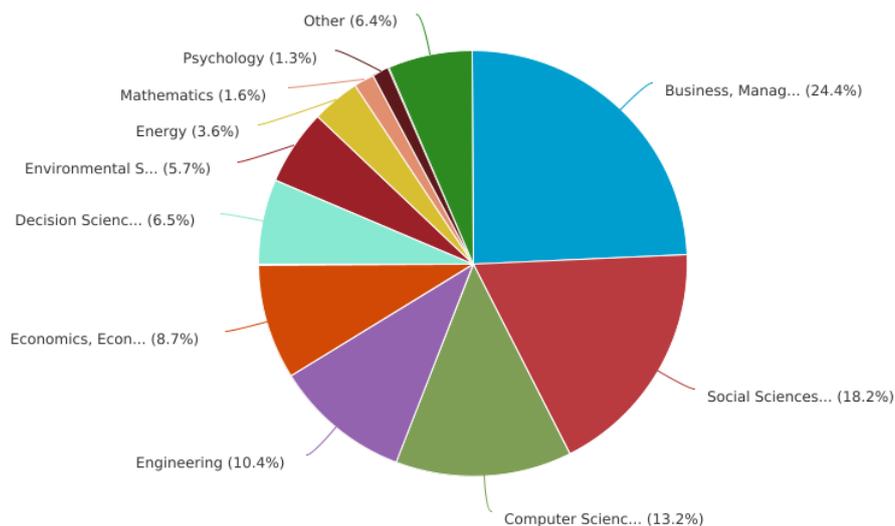
Most Areas Of Research

RQ3 relates to the most researched area. The pie chart in **Figure 3** illustrates a distinct dominance of Business, Management, and Accounting (24.4%) as the primary subject area

with the highest number of documents related to platform business models. This prominence underscores the pronounced focus on the business and economic dimensions of platforms within this domain. Following closely is Social Sciences (18.2%), indicating a significant emphasis on the social and societal implications of platform adoption and use. This encompasses various fields such as sociology, communication, and political science, reflecting a comprehensive exploration of the broader impact on society. In the realm of technology, Computer Science (13.2%) and Engineering (10.4%) emerge as crucial contributors, highlighting the vital role of technological underpinnings and infrastructure that support platform models. These subject areas underscore the significance of the technical aspects in shaping and sustaining platform-based services. To a lesser extent, other subject areas like Mathematics (1.6%), Psychology (1.3%), and Energy (3.6%) also contribute valuable insights from their respective disciplinary perspectives. Despite their lower representation, these diverse fields offer unique viewpoints that contribute to a more comprehensive understanding of platform business models in the service industry.

Documents by subject area

Scopus



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Figure 3: Documents by Subject Area

Most Influence Studies.

Table 4 indicates the 10 most influential publications of digital transformation focusing on the digital platform business. "The Rise of the Platform: A New Understanding of Digital Platforms and New Technologies" by Wirtz et al., (2019) is the most cited publication, with 216 citations in Scopus. It explores the platforms in the peer-to-peer sharing economy, which provides a foundational framework for understanding platform models and their implications. Meanwhile, the second-most-cited publication, with 169 citations, comes from Sadowski, (2020) article, "The Internet of Landlords: Digital Platforms and New Mechanisms of Rentier Capitalism," garnered 169 citations, which delves into the specific impact of platforms on the housing market and the rise of the "rentier economy." This highlights the potential for platforms to disrupt traditional industries and reshape power dynamics. At the same time, the third most cited study, with 162 citations, "The Rise of the Platform Business Model and the Transformation of Twenty-First-Century Capitalism" by Rahman & Thelen, (2019), takes a

broader perspective, examining the wider societal and economic implications of platform models. This paper could be useful for exploring the long-term consequences of platform adoption. Following closely, the fourth article by Bouncken et al., (2021), has received 160 citations and focuses on the strategic implications of platform models for businesses. This research could be relevant for managers and entrepreneurs seeking to leverage platforms for competitive advantage. Next, the fifth most cited article, Stallkamp and Schotter, (2021) "Platforms without borders? The international strategies of digital platform firms," with 140 citations, addresses the global nature of platform businesses and the challenges associated with operating in diverse regulatory environments. Additionally, the following five publications, namely Bonina et al., (2021), Zhao et al., (2020), Ivanov et al., (2022), and Williamson, (2021), have all accumulated over 100 citations each except Garud et al., (2022), with 89 citations.

Table 4: Most Influential Publications Based on Citation Count.

Authors	Title	Year	Source	Cited by
Wirtz J. et al.,	Platforms in the peer-to-peer sharing economy	2019	Journal of Service Management	216
Sadowski J	The Internet of Landlords: Digital Platforms and New Mechanisms of Rentier Capitalism	2020	Antipode	169
Rahman K.S.; Thelen K.	The rise of the platform business model and the transformation of twenty-first-century capitalism	2019	Politics and Society	162
Bouncken R.B. et al.,	Knowledge- and innovation-based business models for future growth: digitalized business models and portfolio considerations	2021	Review of Managerial Science	160
Stallkamp M.; Schotter A.P.J.	Platforms without borders? The international strategies of digital platform firms	2021	Global Strategy Journal	140
Bonina C. et al.,	Digital platforms for development: Foundations and research agenda	2021	Information Systems Journal	126
Zhao Y. et al.,	The evolution of platform business models: Exploring competitive battles in the world of platforms	2020	Long Range Planning	105
Ivanov D. et al.,	Cloud supply chain: Integrating Industry 4.0 and digital platforms in the "Supply Chain-as-a-Service"	2022	Transportation Research Part E: Logistics and Transportation Review	104
Williamson B.	Making markets through digital platforms: Pearson, edu-business, and the (e)valuation of higher education	2021	Critical Studies in Education	103

Garud R. et al.,	Liminal movement by digital platform-based sharing economy ventures: The case of Uber Technologies	2022	Strategic Management Journal	89
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The Relevant Key Areas

RQ5 concerns the relevant key areas. The analysis involved keywords analysis, which result point out the diverse but relevant areas. The VOSviewer analysis of keywords within the dataset, as displayed in **Figure 4**, reveals distinct clusters that provide insights into the research focal points within the domain of platform business models. The first cluster emphasizes the importance of "platform ecosystems." This area explores how platforms drive innovation and use digital technology to create interconnected ecosystems. The prominence of keywords like "platform business," "innovation," and "digital technology" suggests a dedicated exploration of how platforms shape contemporary business dynamics. Meanwhile, the second cluster revolves around "Value Creation," examining how platforms generate value for various stakeholders. Keywords such as "value proposition," "business models," and "case studies" indicate a concerted effort to understand the mechanisms behind value creation. Additionally, terms like "platformization" and "servitization" reveal an interest in how traditional businesses adapt to platform models and offer services through platforms.

At the same time, the third cluster delves into "Challenges and Governance," addressing issues like "regulation," "privacy," and "trust." This area of research focuses on the complex challenges and governance issues associated with platform business models. Keywords like "competition" and "platform capitalism" express concerns about potential power imbalances in the platform ecosystem. The inclusion of terms like "regulation" and "privacy" highlights the growing awareness of the need for regulatory frameworks to ensure fair competition and protect user privacy in the evolving landscape of platform-based businesses. In summary, the VOSviewer analysis reveals three distinct research clusters: platform ecosystems, value creation mechanisms, and challenges/governance considerations. Accordingly, these clusters provide insights into the multifaceted dimensions of research on platform business models, emphasizing the significance of platform ecosystems, the processes of value creation, and the challenges and governance aspects inherent in the dynamic landscape of platform-based economies.

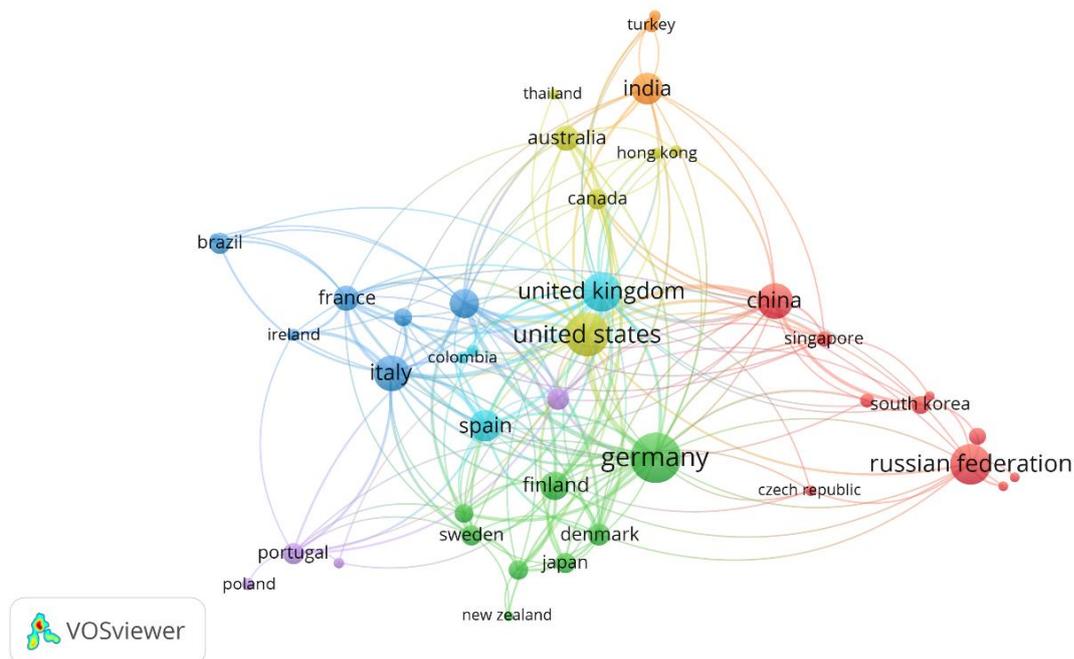


Figure 5: Network Visualization Map of Co-Authorship by Countries

Prominent Research Applications

Co-citation analysis involves establishing connections to research domains through the act of referencing an article (Ardito et al., 2019). When documents are listed together in a publication's reference list, they are considered co-cited, indicating a connection to a related research field (Fahimnia et al., 2015). Therefore, by conducting a comprehensive analysis of clustered articles using co-citation analysis, one can effectively uncover and gain a deeper understanding of the research focus within that cluster. **Figure 6** shows a co-citation map which illustrates the co-cited references obtained from authors who have published the papers. Nodes with larger size indicate a higher number of cited documents, while a thicker link signifies a greater degree of the co-citation between the connected nodes. The map demonstrates 190 links with four clusters. Out of 21 articles, seven papers were classified into Cluster 1 (red), which is the largest cluster encompassing the majority of the documents. As revealed in the cluster, the focuses area of these articles' research was concerning the emergence and management of MSPs and their role in the Digital Revolution. It highlights the paradox of digital platform firms and their ecosystems, highlighting the need for future research on ecosystem governance and societal responsibilities.

Meanwhile, studies conducted in Cluster 2 (green) comprising six documents revealed that the research focus primarily revolved around the challenges of self-regulation and the regulatory environment for digital platforms, highlighting historical examples and current challenges. It suggests a combination of self-regulation and government regulation, considering the platform's data appetite, privacy disregard, and constant expansion. At the same time, Cluster 3 (blue) comprises four documents highlighting a lack of consensus among scholars and the development of literature in silos. However, common themes include the business model emerging as a new unit of analysis, emphasizing a system-level, holistic approach to explaining business, the importance of firm activities in various models, and the focus on creating value rather than capturing it. The purpose of these articles is to provide a better understanding into the importance of business models and their relationship with economic theory, innovation

management, and business strategy. Moreover, documents in Cluster 4 (yellow) also consist of 4 documents associated with the platform competition in two-sided markets, focusing on the determinants of price allocation and end-user surplus for profit-maximizing platforms and not-for-profit joint undertakings. It compares outcomes under integrated monopolists and Ramsey planners, highlighting the importance of balancing both sides.

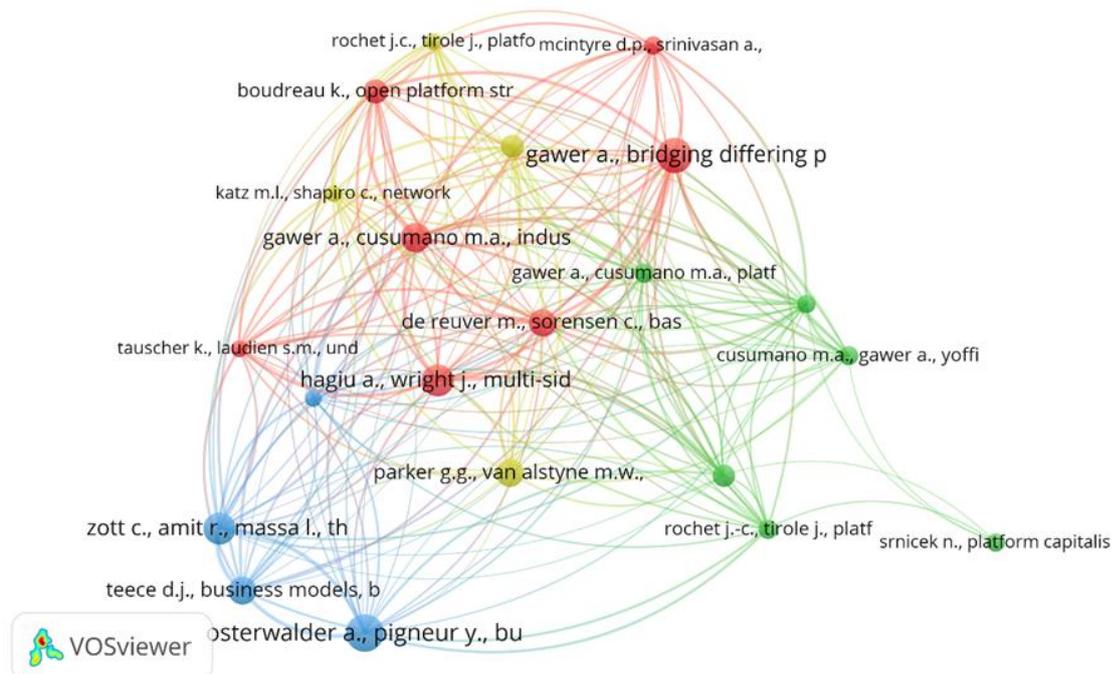


Figure 6: Network Visualization Map of Cited References

Discussion and Conclusion

Conclusively, this study provides a thorough synopsis of research on digital transformation in the service industry during the previous five years. The descriptive analysis shows an increasing emphasis on digital transformation in the service industry, specifically since 2019, with a particular focus on digital platform business. The bibliometric analysis identifies prominent authors who have made substantial contributions to the field, demonstrating various academic backgrounds and affiliations. Furthermore, the most significant study found in this analysis is "Platforms in The Peer-to-Peer Sharing Economy" in the Journal of Service Management by Wirtz et al., (2019), which highlighted the importance of this subject in the current body of literature. This study also emphasizes prominent keywords such as "platform ecosystems," "platform business," "innovation," and "digital technology." These keywords highlight the main themes discussed in the literature, emphasizing how platforms generate innovation and employ digital technology to create interconnected ecosystems. Accordingly, this study highlights the crucial significance of digital transformation in promoting sustainable development and its significant economic and social effects on the service industry.

Moreover, this paper explores key subject areas that contribute to the comprehension of platform business models, specifically in the fields of business, accounting, management, social sciences, computer science, and engineering. Additionally, it highlights influential publications that offer fundamental frameworks and valuable insights into the consequences of platform models in different industries. Furthermore, the analysis reveals three primary

research clusters: platform ecosystems, value creation mechanisms, and challenges/governance considerations. In addition, the paper examines the phenomenon of international author collaboration, with a particular focus on Germany's leading position as a central hub in this collaborative network. At the same time, the co-citation analysis reveals four distinct clusters of research focus: the rise and administration of MSPs, the complexities surrounding self-regulation and government regulation for digital platforms, the importance of business models, and competition within two-sided markets.

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