Review

Mapping the Evolution of Digital Business Research: A Bibliometric Review

Bongsug (Kevin) Chae

College of Business, Kansas State University, Manhattan, KS 66505, USA; bchae@ksu.edu

Abstract: Prevalent digital technologies have changed the landscape of business. There have been a growing number of studies investigating the intersection of digital technologies and business. This study aimed to map the academic literature in digital business by adopting a bibliometric approach. In this study, we considered 1868 articles spanning twenty years, between 2000 and early 2021. Specifically, the study focused on the trends of research in digital business, popular publication sources, highly cited articles and productive researchers, and popular themes and their changes over time.

Keywords: digital business; digital innovation; digital technologies; bibliometric analysis; literature review

1. Introduction

Digital technologies are ubiquitous and enable the rapid development of products and services [1,2]. This phenomenon is broadly known as digitization and digitalization. Digitization refers to converting analog information into digitized products and is driving digitalization, which is fundamentally changing the way products and services are produced, delivered, and consumed through digital technologies. In the literature, there is a stream of research areas, which are closely related to the digital phenomenon in business contexts. This interdisciplinary field includes such topics and areas as digital innovation, digital platform, digital ecosystem, and digital entrepreneurship. This study applies a bibliographical research method to 1868 journal articles’ metadata and reports the intellectual landscape of the emerging field.

Many digital business studies appear in the innovation and information systems literature. In such literature, digital innovation refers to the process by which products and services are innovated with the help of digital technologies. This line of research has brought digital technologies into the foreground of managing business innovation. One of the notable studies noted the prevalence of digitalization in business and society and signaled “profound changes in the ways that firms organize for innovation in the future” [3]. “Digital changes” has been a key focus in innovation research [4].

Another research area involves the concept of platform (e.g., supply-chain platform and industry platform), which appeared as an important strategy for businesses in industrial innovation management and IS literature [5]. Digitalization led to the emergence of platforms enabled by digital technologies. These “digital platforms” such as Twitter and PayPal are software-based and distributed. Digital ecosystem, as a closely related concept, is based on the ecological metaphor that digital platforms are constantly co-evolving with other platforms and in a broader environment. A notable study on information systems presented a framework for understanding the digital platform phenomenon, including shifting business competition toward a platform-based ecosystem [6].

Digitalization also explains the emergence of a new category of entrepreneurial activity called “digital entrepreneurship” arising from the use of digital technologies as the primary means of creating and delivering service offerings. A growing number of studies...
suggest that digital venturing differs from traditional venturing, including not only digit-
ization of products and services but also how they are marked and delivered and how
business models are implemented [7]. In this context, Hull et al. [8] discussed three types
of digital entrepreneurship—mild, moderate, and extreme—in terms of the degree of reliance
on digital technologies for business.

There are other related research areas, and some are closely related to specific aca-
demic fields. For example, the research in digital business ecosystem that explores digi-
tally enabled collaborative environments formed by economic entities is popular in the IS
field [9]. Digital marketing focuses on the use of digital technologies, including cloud com-
puting, AI, and IoT, for marketing activities [10]. Other areas include digital business
models [11], digital business transformation [12], and others.

2. Research Objectives

In recent years, the research in digital technologies and businesses is growing in ac-
dademic literature. In response, the previous studies have attempted to understand the
landscape of this multidisciplinary field. These studies tend to either focus on specific ar-
 eas of digital business [9–11] or use such methods as literature reviews and expert
knowledge [2,12]. Unlike these previous studies, this study focuses on several major re-
 search areas related to digital business using a bibliometric approach. By doing this, this
study aims to contribute to the literature by mapping the evolution of digital business
using a bibliometric analysis. We identified 1869 academic research papers in such topics
as digital innovation, digital platform, digital ecosystem, and digital entrepreneurship
and attempted to answer the following research questions:

• What are the trends and growth of scientific research in digital business?
• What are the publication sources and source-growth dynamics?
• What are the highly cited articles, and who are the most productive researchers?
• What are the popular keywords used in the articles?
• What are the popular topics over time?

3. Methodology

We identified 1869 articles from the Web of Science (WoS) Core Collection. Among sev-
 eral available databases (e.g., Google Scholar and Scopus) for journal articles [13], WoS is con-
sidered a popular, comprehensive, and reliable database for searching journal articles to study
academic or research fields [14]. For the search, we used a combination of the following key-
words: digital innovation OR digital business OR digital platform OR digital ecosystems OR
digital entrepreneurship OR digital strategy. These keywords were chosen to select journal
articles in digital business and relevant research areas rather than in domain-specific research
areas (e.g., digital marketing). The title span of the search was between 2000 and 2021. The
analysis was conducted using a popular bibliometric tool called R Bibliometrix [15]. This open-
source tool supports a wide range of bibliometric methods of analysis. VOSviewer [16] was
also used for network visualization of keywords and author collaboration. Many descriptive
charts were created using Matplotlib, a popular Python library.

4. Results

4.1. Trends and Growth of Scientific Research in Digital Business

Table 1 presents the summary of the dataset used in this study. The data represents
over 1000 article sources and over 5700 unique authors. Figure 1 shows the growth of the
publication in the field. The number of publications has significantly increased since 2014,
from 21 in 2014 to over 500 in 2020. The annual growth rate is 25 percent, calculated as the
percent growth by the number of years.
Table 1. Data Primary Information and Summary of the Dataset.

<table>
<thead>
<tr>
<th>Description</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timespan</td>
<td>2000-2021</td>
</tr>
<tr>
<td>Sources (journals, books, etc.)</td>
<td>1071</td>
</tr>
<tr>
<td>Documents</td>
<td>1869</td>
</tr>
<tr>
<td>Average years from publication</td>
<td>3.1</td>
</tr>
<tr>
<td>Average citations per documents</td>
<td>8.753</td>
</tr>
<tr>
<td>Average citations per year per doc</td>
<td>1.823</td>
</tr>
<tr>
<td>References</td>
<td>72,817</td>
</tr>
<tr>
<td>Document Types</td>
<td></td>
</tr>
<tr>
<td>Article</td>
<td>1686</td>
</tr>
<tr>
<td>Article, early access</td>
<td>100</td>
</tr>
<tr>
<td>Editorial material</td>
<td>81</td>
</tr>
<tr>
<td>Letter</td>
<td>2</td>
</tr>
<tr>
<td>Authors</td>
<td></td>
</tr>
<tr>
<td>Authors</td>
<td>5794</td>
</tr>
<tr>
<td>Author Appearances</td>
<td>6400</td>
</tr>
<tr>
<td>Authors of single-authored documents</td>
<td>375</td>
</tr>
<tr>
<td>Authors of multi-authored documents</td>
<td>5419</td>
</tr>
<tr>
<td>Author Collaborations</td>
<td></td>
</tr>
<tr>
<td>Single-authored documents</td>
<td>395</td>
</tr>
<tr>
<td>Documents per author</td>
<td>0.323</td>
</tr>
<tr>
<td>Authors per document</td>
<td>3.1</td>
</tr>
<tr>
<td>Co-authors per documents</td>
<td>3.42</td>
</tr>
<tr>
<td>Collaboration index</td>
<td>3.68</td>
</tr>
</tbody>
</table>

4.2. Publication Sources and Source-Growth Dynamics

There were over 1000 journal sources in the dataset. Figure 2 shows a list of journals with the greatest number of publications in digital business. The top five journals are Sustainability (38 articles), Technological Forecasting and Social Change (27), Journal of Business Research (25), MIS Quarterly (25), and Technology Innovation Management Review (16).
According to Figure 3, which shows the cumulative counts of articles published in the 30 most relevant journals, the publication on digital business has increased significantly since around 2010, and there has been a steady upward trend since then. Figure 4 shows the yearly publication growth by the journals while highlighting the year in which each of those journals published the greatest number of relevant articles. In the early years (before mid-2010s), only a few journals published a noticeable number of articles, and they were MIS Quarterly (MISQ), IEEE Transactions on Industrial Electronics (IEEETIE), Journal of the Association for Information Systems (JAIS), and Harvard Business Review (HBR).

Figure 3. Cumulative publication counts for 30 most relevant journals.
The popularity of digital business appears to have grown significantly since the mid-2010s. This was largely driven by special issues or sections organized by several journals. Among these journals, Technological Forecasting and Social Change (TFSC) published several articles on digital entrepreneurship in 2019, e.g., [17]. In 2020, the journal Sustainability had several special issues related to the broad theme of digital business, e.g., [18]. In 2021, the Journal of Business Research organized a special issue on “Digital transformation as a springboard for product, process and business model innovation” [19].

Two figures (Figures 5 and 6) show the results of analyzing journal impacts. Figure 4 shows the most locally cited (LC) journals. LC refers to the citations a selected article has received from articles in our research dataset (1869 articles) [20]. The top five journals were MISQ (2098 citations), Information Systems Research (ISR) (1145 citations), Strategic Management Journal (SMJ) (1128 citations), Organization Science (1053 citations), Academy of Management Review (AMR) (753 citations), and Research Policy (710 citations). The journals in this list are related to three disciplines: MIS, business & management, and marketing.

Figure 4. Yearly publication counts for 30 most relevant journals.

Figure 5. Most local cited journals (from reference lists).
Figure 5 shows a list of impactful journals in terms of the H-index, which is an indicator of a selected journal’s output and performance. Five journals—MISQ (20 H-index), IIEETIE (12 H-index), TFSC (11 H-index), JBR (8 H-index), and International Journal of Information Management (IJIM) (7 H-index)—ranked top in this list. A high H-index indicates that the articles published in these journals tend to receive many citations. For example, JBR has published 25 articles in digital business, and nine of the publications received eight or more citations [21–29].

Figure 6. Journal local impact by H-index.

Figure 7 is a co-citation network based on cited journals in the articles. The co-citation network is built based on the degree of coupling between two journals, articles, or authors [30]. Four clusters of journals emerge from the network. One of the clusters where MISQ and ISR emerge as hubs primarily includes journals in IS and relevant areas. The second cluster includes journals in business, management, and entrepreneurship such as Organization Science, AMR, and SMJ. The third cluster is also related to business journals but, unlike those in the second cluster, these journals are oriented toward business practices, including HBR, MIT Sloan Management Review, and California Management Review. Many in the fourth cluster are related to marketing and business, including JBR, Industrial Marketing Management, Journal of Marketing, and Journal of Marketing Research.
4.3. Highly Cited Articles and Productive Researchers

Table 2 shows highly cited articles based on Total or Global Citations (TC), which refers to the number of citations a selected article received from other articles indexed in the bibliographic database, WoS, the source of our research data. Many of the authors with highly cited articles are in such academic fields as Information Systems, e.g., [3,31], entrepreneurship, e.g., [7], marketing, e.g., [32], and organization science, e.g., [33]. Some of these highly cited papers are in the intersection between two disciplines: entrepreneurship and marketing [32] and entrepreneurship and information systems [34].

Table 2. Most Global Cited Articles & Most Local Cited Articles.

<table>
<thead>
<tr>
<th>Paper</th>
<th>TC</th>
<th>Paper</th>
<th>LCS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lusch Rf, 2015, MIS Quart</td>
<td>474</td>
<td>Nambisan S, 2017, MIS Quart</td>
<td>98</td>
</tr>
<tr>
<td>Correia Lm, 2010, IEEE Commun Mag</td>
<td>346</td>
<td>Bharadwaj A, 2013, MIS quart</td>
<td>84</td>
</tr>
</tbody>
</table>

Figure 8 represents a co-citation network of cited references. In this network, “The New Organizing Logic of Digital Innovation: An Agenda for Information Systems Research” [3] is shown to be most influential in digital business research. The article, considered one of the earlier studies in digital business, pointed out that pervasive digitization led to the emergence of “the layered modular architecture”. While the commentary article...
was originally written for IS researchers, it received over 2300 citations from diverse disciplines. The second most influential article is also by Y. Yoo and his colleagues [1], titled “Organizing for Innovation in the Digitized World” and published in Organization Science. Both articles foresaw the significant impact of digital innovation on digital technologies and business for years to come.

![Co-citation network of cited references.](image)

Figure 8. Co-citation network of cited references.

Figure 9 shows the intellectual structure of the digital business research field. Five articles appear to have greatly influenced the trajectory of the digital business field since the early 2010s. Two are IS articles by Y. Yoo and his colleagues [1,3]. The other three articles, focusing on robotic innovation [35], patterns of digital innovation [36], and digital control [33], were published in the same issue of the journal Organization Science. This journal issue also contained other digital business research articles [1,37]. In 2017 several influential articles were published, including digital entrepreneurship [7], digital innovation management [34], and digital innovation process [38].
4.4. Trending Topics from Authors’ Keywords

Finally, our analysis looked at trending topics in digital business through authors’ keywords. Figure 10 is based on the cumulative counts of keywords used in the articles. The purpose was to understand the trend of topics in digital business research. As expected, the list includes digital innovation, digital platform(s), digital transformation, digital entrepreneurship, digital ecosystem, business model, digitization, digital strategy, and digital economy. The figure also reveals the popularity of keywords in recent years. Among them are COVID-19, big data, social media, China, industry 4.0, open innovation, sustainability, digital business, smart city, Twitter, and Internet of things (IoT).
Figure 11 examined the trends of those popular keywords over the years. The keywords popular in the early and mid-2010s were digital ecosystems, digital business strategy, web 2.0, and mobile phone. The digital business field is shown to have drawn much attention as there were many new keywords in the late 2010s, including sharing economy, digital platforms, digital entrepreneurship, social media (e.g., Twitter, Facebook), smart city, and virtual reality. Some of the latest keywords are artificial intelligence, sustainability, telemedicine, digital marketing, and COVID-19.

![Figure 11. Keyword dynamics (trend topics).](image)

Figure 11 displays a conceptual structure map using multiple correspondence analysis (MCA), which analyzes the associations among several nominal variables [39]. The pattern of relationships of those keywords is represented in two dimensions like a principal component analysis (PCA). Six patterns were identified. Four large clusters are (1) digital strategy and business model, (2) digital innovation and entrepreneurship, (3) digital ecosystem and social media, and (4) blockchain, artificial intelligence, and smart city. Two smaller clusters are (5) Industry 4.0 and (6) Internet of things (IoT). Topics like COVID-19, digital marketing, and sharing economy are part of (3) digital ecosystem and social media. Two important notions—digitization and digitalization—appear to be used in different contexts. As digitization (“digitizing data and information”) appears to be closely associated with digital innovation and entrepreneurship, digitalization (“automating business processes”) is discussed with (4) blockchain, artificial intelligence, and smart city.
5. Discussion and Conclusions

Prevalent digital technologies have changed the landscape of business. There have been a growing number of studies investigating the intersection of digital technologies and business. This study aimed to map the academic literature in digital business by adopting a bibliometric approach. Over 1850 articles were considered in this study and spanned over twenty years, between 2000 and early 2021. Specifically, the study focused on the trends of research in digital business, popular publication sources, highly cited articles and productive researchers, and popular themes and their changes over the time.

One of the key findings is that digital business is a fast-growing field. There were very few articles in the early years. The year 2010 appears to be a major milestone for the field as the number of publications jumped to 22 from a single digit. Additionally, this is when one of the most cited articles [3] was published in a top IS journal, ISR. Another major milestone was the year 2015, when the number of digital business publications reached 88. This time, a major contribution (“Service innovation: A service-dominant logic perspective”) was made by a collaboration of scholars in two academic fields, marketing and entrepreneurship, which was published in another top IS journal, MISQ [32]. The publication growth has accelerated since 2015 and reached over 500 articles in 2020.

The findings of most relevant journals reveal the diversity of digital business research. IS journals have been major publication outlets, including MISQ, JSIS, EJIS, JIT, and ISJ, which are considered top journals in that field. Additionally, several business- and innovation-focused multidisciplinary journals have published many articles in digital business. They are TFSC, JBR, Research Policy, IJIM, and TIMR. The popularity of the journal Sustainability for digital business research is also noticeable. This may be because the relatively new online journal publishes many articles related to many aspects of sustainability, including digital technologies and business. The growth of digital business as a research field is well-demonstrated by the launch of the new open access journal “Digital Business” [2].

Not surprisingly, journal special issues appear to be important in shaping the trajectory of a multidisciplinary research area like digital business. The yearly publication counts for the most relevant journals echo this point. For example, MISQ organized a special issue “Service Innovation in the Digital Age” (Vol. 39, No. 1), including several articles, some of which became influential in future studies [32,40,41]. In 2019, TFSC published 14 articles in topics related to digital business, including digital entrepreneurship [17,42,43], digital transformation [44], digital economy [45], and digital innovation ecosystems [46]. Sustainability and JBR launched special issues in digital business in 2020 and
2021, respectively. The contributions of IS journals such as MISQ and EJIS (European Journal of Information Systems) are noticeable, especially between 2010 and 2015. Between 2016 and 2021, there has been more diversity in the journals, and the contributions of business and multidisciplinary journals have increased.

The analysis of co-cited journals shows that digital business is a multidisciplinary field of inquiry. Specifically, three broad disciplines appear to be behind the growth of the field. They are IS, management and entrepreneurship, and marketing. The citation analysis shows that top journals in those three disciplines have been most impactful. For example, the most impactful IS journals are MISQ, ISR, JMIS, and JSIS. There are several impactful journals in the management and entrepreneurship area, including SMJ, AMR, Organization Science, Research Policy, AMJ, and Journal of Product Innovation Management. Among the marketing journals are Journal of Marketing and Industrial Marketing Management. Impactful interdisciplinary journals include JBR, TFSC, and IJIM.

The analysis of articles revealed highly cited articles and productive researchers in the field. The development of an emerging field (e.g., bitcoin) is often accelerated by research essay(s) or commentary(ies) proposing new ideas and research agendas. Research commentaries like Yoo et al. [3] and Nambisan et al. [7,34] have played such critical roles in digital business. The former offered a conceptual framework of explaining the innovation driven by digitization and a research agenda involving two themes: corporate IT infrastructures and new strategic frameworks. The proposed framework has been widely adopted by future studies e.g., [47]. Nambisan’s article theorized the concept of digital entrepreneurship, “the intersection of digital technologies and entrepreneurship”, and advanced the management of digital innovation.

The latest trending topics, such as COVID-19, artificial intelligence, big data, smart city, blockchain, IoT, and Industry 4.0, are pointing out that the trending topics in digital business are increasingly diverse, including emerging technologies (e.g., blockchain), applications (e.g., smart city, telemedicine), and new business and societal challenges (e.g., COVID-19). The conceptual structure map revealed that such diversity can be grouped into six broad topic categories. Topics such as digital innovation, entrepreneurship, big data, digital marketing, social media, and digital business models and strategy are popular. While less popular, concepts and technologies such as Industry 4.0 and IoT are discussed in the contexts of digital business.

Digital business as a research field has primarily focused on the intersection of digital technologies and business and embraced a variety of relevant research areas, including digital entrepreneurship, digital platforms, digital innovation, digital strategy, and digital business model, to name a few. Such intersection is dynamic as both worlds—digital technologies and business—constantly co-evolve over time [2,48]. The co-evolution process creates openness in the future of the field and opportunities for future research. The launch of recent special issue articles in journals (e.g., Sustainability, JBR, and TFSC) and new journals (e.g., Sustainability and Digital Business) has increased such opportunities in the field.

This study is without limitations. There are at least two areas which can be improved in future studies. First, this study relied on WoS as the data source. There are alternative databases such as Crossref, Microsoft Academic, and Scopus [14] for future studies. Second, this study used quantified metrics (e.g., number of citations) to understand the multidisciplinary field of digital business. Future studies could consider both bibliometrics and qualitative text analysis methods, such as topic modeling [48].

**Funding:** This research received no external funding.

**Conflicts of Interest:** The author declares no conflict of interest.
References