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Trends in Digital Transformation and Marketing Productivity

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Abstract

Implementing digital transformation (DT) has become an essential factor in preserving competitiveness and achieving transformative leadership for enterprises. This research examines trends in digital transformation and evaluates the effectiveness of marketing strategies, focusing on the impact of digital technologies such the Internet of Things (IoT), big data, machine learning (ML), and artificial intelligence (AI). Analyzing 214 scholarly articles published from 2017 to 2024 through bibliometric methods indicates that integrating digital technologies has the potential to accelerate advancements and instigate significant changes across various industries. The findings demonstrate that key terms such as "digital marketing," "digitalization," "AI," and "big data" are essential in transforming marketing strategies. The examination of productivity reveals that a few well-known authors and institutions are responsible for the majority of research contributions. This emphasizes the significance of collaboration in order to enhance the collective comprehension of DT in marketing. This research offers a comprehensive examination of digital transformation (DT) and marketing, emphasizing significant themes and emerging trends that may guide future academic investigation and practical application. Future research efforts will focus on conducting empirical studies and exploring practical applications to provide actionable insights, therefore promoting innovation in marketing techniques linked to digital transformation practices.

Keywords: Artificial Intelligence, Big Data, Digital Marketing, Digital Transformation.

Introduction

The emergence of digital technologies has initiated a new phase of company transformation, drastically changing the landscape of marketing strategies and operations. Digital transformation (DT) has become a pivotal catalyst for organizational change, compelling businesses to reevaluate their traditional approaches and adapt to an increasingly digital-centric environment. This shift has profound implications for marketing productivity, as companies leverage advanced technologies to enhance efficiency, personalization, and customer engagement (1, 2). Theories related to technology adoption and innovation diffusion are crucial in understanding how organizations implement digital transformation (DT) to enhance marketing productivity. In this context, the adoption of technology like the Internet of Things (IoT), Artificial Intelligence (AI), and big data has shown to accelerate the marketing process while enhancing campaign efficiency and client personalization. This demonstrates that companies that utilize IoT technology can significantly increase customer engagement through real-time consumer behavior analysis (3).The proposed theory of innovation dissemination elucidates the primary elements affecting technology adoption, including perceived advantages and compatibility with established practices (4). Moreover, it is emphasized that firms possessing a robust innovation culture are more inclined to embrace AI technology effectively, hence improving marketing decision-making and operational efficiency (5). This research formulates a fundamental paradigm by linking technology adoption with innovation dissemination, providing insights into how organizations can leverage digital transformation to enhance marketing performance and address challenges in the digital era.

Digital transformation (DT) in marketing denotes the implementation of digital technologies to innovate marketing strategy, techniques, and operational processes. The integration of artificial intelligence (AI), big data, and Internet of Things (IoT) technologies to enhance operational efficiency and marketing efficacy is a facet of

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digital transformation. This enables firms to gather, analyze, and leverage client data more efficiently to generate individualized and pertinent consumer experiences. Technologies like AI and big data can help predict market trends and adapt marketing strategies in real-time, significantly improving marketing productivity (1). Moreover, DT facilitates the use of digital channels, like social media and e-commerce, into marketing plans, thereby broadening market reach and enhancing customer interaction (6). This transformation not only affects marketing tactics but also reshapes internal operations by speeding up decision-making processes and facilitating collaboration across departments.

DT is significantly impacted not just by technology factors but also by the preparedness and adaptability of the organization's human resources. In addition to technology factors, the human impact on the digital transformation process warrants exploration. Digital transformation not only involves technological changes but also requires changes in organizational culture and individual behavior (7, 8). The organization's preparedness to adopt technological advancements significantly relies on HR's capacity to adjust to new technologies and innovate within the marketing process (9). Aspects such as employee training, digital leadership, and organizational culture adaptation become important factors determining the success of DT in enhancing marketing productivity. This research emphasizes the importance of understanding human dynamics as a crucial component in maximizing the benefits of DT.

DT has become a key catalyst in enhancing marketing productivity through various mechanisms. The integrating of digital technologies, including artificial intelligence (AI), machine learning (ML), and big data analytics, into marketing tactics has led to enhanced operational efficiency and campaign efficacy (1, 9). DT enables better personalization in marketing efforts, enhances customer engagement, and facilitates data-driven decision-making (10, 11). However, the impact of DT on marketing productivity is moderated by factors such as organizational readiness (9), digital capabilities (12) and industry context (13). This conceptual framework illustrates that DT, driven by technological advancements, changes in consumer behavior, and competitive pressures, leads to increased marketing productivity through strategy reformulation (7), organizational restructuring (14), and technology adoption (15). Understanding the complex relationship between DT and marketing productivity provides a foundation for more in-depth bibliometric analysis and can guide future research in this field.

Digital transformation necessitates the integration of emerging technologies, like the Internet of Things, big data, machine learning, and artificial intelligence, which need significant alterations in organizational structure (7). The evaluation of DT progress can be conducted through the analysis of six main factors: infrastructure, strategy and leadership, organizational structure, human resources, organizational culture, and learning technology (16).

Although bibliometric analyses of digital transformation have been conducted in various disciplines such as engineering, sustainability, and administration (17–19). There aren't many thorough bibliometric studies that concentrate on DT in the marketing field. This research seeks to address that gap by a thorough bibliometric examination of the DT and marketing literature from 2017 to 2024. By examining publication trends, identifying key themes, and mapping the intellectual structure of this field, this research will yield significant insights into the ever changing realm of DT in marketing. The results of this study will support scholarly knowledge of DT in marketing while also providing useful advice for companies looking to boost marketing efficiency through digital transformation projects.

Methodology

Previous research has demonstrated that bibliometric analysis serves to evaluate bibliographic data, considered an essential method for appraising scientific endeavors (20). According to several studies, this approach clarifies the current status of research and makes it easier to investigate areas that show promise for knowledge growth (20,21). On July 16, 2024, a collection of articles was obtained from Scopus for the purpose of analyzing research trends, primary subjects of discussion, key authors, and notable publications in the domain of digital

transformation (DT) and marketing. The rationale for selecting Scopus data is to assure the production of work of superior quality and to offer standardized keywords that align with those provided by authors. The initial search query, which used the terms "digital transformation" and "marketing" in the title or abstract, yielded a total of 835 documents. By utilizing filters such as (TITLE-ABS-KEY ("digital transformation") AND TITLE-ABS-KEY ("marketing")) AND the publication year is greater than 2015 AND the publication year is less than 2025 By applying the filters "SRCTYPE=j", "DOCTYPE=ar", "SUBJAREA=BUSI", and "LANGUAGE=English", the dataset was reduced to a total of 214 documents. The period considered for dataset inclusion is from 2017 to 2024, ensuring comprehensive coverage of the literature in these fields.

The selection criteria for digital tools utilized in this research are predicated on numerous pivotal variables, including the tools' relevance to digital transformation, their industry popularity, analytical capabilities, and their ability to facilitate data-driven marketing tactics. Digital technologies such as big data, machine learning (ML), and cloud computing are chosen for their ability to enhance marketing efficiency through process automation, improved personalization, and extensive data analysis. Big data analytics enhances corporate efficiency by managing and analyzing extensive data sets, facilitating improved business decision-making (8). Moreover, machine learning is extensively utilized in marketing strategies to deliver individualized consumer experiences and improve the efficacy of marketing initiatives (22). Cloud computing is selected for its capacity to facilitate a more adaptable digital infrastructure, enabling organizations to expand their marketing operations internationally with enhanced efficiency (23). These strategies were selected based on their prevalence in relevant scientific literature and their widespread implementation across several industries, hence augmenting the representativeness of this research concerning the impacts of digital transformation in marketing.

We utilized the R package Biblioshiny as demonstrated in research (24) for bibliometric analysis. This extensive tool facilitates the visualization of crucial elements in the study field. Biblioshiny is an internet-based platform that enables users to upload their datasets and perform a range of analytical tasks. The software's ability to efficiently process large datasets, coupled with its open-source nature, makes it highly customizable and adaptable to specific research needs. It offers a broad range of analytical capabilities including the identification of key authors, seminar papers, analyze keywords, new sources, scientific mapping, and track longitudinal research trends. This software is widely employed to create and display network diagrams that facilitate the examination of co-citation patterns and the co-occurrence of terms derived from scholarly literature. The initial data loading method was carried out after obtaining the database from Scopus. Subsequently, we conducted data verification and resolved discrepancies, such as instances where publication dates were recorded as zero indicating articles yet to be published, by replacing them with the year 2024. Once the data was loaded, we employed bibliometric functions to generate matrices that consist of documents and their corresponding properties. The process of reducing data and developing a network matrix was conducted utilizing the bibliometric features offered by Biblioshiny. This method facilitated the representation of data mapping in the findings and revelations.

Results

Articles Statistics

The dataset acquired for this investigation is delineated in Table 1. A total of 214 research publications on the subject of Digital Transformation in Marketing were gathered from 2017 to 2024. The mean number of citations per document is 22.77. More precisely, the cumulative quantity of research articles contained in these magazines amounts to 214. This research utilized two scientific units for its analysis: author keywords and Keywords Plus. Author keywords refer to a set of terms or concepts that accurately capture the essence of the study. Keywords Plus, on the other hand, are frequently occurring terms or phrases extracted from the references of a publication through an automated process. These terms may be absent from the paper's title or not included as author keywords. While keywords are useful for doing bibliometric analysis to examine

the knowledge framework of a scientific subject, studies suggest that they are not fully comprehensive in accurately representing the content of the articles (25). This analysis has a total of 355 keywords, in addition to 843 author keywords. The data set contains around 186 articles that have been written by multiple authors. Out of the 664 authors in the dataset, only 28 publications had a single author. The co-authorship per document index is determined by dividing the total number of co-authors by the total number of documents. The inquiry disclosed that the average number of co-authors per document was 3.29. The average is determined by dividing the total number of author appearances by the total number of publications. The cooperation index is calculated by dividing the total number of authors involved in multi-authored works by the total number of such publications. The confidence interval was calculated to be 2.98. The analysis indicated that the proportion of international co-authorship is 23.36%.

Table 1: Main Information

Main Information About Data	Results	Authors	Results
Timespan	2017:2024	Authors	664
Sources (Journals, Books, etc)	141	Authors of single-authored docs	28
Documents	214	**Authors Collaboration**	**Results**
Annual Growth Rate %	68.14	Single-authored docs	28
Document Average Age	2.03	Co-Authors per Doc	3.29
Average citations per doc	22.77	International co-authorships %	23.36
References	13942	**Document Types**	**Results**
Document Contents	**Results**	article	214
Keywords Plus (ID)	355		
Author's Keywords (DE)	843		

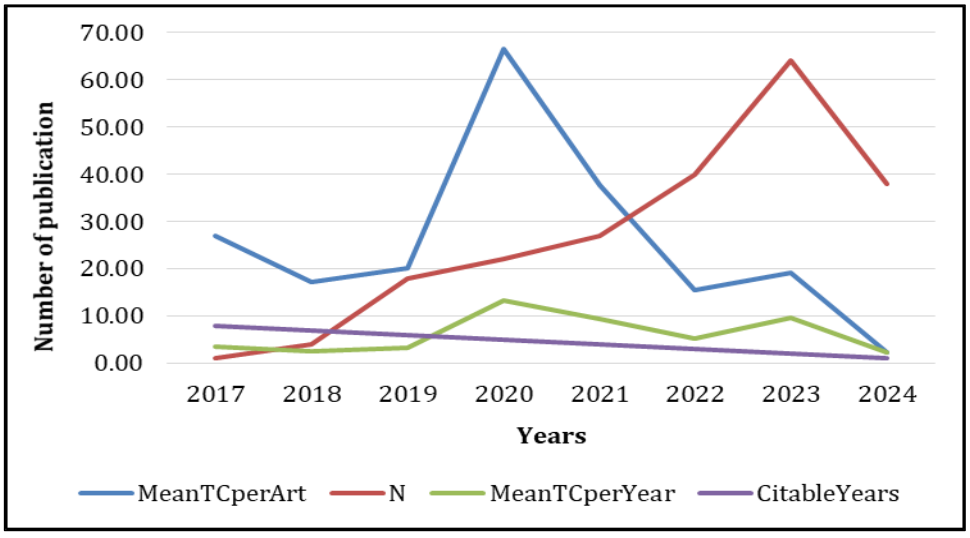

Figure 1: Yearly Publication Trends

Annual Scientific Production

The analysis of the dataset from 2017 to 2024, as illustrated in Figure 1, shows significant trends in DT and marketing research. In 2017, there was only 1 article published, with high mean total citations per article (MeanTCperArt) which indicates a strong impact despite the low publication count. The analysis reveals that the number of publications increased steadily each year, reaching a peak in 2023 with 64 articles. t is notable that the year 2020 had the highest MeanTCperArt at 66.55, which suggests that

highly impactful research was published that year. As observed from the data, from 2017 to 2024, the mean total citations per year (MeanTCperYear) also varied, with notable peaks in 2020 (13.31) and 2021 (9.43). The findings show that by 2024, the MeanTCperArt significantly dropped to 2.34, reflecting newer publications that have not yet accumulated many citations. The trend indicates a growing research interest in DT and marketing, with an increasing number of publications but fluctuating citation impact per article over the years. These observations demonstrate the growing acknowledgment and significance of digital technology in the marketing industry during the investigated timeframe.

Three Field Plots

Figure 2 illustrates a three-field plot linking sources (SO), authors (AU), and keywords (DE) in the field of DT and marketing research. The figure on the left side displays a list of the leading journals that publish articles on DT and marketing research. These include "Industrial Marketing Management," "Journal of Business Strategy," "Journal of Business and Industrial Marketing," "Technological Forecasting and Social Change," and "European Journal of Innovation Management." These journals are color-coded to indicate their influence and frequency of publication. In the center, key authors who contribute significantly to DT and marketing literature are highlighted, including Gupta P, Strobel T, Dahl AJ, Manser Payne EH, and Zhang Z, showing their connections to specific journals and keywords. The color-coded boxes indicate the volume of work each author has contributed. On the right side, important keywords related to DT and marketing research are displayed, such as "digital transformation," "COVID-19," "digitalization," "artificial intelligence," "case study," "value co-creation," "digital marketing," "e-commerce," "innovation," "systematic literature review," and "big data," demonstrating the main themes and trends in the research field. The plot visually represents the connections between the journals, authors, and keywords, illustrating the collaborative nature of research in DT and marketing. The flow lines illustrate the individual contributions of specific authors to papers in different journals and the main subjects they focus on, offering a thorough depiction of the research environment.

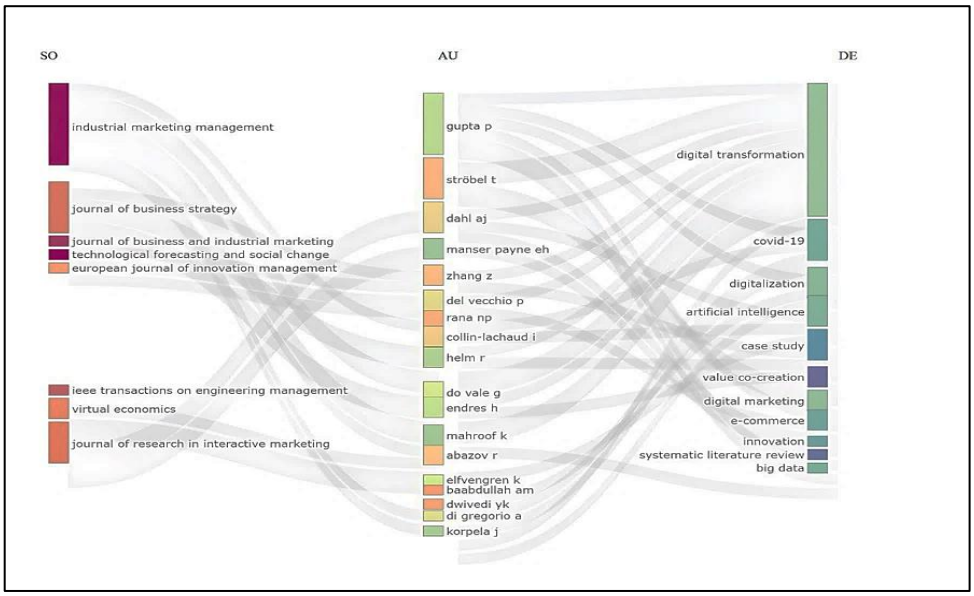

Figure 2: Relationship between Authors, Keywords, and Journals

Most Productive Sources

Table 2 presents the distribution of article contributions from various sources in the field of DT and marketing research. The journal Technological Forecasting and Social Change exhibits the largest publication volume, accounting for 12.50% of all articles. The Industrial Marketing Management and the Journal of Digital and Social Media Marketing each produced six articles, collectively accounting for 9.38% of the total submissions. The Journal of Business and Industrial Marketing and Revista Brasileira De

Marketing each provided five articles, accounting for 7.81% of the total, while the journal Emerald Emerging Markets Case Studies is reported to have published 4 articles (6.25%). Other notable contributions are identified from Applied Marketing Analytics, Cogent Business and Management, IEEE Transactions on Engineering Management, and Innovative Marketing, each contributing 3 articles (4.69%). This data highlights that Technological Forecasting and Social Change is the main source, but other publications also have a substantial impact on the distribution of DT and marketing research.

Most Cited Sources

The article titled "Institutions and Axioms: An Extension and Update of Service-Dominant Logic" written by Vargo SL and Lusch RF published in the Journal of the Academy of Marketing Science in 2016, has obtained the most citations, amounting to 12, in the field of DT and marketing. Vial G authored a paper entitled "Comprehending Digital Transformation: A Review and A Research Agenda" which was published in The Journal of Strategic Information Systems in 2019 and has received 11 citations. Another extensively referenced work is "Firm Resources and Sustained Competitive Advantage" Authored by Barney J, published in 1991 in the Journal of Management, and has garnered 8 citations. These three papers have received the most citations in their respective disciplines. Table 3 is a compilation of papers that have received a minimum of 5 citations.

Table 2: Most Productive Journal Sources

Sources	Articles	Percentage of Contribution (%)
Technological Forecasting and Social Change	8	12.50%
Industrial Marketing Management	6	9.38%
Journal Of Digital and Social Media Marketing	6	9.38%
Journal Of Business and Industrial Marketing	5	7.81%
Revista Brasileira De Marketing	5	7.81%
Emerald Emerging Markets Case Studies	4	6.25%
Applied Marketing Analytics	3	4.69%
Cogent Business and Management	3	4.69%
IEEE Transactions on Engineering Management	3	4.69%
Innovative Marketing	3	4.69%

Table 3: Most Referenced Articles

No	Title of the Article	Cited References	Citations
1	Institutions and Axioms: An Extension and Update of Service-Dominant Logic	Journal of the Academy of Marketing Science. 2016;44(1):5-23. (26)	12
2	Understanding Digital Transformation: An Overview and Research Agenda	The Journal of Strategic Information Systems. 2019;28(2):118-144. (2)	11
3	Corporate Resources and Sustainable Competitive Advantage	Journal of Management. 1991;17(1):99-120. (27)	8
4	Understanding Customer Experience Throughout the Customer Journey	Journal of Marketing. 2016;80(6):69-96. (10)	8
5	The Impact of Digital Technology on Relationships in Business Networks	Industrial Marketing Management. 2017;67:185-192. (28)	7
6	Using Web Analytics to Measure Digital Marketing Performance	Industrial Marketing Management. 2015;50:117-127. (11)	5
7	A Thematic Exploration of Digital Marketing, Social Media, and Mobile Marketing: Research Evolution from 2000 to 2015 and an Agenda for Future Inquiry	Journal of Marketing. 2016;80(6):146-172. (29)	5

8	The Impact of Digital Transformation on the Retail Value Chain	International Journal of Research in Marketing. 2019;36(3):350-366. (30)	5
9	Actor Engagement as a Microfoundation for Value Co-Creation	Journal of Business Research. 2016;69(8):3008-3017. (31)	5
10	Digital Transformation: Interdisciplinary Reflections and a Research Agenda	Journal of Business Research. 2021;122:889-901. (32)	5

Most Relevant Authors

Table 4 displays the leading authors in the field of digital transformation and marketing, as identified by the quantity of articles they have written. The authors Baabdullah AM, Dwivedi YK, Mogaji E, Rana NP, Ströbel T, and Zhang Z each represent approximately 12% of the total articles in this field. Additionally, researchers such as Abazov R, Balakrishnan J, Collins-Lachaud I, and Dahl AJ have each contributed around 8% to the overall publication count. The concept of fractional authorship is illustrated here, highlighting the varying contributions of these authors to related works. Authors listed in Table 4 who have published at least two articles in the domain of DT and marketing have significantly shaped the discourse in this field.

Author's Productivity

Lotka's law, put out by Alfred Lotka, is a statistical theory that states, as previous research has shown, that a small group of experts contribute significantly to the scientific community (33). The concept formulated by Lotka is subsequently known in further study as the author's productivity inverse square law (34). As illustrated in Table 5, a small number of authors, particularly those who have produced numerous papers, have contributed the majority of the publications in this particular sector. Meanwhile, a significant proportion of authors, specifically around 631 academics, have made a solitary contribution to the subject of DT and marketing. This observation corresponds with Lotka's law, an extension of the author's inverse square law of production. This law states that the quantity of researchers producing x studies is inversely proportional to the square of x. The prediction model estimates the quantity of authors who have published papers by analyzing the amount of contributors to each individual study, as corroborated by empirical evidence (35).

Table 4: Active Researchers in DT and Marketing

Authors	Articles	Articles Fractionalized	Percentage of contribution
Baabdullah AM	3	0.43	12%
Dwivedi YK	3	0.43	12%
Mogaji E	3	1.51	12%
Rana NP	3	0.38	12%
Ströbel T	3	1.17	12%
Zhang Z	3	1.00	12%
Abazov R	2	0.58	8%
Balakrishnan J	2	0.26	8%
Collin-Lachaud I	2	0.58	8%
Dahl AJ	2	0.67	8%

Table 5: Productivity of Authors

Documents written	N. of Authors	Proportion of Authors
1	631	0.95
2	27	0.041
3	6	0.009

Country Wise Publications

The countries that have the most notable impact on DT and marketing research include the United Kingdom, the United States, Italy, Germany, Portugal, Spain, Switzerland, China, Ecuador, and India as outlined in previous studies in Table 6. The United Kingdom and the United States are recognized as the main driving forces behind advancements in DT and marketing. Regarding countries with the highest number of citations, the United Kingdom is reported to have amassed approximately 1,375 citations, followed by the United States with 498 citations, Italy with 343 citations, and Germany with 290 citations, according to the data in Table 6. DT-related research from Ecuador is noted for having the highest average article citations, while India is documented to have received 111 citations, as referenced in Table 6.

Table 6: The Most Frequently Cited Country's Scientific Production

Country	Total Citation	Average Article Citations
United Kingdom	1375	80.90
USA	498	31.10
Italy	343	21.40
Germany	290	24.20
Portugal	283	70.80
Spain	186	23.20
Switzerland	138	34.50
China	136	10.50
Ecuador	128	128.00
India	111	13.90

Most Globally Cited Articles

The article "Strategic Action Fields of Digital Transformation: An Exploration of the Strategic Action Fields of Swiss SMEs and Large Enterprises," has 107 global citations and has a significant impact on our understanding of how DT reshapes strategic business actions in both small and large enterprises (36), Other significant works with 39 worldwide citations (37), 38 global citations (38), and 30 global citations (39). These papers jointly underscore the pivotal role of digital transformation in strengthening marketing productivity, presenting various viewpoints on how digital tools and tactics are improving efficiency and client interaction across multiple sectors (40).

Most Locally Cited Articles

Local citations measure the number of citations that a document has received from other documents inside the analyzed collection. Bibliometrix calculates the influence of documents in the examined collection by analyzing the entire reference set. The paper titled 'The value relevance of digital marketing capabilities to firm performance' is frequently cited within the local community (37). It has received 3 citations from local sources and 39 citations from global sources. Another extensively referenced work was authored by (36) and published in the Journal of Strategic Management. This paper has received 3 citations from local sources and 107 citations from global sources. Table 7 displays the publications that are cited most frequently in the fields of DT and marketing, both on a worldwide scale and within local contexts.

Most Relevant Affiliations

The primary contributors to scientific output in the fields of DT and marketing research include renowned institutions such as ESIC Business & Marketing School (8%), Swansea University (6%), King Abdulaziz University (6%), University of Wisconsin-Whitewater (6%), and University of Bradford (6%). ESIC Business & Marketing School is the main source of research on DT-related topics, having produced four publications as indicated in Table 8.

Table 7: Global and Local Cited Articles with Total Citations

Document	DOI	Year	LC	GC	LC/GC Ratio (%)
Peter MK, 2020, J Strat Manag (36).	10.1108/JSMA-05-2019-0070	2020	3	107	2.8
Homburg C, 2022, J Acad Mark Sci (37).	10.1007/s11747-022-00858-7	2022	3	39	7.69
Moi L, 2021, J Manage Gov (38).	10.1007/s10997-020-09534-w	2021	2	38	5.26
Endres H, 2020, Ind Mark Manage (39).	10.1016/j.indmarman.2020.06.004	2020	2	30	6.67
Hausberg JP, 2019, J Bus Econ (41).	10.1007/s11573-019-00956-z	2019	2	122	1.64
Mogaji E, 2023, Int J Bank Mark (42).	10.1108/IJBM-06-2023-0333	2023	1	4	25
Ramadani V, 2023, Ieee Trans Eng Manage (43).	10.1109/TEM.2022.3174628	2023	1	17	5.88
Wilson RD, 2023, J Bus Ind Mark (44).	10.1108/JBIM-12-2021-0598	2023	1	4	25
Dwivedi YK, 2023, Psychol Mark (45).	10.1002/mar.21888	2023	1	11	9.09
Gillpatrick T, 2019, Econ Innovate Econ Res (46).	10.2478/eoik-2019-0023	2019	1	15	6.67

Table 8: Most Influential Affiliations

Affiliation	Documents
ESIC Business & Marketing School	4
Swansea University	3
King Abdulaziz University	3
University of Wisconsin-Whitewater	3
University of Bradford	3
University of Bern	3
Universität Bayreuth	3
Qatar University	3
Symbiosis International Deemed University	3
IÉSEG School of Management	3

Most Frequently Used Words

Within the realm of DT and marketing, the most frequently used keywords serve to emphasize the specific areas of attention within this topic of study. The top keyword is "digital transformation," with 96 occurrences, indicating its central role in the research. This is followed by "digital marketing" with 34 occurrences, "digitalization," and "marketing." Other significant keywords include "artificial intelligence," "big data," "COVID-19," "e-commerce," "innovation," and "machine learning." The researchers as illustrated in Figure 3 represent the main themes and trends in DT and marketing research. These frequent keywords underscore the emphasis on understanding and leveraging digital transformation technologies and methodologies in marketing, addressing the integration of AI, big data, and e-commerce, as well as responding to the impacts of COVID-19.

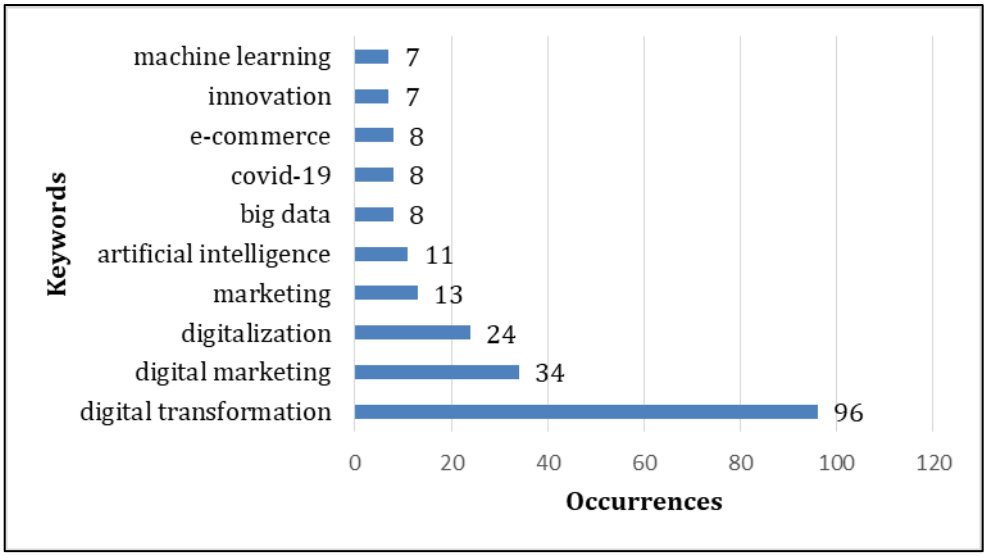

Figure 3: Most Frequently Used Words

Word Treemap

A word treemap is generated using Biblioshiny by mapping the most commonly appearing terms onto a rectangular area. The dimensions of each rectangle correlate to the frequency of the respective keyword. The keywords are categorized into clusters, with each cluster being represented by a distinct color. An algorithm is used to determine the positioning of the clusters and the organization of the rectangles within each cluster in order to optimize the overall clarity and coherence of the visualization. The treemap provides a concise and easy-to-understand summary of the main topics and concepts in a specific research field as noted by Aria *et al*., (24). The author keywords field was chosen because of its inclusion of terms that precisely depict the substance of the document as perceived by the author. Figure 4 depicts a treemap displaying important phrases such as "digital transformation," "commerce," and "marketing," as well as "consumer behavior," "innovation," "artificial intelligence," "China," and "COVID-19," along with their occurrences in various sources. The term "digital transformation" appears most frequently, occurring 96 times. This is followed by "digital marketing," which appears 34 times, and "digitalization," which appears 24 times. Other notable terms include "marketing" 13 occurrences, "artificial intelligence" 11 occurrences, "big data" 8 occurrences, "COVID-19" 8 occurrences, "e-commerce" 8 occurrences, "innovation" 7 occurrences, and "machine learning" 7 occurrences. This treemap provides a clear and comprehensive visualization of the important topics and trends in Digital Transformation and marketing research. It offers valuable insights into the core principles of the subject. This treemap offers a thorough and visually concise overview of the main topics and emerging patterns in the field of DT and marketing.

Word Dynamics

Biblioshiny utilizes word dynamics to discover the most pertinent and commonly appearing terms within a specific domain. This allows scholars to understand common patterns and topics within a certain area of inquiry. By analyzing the temporal patterns of word usage, it is possible to track the progress of research in a certain field and identify emerging trends. This material is valuable for researchers, legislators, and industry experts who desire to remain informed about the most recent advancements in a certain field. Moreover, it can aid in identifying unexplored research domains and offer guidance for future inquiries. The dynamics graph displays the annual variations in the occurrence of author keywords from 2017 to 2024. Table 9 displays the sequence of the top 10 terms that are used most frequently. The most commonly utilized terms in 2017 were Digital Transformation (DT), Digital Marketing (DM), Digitalization (Dg), Marketing (Mk), Artificial Intelligence (AI), Big Data (BD), COVID-19, E-Commerce (E-Com), Innovation (Inn), and Machine Learning (M-Learn). From 2017 to 2024, there has been a significant increase in the use of these keywords, indicating growing research interest in these areas. Digital Transformation

(DT) has seen the most substantial rise, reflecting its central role in current research. Emerging ideas including Digital Marketing, Digitalization, Artificial Intelligence, Big Data, E-Commerce, and Machine Learning have seen substantial growth, highlighting their significance in the evolving research landscape.

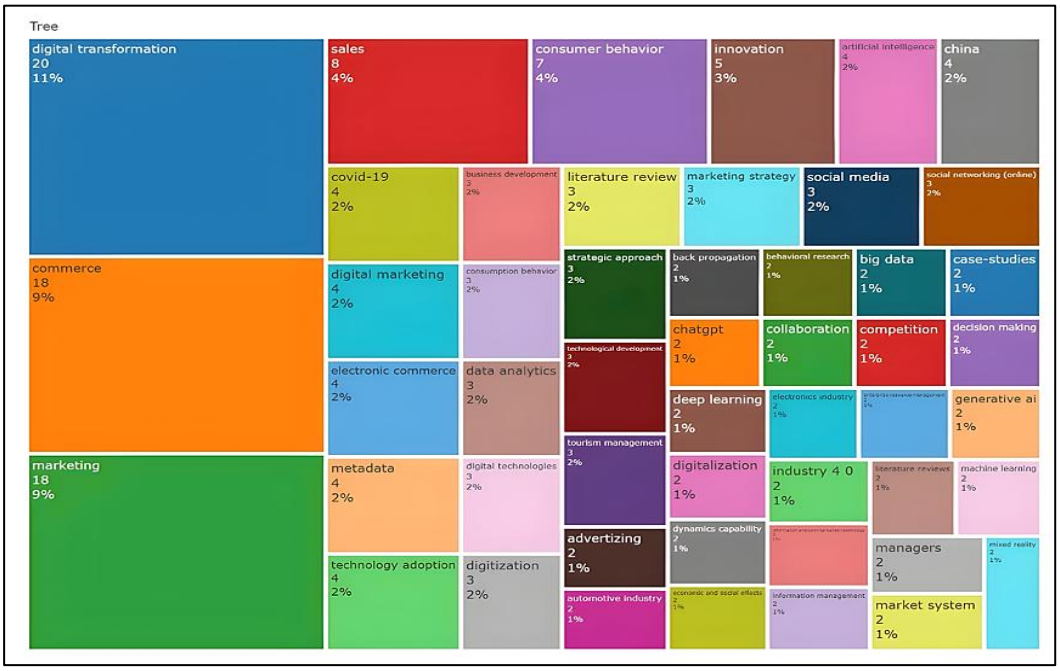

Figure 4: Treemap of Words

Table 9: Word Dynamics

YEAR	DT	DM	DG	MK	AI	BD	COVID-19	E-COM	INN	M-L
2017	0	0	0	0	0	0	0	0	0	0
2018	1	0	0	0	1	0	0	0	0	0
2019	9	5	0	1	2	3	0	1	1	3
2020	21	10	6	1	2	4	2	2	2	3
2021	34	15	9	4	5	5	4	5	3	4
2022	50	20	17	8	6	5	7	6	5	6
2023	82	30	21	10	8	7	8	7	6	6
2024	96	34	24	13	11	8	8	8	7	7

*DT=Digital Transformation, DM= Digital Marketing, Dg= Digitalization, Mk= Marketing, AI= Artificial Intelligent, BD= Big Data, E-Com= E-Commerce, Inn= Innovation, M-L= Machine Learning

Factor Analysis Based on Author Keywords

Using multi-dimensional scaling, a factorial analysis based on author keywords creates a map that visually represents the occurrence of overlapping or closely related subjects. The map, which uses hierarchical clustering to assign separate groups different colors, offers important insights into interconnected subjects and prospective avenues for future investigation. This analysis reveals various clusters of related keywords within the field of DT and marketing. One cluster includes keywords related to "retailing," "business model," "omni-channel," "marketing mix," "case study," "digitalization," "e-commerce," and "tourism," highlighting their interconnectedness in the context of retail and business strategies. Another cluster contains terms like "entrepreneurship," "economic growth," "business performance," and "social media marketing," indicating a focus on business performance and growth through digital means. A separate cluster encompasses "sustainability," "supply chain," and "ambidexterity," emphasizing the importance of sustainable practices and flexible business strategies. Additionally, "machine learning," "artificial intelligence," "innovation," and "digital technology" form a

cluster, showing the integration of advanced technologies in digital transformation efforts. The keywords "digital transformation," "SMEs," "digital technologies," and "South Africa" are grouped together, indicating a specific focus on the impact of digital transformation on small and medium enterprises and certain locations. The map highlights the interconnectedness of various research topics within DT and marketing, showing how certain areas are closely linked. For instance, the term "digital transformation" is strongly connected to "digital technologies," "SMEs," and "South Africa," suggesting a concentration on the effects of DT on small and medium firms and regional research. Similarly, "retailing," "business model," and "omni-channel" are grouped, suggesting a strong link between these concepts in the context of retail and business strategies. The clusters indicate potential areas for further exploration, such as the impact of digital transformation on "supply chain" and "sustainability," or the integration of "machine learning" and "artificial intelligence" in "digital technology" as identified in the analysis. The map can guide researchers in identifying gaps and overlaps in the current research landscape, helping to direct future studies to areas with the most potential for new insights. This factorial analysis, employing multi-dimensional scaling, provides a comprehensive perspective on the primary themes and connections in the field of DT and marketing research. This analysis aids in enhancing comprehension of the structure and development of the subject. This is illustrated in Figure 5.

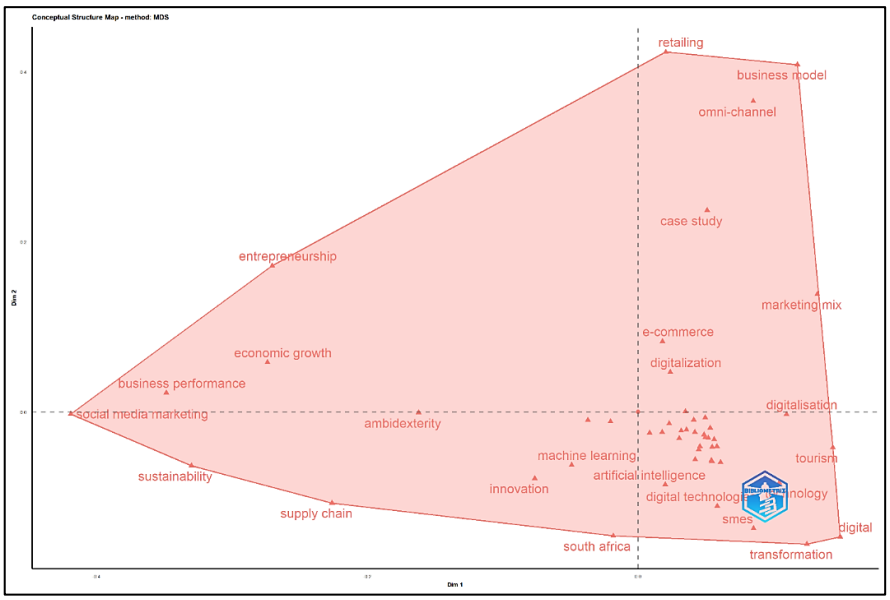

Figure 5: Factor Analysis Based on the Author's Keywords

Co-occurrence Network

A co-occurrence network represents the commonly used and closely related terms or themes identified in research articles. The network's co-occurrences are normalized using association strength similarity measurements and the Louvain clustering approach, resulting in a total of 50 nodes, as detailed in previous studies. The co-occurrence network, depicted in Figure 6, portrays the author's keywords extracted from the bibliographic metadata of this study. The isolated nodes have been removed, and each vertex in the graph represents a single object, specifically the keywords used by the authors. The sizes of the nodes, which are proportionate to the occurrence of the items, emphasize the most common items in their respective clusters. The network reveals that "digital transformation" is the most prominent keyword, forming a central node with strong connections to other significant terms such as "digital marketing," "digitalization," "e-commerce," "innovation," and "customer experience," as identified by the researchers. This suggests that these subjects are intricately connected and commonly discussed in the field of research. Other key terms, including "artificial intelligence," "machine learning," "big data," "business model," and "social media," also form important clusters, highlighting their relevance and interconnections within the field, according to

recent findings. The network illustrates the interconnected nature of various research topics in DT and marketing, providing insights into how different concepts are related and how frequently they co-occur in the literature. This approach facilitates the identification of fundamental themes and patterns, offering a comprehensive understanding of the study landscape and potential avenues for future research.

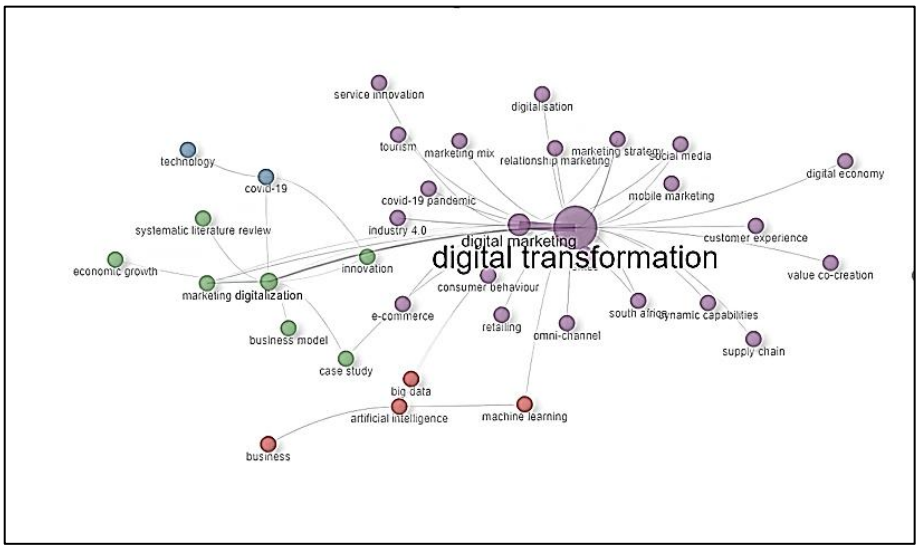

Figure 6: Co-occurrence Network of Author's Keywords

Thematic Map Analysis

A thematic map can be used to examine the progression of ideas or themes across time, enabling scholars to identify the most pertinent publications for each thematic cluster as discussed in previous research (47). The clustering method produces a thematic map that offers important insights into the importance of the selected topics or subjects, determined by their centrality and density (24). This enables the anticipation of future growth in thematic areas.

Figure 7 illustrates a bidirectional matrix plot employing centrality and density as axes to portray the theme network derived from the conceptual network, as elucidated by prior research. A thematic or strategic map is defined as an assemblage of various clusters or topics. The importance of a theme within the broader study domain is determined by its centrality and density, with density indicating the degree of theme development. The parameters for the thematic map in this field are the author's keywords and a maximum word count of 250. Each bubble in the graphic represents a network cluster and is labeled with the predominant term in that cluster. The size of each bubble corresponds directly to the frequency of the words in the cluster.

The arrangement of the bubbles in Bibliometrix's four quadrants is established according to their centrality and density values as detailed by researchers (48). Themes located in the upper-left quadrant exhibit a high level of complexity and specialization, but they are disconnected from the outside world and have limited impact or importance. The quadrant located in the lower-left region signifies themes with low density and centrality. These topics are now either in the process of emerging or waning and have undergone negligible development. The quadrant in the upper-right position represents motor themes that exhibit a significant concentration and importance. These themes are tightly connected to other related conceptions and are crucial for the advancement of a particular area of research. The major and transversal topics in the lower-right quadrant are significant for research; however, they have not been thoroughly explored. The thematic map in this study does not display any distinct and well-developed motifs, suggesting the absence of topics in the upper-left quadrant. The themes of "service innovation," "systematic literature review," "digital technologies," and "transformation" are not well-developed and have low frequency and importance, as identified in the map. These themes are located in the lower-left quadrant. The upper-right quadrant exhibits motor themes that are well-developed, with a high density and centrality. These themes include

"digital transformation," "digital marketing," "digitalization," "innovation," and "industry 4.0," which are prominently featured due to their significant concentration and relevance. The key and transversal concepts, including "marketing management," "brand management," "customer journey," and "digital branding," located in the lower-right quadrant, have significant potential but need more refinement. This analysis offers valuable insights into the significance and development of topics in Digital Transformation and marketing research. It helps identify critical areas for future exploration and provides an overview of the current state of research in this subject.

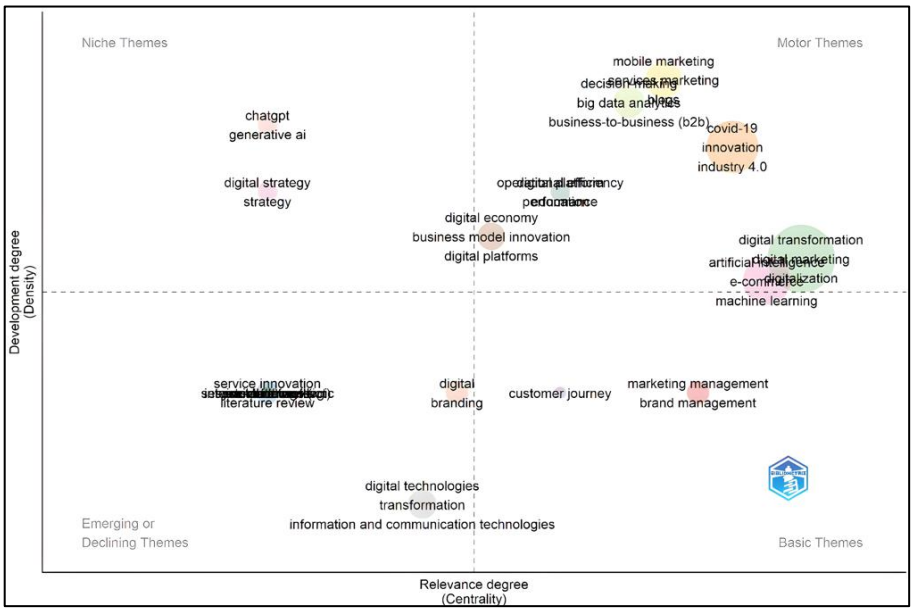

Figure 7: Thematic Map

Discussion

The bibliometric analysis of Digital Transformation (DT) and marketing research conducted between 2017 and 2024 offers a detailed comprehension of the field's development and present condition. The data demonstrates a strong and consistent growth pattern, with an annual growth rate of 68.14%. Research from recent times highlights the growing significance of digital transformation (DT) in the marketing sector (20). This trend illustrates the progressive integration of digital technology by firms to boost marketing strategies, improve operational efficiencies, and bolster customer engagement, so directly augmenting marketing productivity.

The co-occurrence network analysis highlights the centrality of "digital transformation" and its strong associations with terms such as "digital marketing," "digitalization," "e-commerce," and "innovation" (21). These connections suggest that DT is viewed holistically, impacting various facets of marketing. The widespread use of advanced technologies such as "artificial intelligence," "machine learning," and "big data" highlights their important role in promoting innovation and improving efficiency in marketing tactics. The integration of these technologies into marketing strategies enables organizations to enhance productivity through automation, personalization, and improved data analytics.

The thematic map analysis provides further insights into the core and emerging themes in the research. The identification of motor themes such as "digital transformation," "digital marketing," "digitalization," "innovation," and "industry 4.0" underscores their critical role in advancing the field (24). These well-developed themes indicate a strong research focus and significant practical applications, particularly in integrating digital technologies into marketing strategies. The application of these themes in marketing practice has the potential to boost productivity through resource optimization, better targeting, and improved ROI of marketing campaigns.

In addition to general findings regarding the trend of digital transformation (DT) in marketing productivity, it is important to explore how the differences in experience between large companies and SMEs can affect the implementation of DT. Previous research has

shown that the scale of the company significantly influences their ability to adopt and utilize digital technology. Therefore, a comparative approach between large companies and SMEs becomes relevant in understanding the more specific impacts of digital transformation. To gain a more comprehensive understanding of the impact of DT on marketing productivity, this study compares large companies with SMEs. Previous research has shown that SMEs and large companies have different experiences in implementing digital transformation due to differences in resources, scale, and technology adaptation capacity (49). This comparison can provide insights into the specific challenges faced by SMEs in adopting digital technology and how they can leverage DT to compete with large companies. With this approach, this research makes an important contribution to understanding the variations in organizational experiences in facing digital transformation in the context of marketing.

The productivity analysis, following Lotka's law, shows a concentration of research contributions from a few prolific authors and institutions (33). Institutions like ESIC Business & Marketing School and Swansea University stand out for their substantial research output. The gathering of experts emphasizes the significance of cooperation and the exchange of knowledge among prominent academics and institutions to progress the collective comprehension of DT in marketing. This collaboration contributes to enhanced marketing productivity through the dissemination of best practices and innovations in DT implementation.

Conclusion

This bibliometric study offers a comprehensive overview of the research patterns in the domain of Digital Transformation (DT) and marketing, spanning from 2017 to 2024. The findings indicate that the swift expansion of digital transformation research and the emphasis on sophisticated technologies like artificial intelligence, machine learning, and big data have resulted in substantial changes in marketing productivity. Organizations that have used these technology into their marketing strategies have achieved increased operational efficiency, smarter targeting, and more personalized client engagement, leading to higher return on investment (ROI). Importantly, this study underscores the profound impact of Digital Transformation on Marketing Productivity. The integration of DT in marketing strategies allows organizations to improve operational efficiency, personalize marketing messages, and enhance customer engagement. The rapid growth in DT research, the use of advanced technologies, and the focus on key themes such as digitalization and innovation all contribute to increased productivity in marketing activities. By adopting these transformative approaches, organizations can optimize their resources, improve campaign effectiveness, and ultimately achieve higher levels of marketing productivity in this digital era.

The study also identifies leading contributors in the field, with a few authors and institutions producing a significant portion of the research. This highlights the concentration of expertise and the importance of collaborative efforts in advancing the field. Such collaboration contributes to enhanced marketing productivity through the dissemination of best practices and innovations in DT implementation (1). Future studies should continue to explore these interconnected themes, addressing the research gaps and leveraging advanced technologies to drive forward the digital transformation agenda in marketing.

Abbreviations

DT: Digital Transformation, ML: Machine Learning, AI: Artificial Intelligence, DM: Digital Marketing, Dg: Digitalization, Mk: Marketing, BD: Big Data, E-Com: E-Commerce, M-Learn: Machine Learning.

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Author Contributions

Riza Akbar: preparing the manuscript, collecting data, analysing the data, final manuscript reviewing. Retno Widowati: the conception and interpretation of results, final manuscript reviewing.

Conflict of Interest

The authors assert that they possess no identifiable competing financial interests or personal affiliations that may have seemingly impacted the work presented in this study.

Ethics Approval

Not applicable.

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References

1. Kraus S, Durst S, Ferreira JJ, Veiga P, Kailer N, Weinmann A. Digital transformation in business and management research: An overview of the current status quo. Int J Inf Manage. 2022;63:102466.
2. Vial G. Understanding digital transformation: A review and a research agenda. J Strateg Inf Syst. 2019;28(2):13-66.
3. Kumar S, Tiwari P, Zymbler M. Internet of Things is a revolutionary approach for future technology enhancement: a review. J Big Data. 2019;6(1):1-21.
4. Rogetzer P, Silbermayr L, Jammernegg W. Sustainable sourcing including capacity reservation for recycled materials: A newsvendor framework with price and demand correlations. Int J Prod Econ. 2019;214:206-219.
5. Ziakis C, Vlachopoulou M. Artificial Intelligence in Digital Marketing: Insights from a Comprehensive Review. Information. 2023;14(12):664.
6. Nambisan S, Lyytinen K, Majchrzak A, Song M. Digital innovation management: Reinventing innovation management research in a digital world. MIS Q. 2017;41(1):223-238.
7. Omol EJ. Organizational digital transformation: from evolution to future trends. Digit Transform Soc. 2024;3(3):240–256.
8. Singh SK, Del Giudice M. Big data analytics, dynamic capabilities and firm performance. Manag Decis. 2019;57(8):1729-1733.
9. Sanchez MA. Framework to assess organizational readiness for digital transformation. Dimens Empres. 2017;15(2):27-40.
10. Lemon KN, Verhoef PC. Understanding customer experience throughout the customer journey. J Mark. 2016;80(6):69-96.
11. Järvinen J, Karjaluoto H. The use of Web analytics for digital marketing performance measurement. Ind Mark Manag. 2015;50:117-127.
12. Li F. Leading digital transformation: three emerging approaches for managing the transition. Int J Oper Prod Manag. 2020;40(6):809-817.
13. Bharadwaj A, El Sawy OA, Pavlou PA, Venkatraman N. Digital business strategy: Toward a next generation of insights. MIS Q. 2013;37(2):471-482.
14. Singh A, Hess T. How chief digital officers promote the digital transformation of their companies. MIS Q Exec. 2020;16(1):202-220.
15. Sebastian IM, Moloney KG, Ross JW, Fonstad NO, Beath C, Mocker M. How big old companies navigate digital transformation. MIS Q Exec. 2020;16(3):133-150.
16. Jackson NC. Managing for competency with innovation change in higher education: Examining the pitfalls and pivots of digital transformation. Bus Horiz. 2019;62(6):761-772.
17. Lee L, Charles V. The impact of consumers' perceptions regarding the ethics of online retailers and promotional strategy on their repurchase intention. Int J Inf Manage. 2021;57:102264.
18. Ragazou K, Passas I, Sklavos G. Investigating the Strategic Role of Digital Transformation Path of SMEs in the Era of COVID-19: A Bibliometric Analysis Using R. Sustainability. 2022;14(18):11295.
19. Chawla RN, Goyal P. Emerging trends in digital transformation: a bibliometric analysis. Benchmarking. 2021;29(4):1069-1112.
20. Singh S, Bashar A. A bibliometric review on the development in e-tourism research. Int Hosp Rev. 2021;37(1):71-93.
21. Ahmi A. Bibliometric Analysis Using R for Non-Coders: A Practical Handbook in Conducting Bibliometric Analysis Studies Using Biblioshiny for Bibliometrix R Package. J Family Bus Manag. 2022;12(1):67-89.
22. Jordan MI, Mitchell TM. Machine learning: Trends, perspectives, and prospects. Science. 2015;349(6245):255-260.
23. Hashem IAT, Yaqoob I, Anuar NB, Mokhtar S, Gani A, Ullah Khan S. The rise of "big data" on cloud computing: Review and open research issues. Inf Syst. 2015;47:98-115.
24. Aria M, Cuccurullo C. bibliometrix: An R-tool for comprehensive science mapping analysis. J Informetr. 2017;11(4):959-975.
25. Zhang J, Yu Q, Zheng F, Long C, Lu Z, Duan Z. Comparing keywords plus of WOS and author keywords: A case study of patient adherence research. J Assoc Inf Sci Technol. 2016;67(4):967-972.
26. Vargo SL, Lusch RF. Institutions and axioms: an extension and update of service-dominant logic. J Acad Mark Sci. 2016;44:5-23.
27. Barney J. Firm Resources and Sustained Competitive Advantage. J Manage. 1991;17(1):99-120.
28. Pagani M, Pardo C. The impact of digital technology on relationships in a business network. Ind Mark Manag. 2017;67:185-192.
29. Lamberton C, Stephen AT. A thematic exploration of digital, social media, and mobile marketing: Research evolution from 2000 to 2015 and an agenda for future inquiry. J Mark. 2016;80(6):146-172.
30. Reinartz W, Wiegand N, Imschloss M. The impact of digital transformation on the retailing value chain. Int J Res Mark. 2019;36(3):350-366.
31. Storbacka K, Brodie RJ, Böhmann T, Maglio PP, Nenonen S. Actor engagement as a microfoundation for value co-creation. J Bus Res. 2016;69(8):3008-3017.
32. Verhoef PC, Broekhuizen T, Bart Y, Bhattacharya A, Qi Dong J, Fabian N, et al. Digital transformation: A multidisciplinary reflection and research agenda. J Bus Res. 2021;122:889-901.
33. Coile RC. Lotka's frequency distribution of scientific productivity. J Am Soc Inf Sci. 1977;28(6):366-370.
34. Basile V, Giacalone M, Cozzucoli PC. The Impacts of Bibliometrics Measurement in the Scientific Community: A Statistical Analysis of Multiple Case Studies. Rev Eur Stud. 2022;14:10.
35. Martín-Navarro A, Lechuga Sancho MP, Martínez-Fierro S. Evolution of entrepreneurship research in the food sector: a bibliometric review. Br Food J. 2023;125(5):1537-1558.
36. Peter MK, Kraft C, Lindeque J. Strategic action fields of digital transformation: An exploration of the strategic action fields of Swiss SMEs and large

enterprises. J Strateg Manag. 2020;13(1):160-180.
37. Homburg C, Wielgos DM. The value relevance of digital marketing capabilities to firm performance. J Acad Mark Sci. 2022;50(4):666-688.
38. Moi L, Cabiddu F. Leading digital transformation through an Agile Marketing Capability: the case of Spotahome. J Manag Gov. 2021;25(4):1145-1177.
39. Endres H, Helm R, Dowling M. Linking the types of market knowledge sourcing with sensing capability and revenue growth: Evidence from industrial firms. Ind Mark Manag. 2020;90:30-43.
40. Al-Adwan AS, Al-Debei MM, Dwivedi YK. E-commerce in high uncertainty avoidance cultures: The driving forces of repurchase and word-of-mouth intentions. Technol Soc. 2022;71:102083.
41. Hausberg JP, Liere-Netheler K, Packmohr S, Pakura S, Vogelsang K. Research streams on digital transformation from a holistic business perspective: a systematic literature review and citation network analysis. J Bus Econ. 2019;89:931-63.
42. Mogaji E. Redefining banks in the digital era: a typology of banks and their research, managerial and policy implications. Int J Bank Mark. 2023;41(7):1899-1918.
43. Zeqiri J, Ramadani V, Aloulou WJ. The effect of perceived convenience and perceived value on intention to repurchase in online shopping: the mediating effect of e-WOM and trust. Econ Res Istraz. 2023;36(3):2153721.
44. Wilson RD, Stephens AM. The challenges of B2B innovation: using marketing analytics to plan and implement a successful digital catalog adoption. J Bus Ind Mark. 2023;38(2):290-302.
45. Dwivedi YK, Balakrishnan J, Baabdullah AM, Das R. Do chatbots establish "humanness" in the customer purchase journey? An investigation through explanatory sequential design. Psychol Mark. 2023;40(11):2244-2271.
46. Gillpatrick T. The digital transformation of marketing: Impact on marketing practice & markets. Econ - Innov Econ Res J. 2019;7(2):139-156.
47. Leong PA. Visualizing texts: a tool for generating thematic-progression diagrams. Funct Linguist. 2019;6:1-13.
48. Cobo MJ, López-Herrera AG, Herrera-Viedma E, Herrera F. Science mapping software tools: Review, analysis, and cooperative study among tools. J Am Soc Inf Sci Technol. 2011;5(1):146-166.
49. Vrontis D, Makrides A, Christofi M, Thrassou A. Social media influencer marketing: A systematic review, integrative framework and future research agenda. Int J Consum Stud. 2021;45(4):617-644.