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Digital Marketing Trends Reshaped by Artificial Intelligence: A Bibliometric Approach

Yapay Zekâ ile Yeniden Şekillenen Dijital Pazarlama Trendleri: Bibliyometrik Bir Yaklaşım

Mehmet Gökerik [a, *] & Öznur Aktaş [b]

[a] Dr. Öğr. Üyesi, Karabük Üniversitesi, İşletme Fakültesi, İşletme Bölümü, 78050, Karabük /Türkiye
ORCID: 0000-0002-0827-5805
[b] Öğr.Gör., Kocaeli Üniversitesi, Gazanfer Bilge MYO, Büro Hizmetleri ve Sekreterlik Bölümü, 41000, Kocaeli /Türkiye
ORCID: 0000-0002-0904-0653

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ÖZ

Bu çalışma, yapay zekâ teknolojilerinin dijital pazarlama trendlerini nasıl dönüştürdüğünü inceleyerek, 2010-2024 yılları arasındaki scopus indeksinde taranmış akademik yayınlara odaklanmaktadır. Yapay zekanın pazarlama alanındaki yükselişi ile, pazarlama stratejilerini optimize etme ve veri analizi kapasitelerini artırmada önemli bir etki oluşturmuştur. Çalışmanın amacı, yapay zekâ ve dijital pazarlama kesişimindeki mevcut araştırma eğilimlerini, temel bulguları ve gelecekteki potansiyel alanları bibliyometrik bir yaklaşımla değerlendirmektir. Çalışmanın analizi "R" programının bibliometrix eklentisi kullanılarak yapılmıştır. Scopus veri tabanlarından elde edilen makaleler, belirlenen anahtar kelimelerle filtrelenip, sıklık, alıntı sayısı, yazarlar, kaynaklar ve konuları temel alarak değerlendirilmiştir. Ayrıca, eş-ortaklık analizi, ağ analizi ve trend analizi gibi yöntemler kullanılarak, literatürdeki ana akımlar ve ilişkiler ortaya konuşmuştur. Bulunan sonuçlar, yapay zekânın dijital pazarlama alanında giderek artan bir etkiye sahip olduğunu göstermektedir.

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ABSTRACT

This study examines how artificial intelligence technologies have transformed digital marketing trends, focusing on academic publications indexed in Scopus from 2010 to 2024. The rise of artificial intelligence in marketing has significantly impacted optimizing marketing strategies and enhancing data analysis capabilities. The aim is to assess current research trends, key findings, and future potential areas at artificial intelligence and digital marketing intersections through a bibliometric approach. The analysis was conducted using the "R" program's bibliometrix package, evaluating articles from Scopus databases based on selected keywords, frequency, citation counts, authors, sources, and subjects. Additionally, co-occurrence, network, and trend analysis methods were employed to reveal the main currents and relationships in the literature. The results indicate an increasingly significant impact of artificial intelligence on the field of digital marketing.

1. Introduction

In the rapidly evolving digital era of today, the realms of business and marketing are undergoing a fundamental transformation. This paradigm shift is propelled by the swift advancements in Artificial Intelligence (AI) and digital marketing domains (Smith et al., 2012). The evolution of the Internet and burgeoning technologies have enabled businesses to reach and engage with their consumer base in unprecedented and impactful ways (Chaffey, 2019). AI and digital marketing stand at the forefront of this revolution, radically altering marketing strategies and business management and continuing to do so (Hanna et al., 2011).

Digital marketing, in the current context, fundamentally alters how businesses connect and interact with customers. With the widespread internet adoption and technological advancements, marketing strategies have increasingly

* *Sorumlu yazar/Corresponding author*.
e-posta: *mehmetgokerik@karabuk.edu.tr*

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become digitized, enhancing capacities to understand consumer behaviors and offer tailored experiences. During this evolutionary process, AI technologies have emerged as game-changers in digital marketing, revolutionizing areas like data analysis, customer service, and personalized marketing, enabling businesses to craft more effective, efficient, and target-oriented marketing strategies (Tiautrakul and Jindakul, 2019; Ruiz-Real et al., 2020).

The application of AI in digital marketing enables businesses to more accurately comprehend customer needs and develop suitable solutions. AI's multifaceted capabilities in analyzing customer data, automating and personalizing marketing campaigns, and predicting customer behaviors, add a new dimension to marketing strategies (Dumitriu and Popescu, 2020; Alyoshina, 2021). For instance, AI-powered chatbots have revolutionized customer services and interactions, making customer engagement continuous and efficient (Khatri, 2021; Bhatt, 2021).

The integration of AI into digital marketing also transforms decision-making processes in businesses. While traditional marketing methods often rely on intuition and limited data, AI-supported systems, through big data analysis and machine learning, facilitate more accurate and scientific decision-making. This development enables businesses to optimize marketing performance and customer experience (He, 2022; Zaveri and Amin, 2019). The impact of AI in digital marketing extends beyond internal business processes to also influence consumer shopping experiences. AI technologies offer customers more personalized, engaging, and interactive experiences, enhancing customer satisfaction and brand loyalty (Kotane et al., 2019; Grossberg, 2016).

Artificial Intelligence (AI) has revolutionized the field of digital marketing, radically transforming businesses' marketing strategies. In 2021, the estimated value of AI in the marketing sector reached $15.84 billion USD, with expectations that this figure will exceed $107.5 billion USD by 2028. This growth aligns with the projection of reaching $40.09 billion USD by 2025, with a compound annual growth rate (CAGR) of approximately 29.79% from the $5.00 billion USD market value in 2017 (Businessolution, 2023).

AI technologies are anticipated to impact marketing and sales functions from $1.4 trillion to $2.6 trillion USD. Presently, companies utilizing AI technologies are experiencing a remarkable increase of 451% in qualified potential customers. Furthermore, 84% of digital marketing managers have acknowledged that Artificial Intelligence and Machine Learning enhance the ability to provide real-time and personalized experiences to customers (Statista, 2023).

The primary research question of this study is to explore the academic development and current state of the fields of AI and digital marketing through a bibliometric analysis of scientific studies conducted in these areas. The numerical increase in studies at the intersection of digital marketing and AI signifies the importance and impact of this subject. Data collected from the Scopus database indicates a significant increase in the number of articles published on this topic from 2010 to 2024, demonstrating its status as a continually evolving and appealing research subject.

Incorporating bibliometric analysis in this study is crucial for understanding the general structure of academic literature in AI and digital marketing, publication trends, and how these topics are approached by the scientific community. Such analysis plays a vital role in identifying research gaps and future research directions, assisting academics, researchers, and industry experts in comprehending the most current and influential works in AI and digital marketing, and utilizing this knowledge in their own endeavors.

By synthesizing the findings from the bibliometric analysis, this research aims to provide researchers and industry stakeholders with a wealth of information on the convergence of AI and digital marketing. It aims to equip these audiences with a nuanced understanding of the field's current state, seminal works, and forward-looking perspectives. Ultimately, this study serves as a foundational resource for navigating the complexities of AI in digital marketing and fosters an informed dialogue on the strategic integration of AI technologies in marketing practices to drive future innovation and growth.

2. Literature Review

2.1. Digital Marketing

Digital marketing fundamentally transforms how businesses manage customer relationships, enhance brand awareness, and expand market share in today's rapidly changing technological environment. At the core of digital marketing lies the ability to communicate with consumers promptly and effectively, offering unique advantages over traditional marketing methods. Using digital marketing tools enables businesses to gain real-time customer insights, deliver value more effectively to customers, and develop strategies to build brand loyalty (Bruce et al., 2023; Chylinski et al., 2020; Drummond et al., 2020). In this context, digital marketing has focused on how customers develop connections with digital assets and brands, and how customer loyalty is shaped in this process (Bischoff et al., 2019; Gielens and Steenkamp, 2019).

The theoretical framework of digital marketing plays a critical role in understanding changes in marketing practice. Digitization offers new ways to embed customer experience and personalize brand communication, transforming how customers interact with brands. Digital marketing supports the evolution of customer decision-making processes, significantly influencing the dynamics that affect their information-seeking and purchasing behaviors (Kocic and Radaković, 2018; Vollrath and Villegas, 2021). During this

process, the strategic selection and use of digital marketing tools emerge as a fundamental element of firms' marketing plans (Busca and Bertrandias, 2020; Kumar et al., 2016).

Moreover, digital marketing significantly impacts value creation in digital markets for cultural products and reshaping consumer power. Digital marketing enables consumers to better meet their own consumption needs and encourages new consumer co-production activities that create more value for other consumers. These new co-production activities require firms to reconsider their role in the marketing value creation process; firms must now identify new marketing actions that support a marketing value creation process in which consumers are also co-producers (Dellaert, 2018; Sanz, 2014).

Finally, adopting digital marketing has a distinct impact on sustainable growth. Small and medium-sized enterprises (SMEs), in particular, leverage their online presence to initiate competitive promotions and interact with consumers using digital marketing strategies. Digital marketing supports SMEs in developing sustainable strategies and significantly improves the sustainable growth of SMEs in developing countries (Low et al., 2020). In this context, the acceptance of digital marketing significantly affects business managers' behavioral tendencies towards adopting digital platforms (Ashworth and Free, 2006; Coelho and Mendes, 2019).

Digital marketing transforms how brands reach customers in an era of rapid technological advancement and dynamic consumer behavior changes. Today's digital marketing trends offer more dynamic, interactive, and measurable advantages than traditional marketing methods. In this context, technological innovations such as artificial intelligence, big data analysis, and social media marketing enable brands to understand consumer behaviors and create personalized marketing campaigns (Sprong et al., 2021; Cham et al., 2022). Particularly, the use of artificial intelligence technology plays a critical role in making data-driven decisions that improve customer experience and optimize marketing strategies.

Social media influencer marketing is significant in digital marketing trends, facilitating organic and trustworthy interactions between brands and their target audiences. This strategy significantly impacts consumers' purchasing decisions, serving as an effective way for brands to reach broad audiences and increase brand loyalty (Joshi et al., 2023). Additionally, there is an increasing focus on issues such as data security, consumer privacy, and ethics in digital marketing research. In this regard, designing and implementing digital marketing practices in accordance with ethical standards is key to achieving sustainable success for brands (Kannan, 2017).

2.2. Artificial Intelligence

Artificial intelligence (AI) is defined as the development of computer systems capable of complex problem-solving, learning, adaptation, and decision-making abilities. It significantly impacts a broad spectrum, from education to healthcare services, and energy applications to social sciences (Chen et al., 2020; Koulaouzidis et al., 2022). AI applications aim to enhance the quality of education by personalizing students' learning experiences and assisting teachers in administrative processes (Chen, L., et al., 2020). In the health sector, particularly the use of human-computer interaction (HCI) and explainable artificial intelligence (XAI), has allowed the development of more transparent and interactive systems, thereby increasing users' trust in machines (Nazar, M., et al., 2021). These advancements are seen as indicators of AI's ability to exhibit human-like intelligence and its capacity for continuous learning and adaptation (Almeida, 2024).

In recent years, artificial intelligence (AI) has also increased its influence in the social sciences, becoming a crucial tool for understanding the behaviors, interactions, and decision-making processes of individuals, communities, and organizations. AI technologies offer unique opportunities for analyzing large datasets, recognizing complex patterns, and modeling social dynamics. These developments have found applications across various areas, from education to health, e-commerce to social media analytics. Particularly, the development and personalization of e-learning platforms, prediction of consumer behaviors, and sentiment analysis on social media highlight the critical roles AI plays in social sciences (Anoir et al., 2024; Sunarya et al., 2024; Liebenlito et al., 2024).

Finally, the applications of artificial intelligence in social sciences have strengthened the interdisciplinary approach and dialogue between social sciences and technical fields. This integration expands theoretical frameworks and deeper, more nuanced understandings in research and application areas of social sciences. Contributions of AI to social epistemology and the new perspectives it provides in understanding human behavior demonstrate that this technology is not merely a technical tool but also has the potential to shed light on fundamental questions in social sciences (Peters, 2024; Gill, 2024). In this context, the use of AI in social sciences occupies an important position both as a driving force for technological innovations and as a means of enriching social research.

3. Bibliometric Analysis

Bibliometric analysis is defined as a method that examines the quantitative and qualitative characteristics of academic publications, enabling the numerical interpretation and analysis of these data through the use of graphs and tables (Pritchard, 1969; Erkan, 2020). This analysis is employed to identify publication trends on a topic, the most cited publications, the journals in which these publications are made, and which authors are the most influential. Borgman and Furner (2002) have stated that bibliometrics is a powerful tool for describing, explaining, evaluating, and predicting the structure and function of academic

communication. The advancement of information technology and the widespread access to databases have directed many institutions, universities, and researchers towards bibliometric analyses, increasing the significance of work in this field. This situation has also led institutions within our country to commence bibliometric studies to assess and improve their own publications.

Bibliometric analysis typically encompasses methods such as citation analysis, content analysis, and the statistical analysis of data obtained from publication databases. These analyses are utilized to understand developments in research fields, identify potential collaborations, detect research trends, and evaluate academic performance. Particularly, universities, research institutions, and publishing houses resort to bibliometric analyses to define academic strategies and manage resources effectively. In this context, bibliometric analysis emerges as a crucial tool for comprehending and guiding publication and research activities in the academic world (Güler, 2023; Önal, 2017; Erkan, 2020).

In the scope of this research, an initial search was conducted in the Scopus database for works containing the terms "digital marketing" and "artificial intelligence" within their titles, abstracts, or keywords, yielding 253 results. Subsequently, data related to these findings were transferred to the R programming environment for bibliometric analysis using the "bibliometrix" package. Developed by Aria and Cuccurullo in 2017, the "bibliometrix" package is designed for use in R and facilitates comprehensive literature examination, allowing researchers to observe developments within any given field.

The employment of the "bibliometrix" package within the R programming environment for this study's bibliometric analysis represents a significant advancement in the methodological approach to examining the convergence of digital marketing and artificial intelligence. This approach enables a deeper, data-driven understanding of the academic landscape, facilitating the identification of emerging trends, influential authors, and core publications that shape the field. Moreover, by leveraging the sophisticated analytical capabilities of "bibliometrix", this research not only navigates through the quantitative metrics of publication impact and collaboration networks but also delves into the qualitative aspects of content thematic evolution. The integration of this advanced analytical tool underscores the study's commitment to precision and depth in mapping the intellectual territory of AI's role in transforming digital marketing strategies, thereby contributing valuable insights into the strategic direction of future research and policy formulation in academia and industry alike.

4. Methodology

This study employs a comprehensive bibliometric analysis approach, drawing upon data sourced from Scopus, one of the largest bibliometric databases. The analytical framework of this research is designed to systematically explore the intersection of Artificial Intelligence (AI) and digital marketing. The core of this analysis is underpinned by the following research questions:

(i). What is the annual publication trend of research combining AI and digital marketing?

(ii). Who are this domain's most prolific authors, journals, institutions, and countries?

(iii). Which authors, countries, and studies are the most influential?

(iv). What is the intellectual structure of the current research?

(v). What are the collaboration patterns among authors and countries, co-citation, and co-occurrence of authors and studies?

(vi). What are the key terms and trending topics in this field?

(vii). Are the findings consistent with Bradford's Law?

A meticulously defined methodological framework was implemented to thoroughly explore the research questions posed. The investigation was narrowed down to scholarly works listed in Scopus, specifically emphasizing those incorporating both "artificial intelligence" and "digital marketing" as integral key terms. This stringent selection criterion facilitated the extraction of 253 pertinent studies, covering an extensive period from 2010 up to and including anticipatory publications slated for 2024.

The analytical process used 'R Studio', a decision underpinning the software's alignment with contemporary bibliometric analysis standards. 'R Studio' is renowned for its advanced data management, processing, and visualization capabilities, making it an ideal tool for managing the complexity and volume of the dataset under review. Its utility in performing sophisticated statistical analyses was crucial for unraveling the nuanced patterns, relationships, and trends present within the selected studies.

Data compilation for this bibliometric assessment was finalized on 13 December 2023, drawing from the Scopus database to span from 2010 through to the forecasted contributions of 2024. This timeframe was strategically chosen to encapsulate a broad perspective on the developmental trajectory and present status of interdisciplinary research intersecting AI with digital marketing. The forward-looking inclusion of data extending into 2024 ensures that the analysis remains contemporarily relevant, capturing the forefront of academic discourse and innovation in these dynamically advancing areas.

The methodological approach of this study stands on a foundation of thoroughness and systematic precision, pivotal for underpinning the credibility and substantiation of the research outcomes. By carefully selecting the period of study and sources of data, in conjunction with employing state-of-the-art analytical technology, this methodology

affords a comprehensive and insightful exploration into the landscape of AI and digital marketing research. This rigorous approach facilitates a detailed and accurate response to the research questions, bolstered by a solid empirical basis.

5. Findings

In the Findings section of this study, we present a series of tables and visuals, meticulously organized based on the analysis conducted using the R Studio software. These elements are accompanied by detailed interpretations to elucidate the emerging trends and patterns. The findings have been categorized and presented under specific subheadings for a structured and coherent analysis. This section sequentially addresses the following aspects:

(i). Basic information derived from the analysis.

(ii). Annual trends in scientific publication production and citation tendencies over the years.

(iii). Insights regarding the sources of publications.

(iv). Analysis of the most prolific authors and their local impacts.

(v). The most influential studies identified.

(vi). The leading organizations in terms of publication output.

(vii). Frequently used keywords and trending topics.

(viii). Patterns of co-citation, co-occurrence, and collaboration networks.

(ix). International collaborations between countries.

(x). The most influential and productive countries in this field.

5.1. Descriptive Analysis

Table 1 offers a comprehensive overview of 253 publications sourced from 176 references. These documents encompass a period from 2010 to 2024. The analysis revealed a total of 984 author keywords (ID) and 709 author-used keywords (DE) and identified 690 authors in the field. Notably, 48 authors have published independently, without collaborations. There were 50 single-authored documents, with a co-authorship rate of 2.88% and an international collaboration rate of 18.97%. This indicates a significant level of independent research activity in this area.

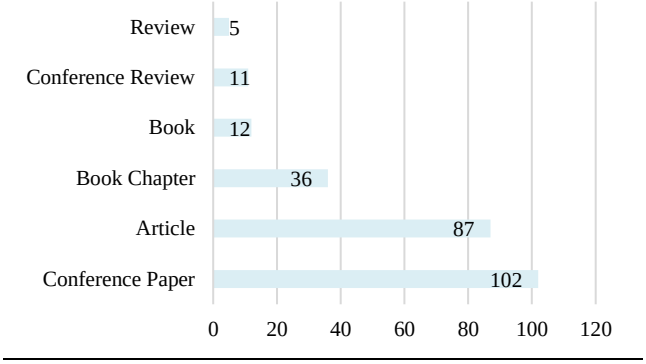
Table 1: Main Information Obtained Through Bibliographic Analysis

Description	Result	Description	Result
Main Information About Data		Authors Collaboration	
Timespan	2010-2024	Single-Authored Documents	50
Sources (Journals, Books, etc.)	176	Co-Authors Per Documents (%)	2,88
Documents	253	International Co-Authorships (%)	18,97
Annual Growth Rate %	10,41	Document Types	
Document Average Age	1,74	Article	87
Average citations per document	9,715	Book	12
References	9534	Book Chapter	36
Document Contents		Conference Paper	102
Keywords Plus (ID)	984	Conference Review	11
Author's Keywords (DE)	709	Review	5
Authors			
Authors	690		
Authors of Single-Authored Documents	48		

A total of 253 documents Source: Scopus

As depicted in Figure 1, of the publications analyzed, 40.31% (102) are conference proceedings, 35% (87) are journal articles, 14.23% (36) are book chapters, and 5% (12) are books. This distribution highlights the predominance of conference proceedings as a primary scientific output in studies combining digital marketing and AI.

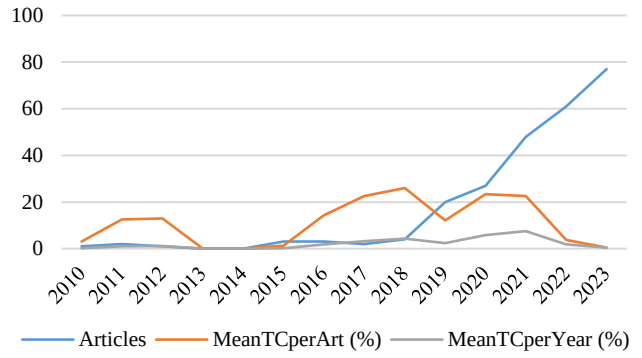
Figure 1: Percentage of Document Types



5.2. Annual Scientific Publication Production and Citation Trends

Figure 2 illustrates the annual production of scientific publications in the period from 2010 to 2024, alongside the yearly citation percentages and citations per publication.

Figure 2: Number of Studies by Year, and Trends in Average Citations per Year and per Publication (TC=Total Citations)



An examination of the publication output from 2010 to 2024 reveals a growing trend in publications addressing AI and digital marketing. The analysis indicates a gradual increase from a single publication in 2010 to a peak in 2024, with 4 anticipated publications. Notably, no relevant studies were recorded in 2013 and 2014. This trend underscores a burgeoning interest in the combined field of AI and digital marketing, particularly since 2019.

When examining the average annual citation trend for these publications, the years with the highest citation rates were identified as 2021 (7.51%), 2020 (5.84%), 2018 (4.33%), and 2017 (3.1%). The years 2021 and 2020 stand out with particularly high citation rates. A closer look at citations per publication reveals that studies from 2020 (23.37%), 2021 (22.54%), 2017 (22.5%), 2016 (14.33%), 2012 (13%), 2011 (12.5%), and 2019 (12.1%) garnered more citations. This indicates that publications from 2020, 2021, 2017, 2019, and 2016 have been more frequently cited, despite the higher number of publications in 2022 and 2023.

5.3. Findings Related to Publication Sources

An examination of the journals where studies combining AI and digital marketing are published revealed the top 10 influential journals in this domain. These findings, including the number of publications from each journal, are presented in Table 2.

Table 2: Journals with the Most Publications on the Topic

Sources	Articles
Lecture Notes in Networks and Systems	15
Acm International Conference Proceeding Series	8
Communications in Computer and Information Science	7
AIP Conference Proceedings	5
Applied Marketing Analytics	5
Contemporary Approaches of Digital Marketing and The Role of Machine Intelligence	5
Lecture Notes in Electrical Engineering	5
Journal of Digital and Social Media Marketing	4
Springer Proceedings in Business and Economics	4
2022 2nd International Conference on Advance Computing and Innovative Technologies in Engineering, Icacite 2022	3

Upon examining Table 2, it is noted that publications addressing the conjunction of Artificial Intelligence (AI) and digital marketing have been predominantly featured in 'Lecture Notes in Networks and Systems' (15 publications), 'ACM International Conference Proceeding Series' (8 publications), and 'Communications in Computer and Information Science' (7 publications).

Figure 3: Publication Production Over Time by Journals

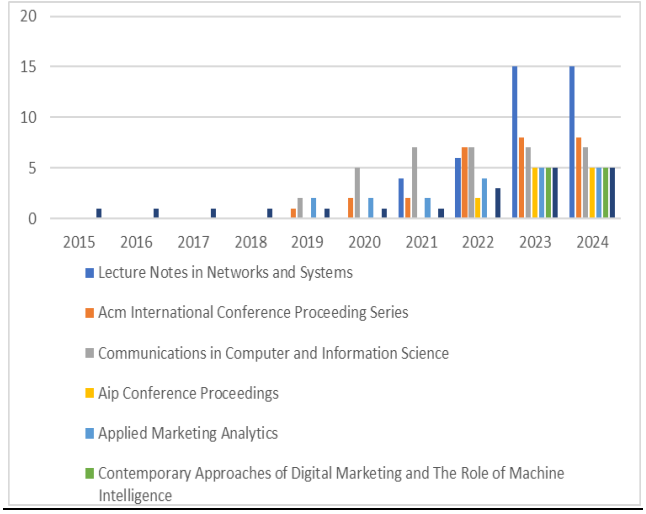
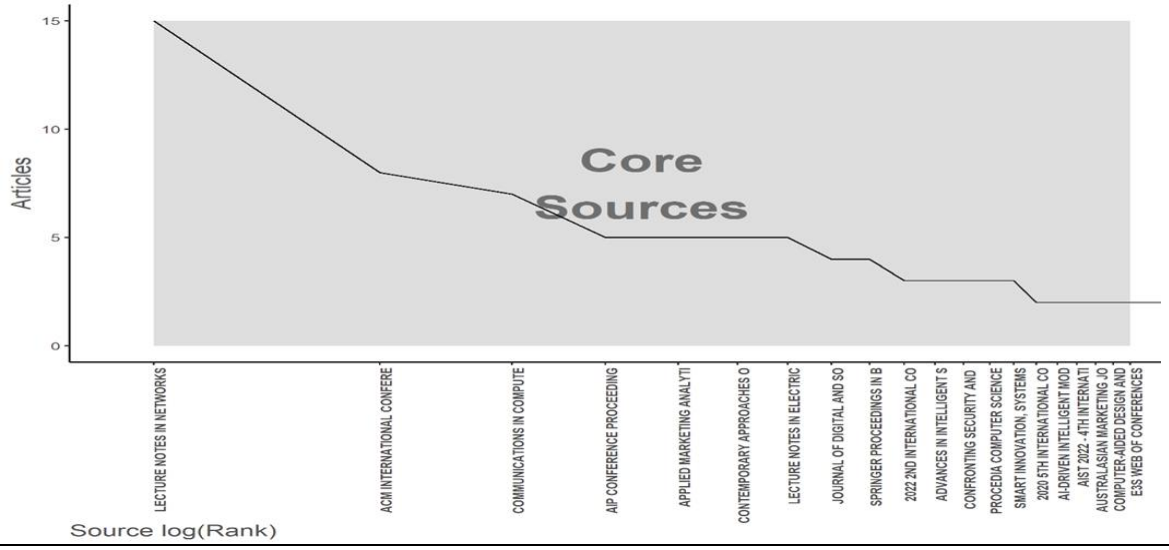


Figure 3 delineates the temporal distribution of publications by various sources on the topic. It is observed that 'Lecture Notes in Networks and Systems', despite having no publications from 2010 to 2020, exhibited a significant increase in publication numbers thereafter, indicating a growing interest in this field. Both 'The ACM International Conference Proceeding Series' and 'Communications in Computer and Information Science' began publishing on the topic post-2019, with 'Lecture Notes in Networks and Systems emerging as the predominant source.

Bradford's Law is employed to identify core journals in a field, categorizing the journals that publish total articles into three distinct zones. The primary zone comprises niche-specific core journals that publish many articles on the topic. Most publications on this subject are found in this zone, making these journals a crucial resource for researchers in the field (Batra et al., 2023).

Figure 4 presents the Bradford's Law analysis for journals. Table 2 lists the top ten journals by publication volume in the field. A review of Figure 4 indicates that all these journals fall within the first zone, affirming their status as core sources.

Figure 4: Bradford's Law Analysis for Journals Publishing on the Topic



5.4. Analysis of the Most Productive Authors and Their Local Impacts

Table 3 displays the top 20 most prolific authors in the field, along with their h-index, g-index, m-index, number of publications (NP), total citations indicating their local impact (TC), and the year they started publishing in this domain (PY_Start). The first study combining digital marketing and AI was published in 2010 by Li S. The most productive authors are Gupta S. (n=5), Garg S. (n=4), Li S. (n=4), and Singh A. (n=4). It is noted that Wang Y., with 3 publications, has garnered 614 citations, and Dwivedi Y.K., with 2 publications, has achieved 611 citations, indicating their significant local impact.

Table 3: Most Productive Authors and Their Local Impacts

Authors	h_index	g_index	m_index	TC	NP	PY_start
Li S	3	4	0,214	61	4	2010
Wang Y	3	3	1	614	3	2021
Chester J	2	2	0,167	54	2	2012
Dwivedi YK	2	2	0,667	611	2	2021
Garg S	2	2	0,25	8	4	2016
Gkikas DC	2	2	0,4	21	2	2019
Gupta B	2	2	1	5	2	2022
Gupta S	2	2	0,5	10	5	2020
Hassan A	2	2	0,667	7	2	2021
He H	2	2	0,143	27	2	2010
Theodoridis PK	2	2	0,4	21	2	2019
Aarikka-Stenroos L	1	1	0,5	18	1	2022
Abban R	1	1	0,5	2	1	2022
Abdulrahim NF	1	1	0,5	38	1	2022
Abebe GK	1	1	0,5	2	1	2022
Abu-Alsondos IA	1	1	1	5	1	2023
Aftab MO	1	1	0,333	3	1	2021
Aggarwal S	1	1	0,5	1	1	2022

TC: Total citations, NP: Author's number of publications, PY_Start: Start year

5.5. Most Influential Studies

The number of publications by authors and journals indicates productivity, while citation analysis reflects their impact. A study's influence is determined by the number of citations it receives, which is a fundamental bibliometric mapping technique reflecting intellectual connections between publications (Appio et al., 2014). Table 4 lists the most cited works in the field.

Table 4 presents the top 20 most influential studies along with their citation counts, annualized citations (TC per Year), and normalized citation rates (Normalized TC). The study by Yogesh K. Dwivedi et al. (2021) leads with 579 citations and an annual average of 193 citations. This indicates that this study has been extensively referenced by authors in the field. Other influential works include those by Liye Ma and Baohong Sun (2020) with 192 citations; Jose Ramon Saura et al. (2021) with 97 citations; Norbert Wirth (2018) with 82 citations; and Diana-Cezara Toader et al. (2020) with 80 citations.

Table 4: Globally Most Influential Studies

Authors	Title	Sources	TC	TC_p_y	NTC
Dwivedi, Y. K. et al. (2021)	Setting the future of digital and social media marketing research: Perspectives and research propositions	International Journal of Information Management	579	193,00	25,69
Ma, L. And Sun, B. (2020)	Machine learning and AI in marketing – Connecting computing power to human insights	International Journal of Research in Marketing	192	48,00	8,22
Saura, J. R. et al. (2021)	Setting B2B digital marketing in artificial intelligence-based CRMs: A review and directions for future research	Industrial Marketing Management	97	32,33	4,30
Wirth, N. (2018)	Hello marketing, what can artificial intelligence help you with?	International Journal of Market Research	82	13,67	3,15
Toader, D. C. et al. (2020)	The Effect of Social Presence and Chatbot Errors on Trust	Sustainability,	80	20,00	3,42
Mogaji, E. et al. (2021)	The implications of artificial intelligence on the digital marketing of financial services to vulnerable customers	Australasian Marketing Journal	73	24,33	3,24
Radesky, J. et al. (2020)	Digital Advertising to Children	The American Academy of Pediatrics	63	15,75	2,70
Miklosik, A. et al. (2019)	Towards the Adoption of Machine Learning-Based Analytical Tools in Digital Marketing	IEEE Access	63	12,60	5,21
Darmody, A. and Zwick, D. (2020)	Manipulate to empower: Hyper-relevance and the contradictions of marketing in the age of surveillance capitalism	Big Data & Society	58	14,50	2,48
Kull, A. J. et al. (2021)	How may I help you? Driving brand engagement through the warmth of an initial chatbot message	Journal of Business Research	57	19,00	2,53
Ducange, P. et al. (2019)	An effective Decision Support System for social media listening based on cross-source sentiment analysis models	Engineering Applications of Artificial Intelligence	52	10,40	4,30
Dellaert, B. G. et al. (2020)	Consumer decisions with artificially intelligent voice assistants	Marketing Letters	44	11,00	1,88
Montgomery, K. C. et al. (2017).	Children's privacy in the big data era: Research opportunities	The American Academy of Pediatrics	41	5,86	1,82
Leung, K. H. et al. (2019)	A B2B flexible pricing decision support system for managing the request for quotation process under e-commerce business environment	International Journal of Production Research	40	8,00	3,31
Ali Abbasi, G. et al. (2022).	Determinants of SME's social media marketing adoption: Competitive industry as a moderator	Sage Open	38	19,00	10,08
Ruiz-Real, J. L. et al. (2021)	Artificial intelligence in business and economics research: Trends and future	Journal of Business Economics and Management	37	12,33	1,64
Chintalapati, S. And Pandey, S. K. (2022)	intelligence in marketing: A systematic literature review	International Journal of Market Research	37	18,50	9,81
Buttle and Maklan (2019)	Customer Relationship Management: Concepts and Technologies	Buttle F, 2019, Cust Relatsh Manag: Concepts and Technol: Fourth Ed	35	7,00	2,89
Lı, S. et al. (2016)	Matching via Dimensionality Reduction for Estimation of Treatment Effects in Digital Marketing Campaigns.	Proceedings of the Twenty-Fifth International Joint Conference on Artificial Intelligence	33	4,13	2,30
Han, R. et al. (2021)	Artificial intelligence in business-to-business marketing: a bibliometric analysis of current research status, development and future directions	Industrial Management & Data Systems	32	10,67	1,42

TC=Total Citations, TC_p_y = Total citations per year, NTC=Normaliz-ed Total Citations

5.6. Most Productive Organizations

As indicated in Table 5, 'Research and Development' leads with 12 publications, followed by the 'University of Patras' with 8 publications, and both 'Amity University' and 'Sun Yat-Sen University' with 6 publications each.

5.7. Most Frequently Used Words and Trending Topics

Table 6 displays the most frequently used keywords in the 253 studies addressing AI and digital marketing. The keywords are categorized into author keywords, keywords plus, and keywords from abstracts.

Table 5: Most Productive Organizations

Affiliation	Articles	Affiliation	Articles
Research and Development	12	Mının Nızhny Novgorod State Pedagogıcal Unıversity	4
Unıversıty Of Patras	8	Natıonal Taıchung Unıversity Of Scıence and Technology	4
Amıty Unıversıty	6	State Bıotechnologıcal Unıversity	4
Sun Yat-Sen Unıversity	6	Swansea Unıversity	4
Manufacturıng Scıences	5	Swınburne Unıversity Of Technology	4
Reva Unıversity	5	Symbıosıs Internatıonal (Deemed Unıversity)	4
Technıcal Unıversity Of Cluj Napoca	5	Tampere Unıversity	4
The Hong Kong Polytechnıc Unıversity	5	Unıversıdad Iberoamerıcana Cıudad De Méxıco	4
Charotar Unıversity Of Scıence And Technology	4	Unıversıdad Técnıca De Ambato	4
Manchester Metropolıtan Unıversity	4	Unıversity Of Almería	4

Table 6: Most Frequent Words

Author's Keywords	Freq	Keywords Plus	Freq	Abstracts	Freq
digital marketing	107	digital marketing	85	digital marketing	1657
artificial intelligence	106	artificial intelligence	81	artificial intelligence	913
machine learning	31	marketing	76	data	271
marketing	17	commerce	66	research	215
big data	15	e-learning	21	study	181
social media	15	machine learning	21	learning	172
digital transformation	8	sales	21	technology	163
digitalization	7	machine-learning	19	social	153
social media marketing	7	electronic commerce	16	customer	152
deep learning	6	big data	15	business	150

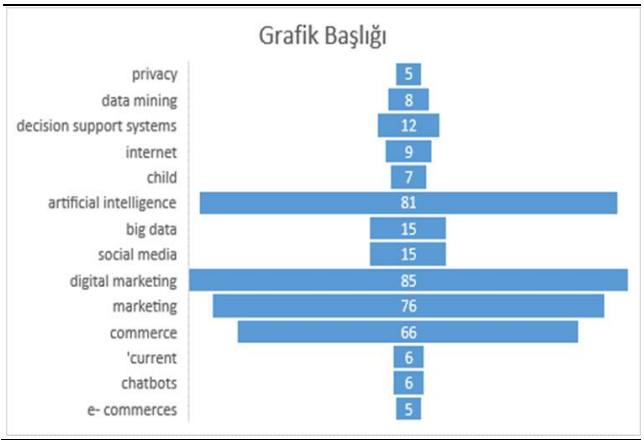
The most commonly used author keywords include 'digital marketing' (107), 'artificial intelligence' (106), 'machine learning' (31), 'marketing' (17), 'big data' (15), and 'social media' (15). An examination of keywords plus reveals 'digital marketing' (85), 'artificial intelligence' (81), 'marketing' (76), 'commerce' (66), 'e-learning' (21), 'machine learning' (21), and 'sales' (21) as the most frequent. In abstracts, the leading keywords are 'digital marketing' (1657), 'artificial intelligence' (913), 'data' (271), 'research' (215), 'study' (181), and 'learning' (172). These results affirm the dominance of 'artificial intelligence' and 'digital marketing' as key terms.

The word cloud presented in Figure 6 illustrates the most frequently used words. The size of the text indicates the frequency of word usage. As observed in the keyword analysis, the most commonly used keywords here are "digital marketing," "artificial intelligence," "marketing," and "commerce."

Figure 6: Word Cloud

Figure 7 presents the bibliometric analysis of trend topics based on author keywords, highlighting the popularity of specific topics in different years. Recent focus on 'current', 'chatbots', and 'e-commerce' is evident, with 'digital marketing' being prominent in 2022 and 'artificial intelligence' in 2021.

Figure 7: Trending Topics

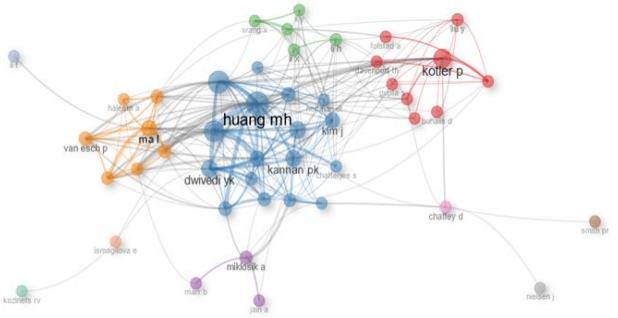


5.8. Co-citation, Co-occurrence, and Collaboration Networks

Co-citation analysis indicates when two separate studies are cited by other works simultaneously. When two studies are co-cited by other works, it implies a relationship between these two sources. The more frequently these sources are co-cited by other works, the stronger their relationship becomes. Additionally, this suggests that the studies share similarities in content or impact (Di Guardo and Harrigan, 2012, p. 791). The thickness of the lines represents the density of co-citation links, while the size of the nodes indicates the frequency of co-citations among authors (Biancone et al., 2020).

Separate co-citation networks were constructed for authors (Figure 8), references (Figure 9), and studies (Figure 10). As seen in Figure 8, there are a total of 11 thematic clusters for authors. Regarding co-citations, it can be observed that Huang and colleagues dominate the blue cluster, Kotler and colleagues in the red cluster, and Ma L. and colleagues in the orange cluster.

Figure 8: Co-citation Network for Authors



In Figure 9, the citation network among references is depicted, and it is evident that there are 10 thematic clusters within these citation networks. Within the red cluster, Kumar V. and colleagues have a significant presence, while in the orange cluster, Kotler P. and colleagues appear to hold substantial weight. It is also apparent that various studies draw upon these references collectively.

Figure 9: Co-citation Network for Sources

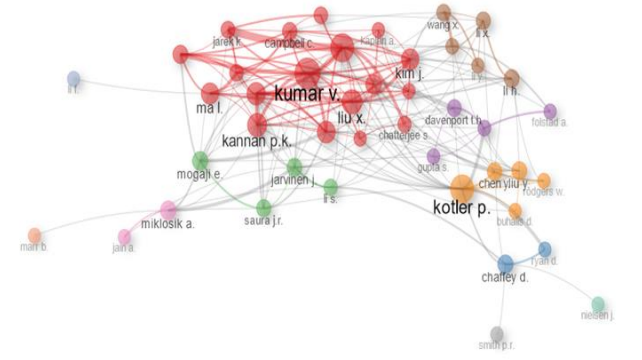


Figure 10 illustrates the co-citation network among studies, forming a total of 7 thematic clusters. It is evident that Martinez-Lopez F.J. (2013) has the largest co-citation network but is not connected to any other cluster outside the blue cluster. In fact, Figure 10 also indicates that, apart from the red and blue clusters, there is no co-citation relationship among the formed clusters.

Figure 10: Co-citation Network for Studies

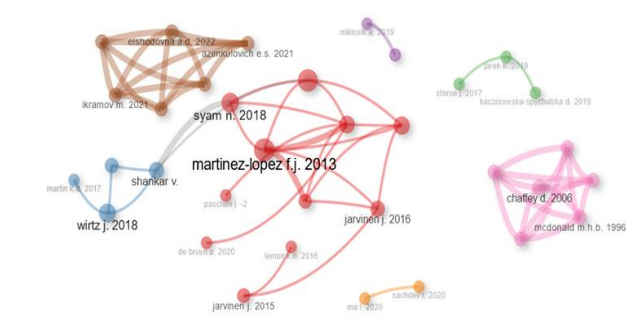
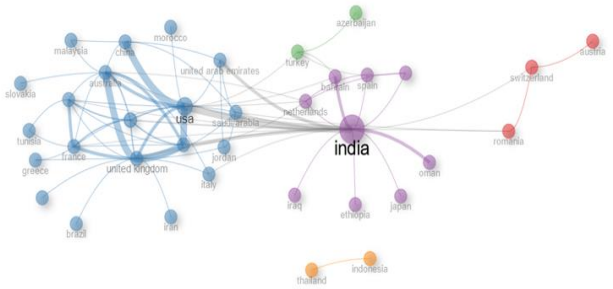


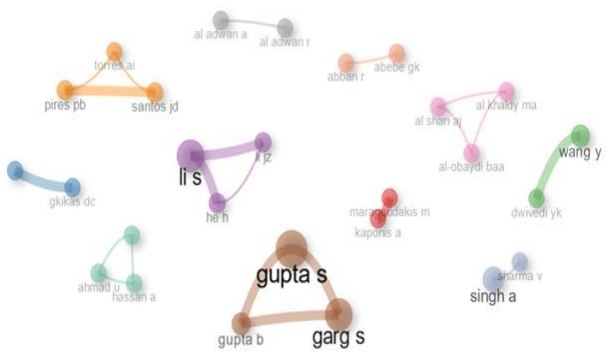
Figure 11 displays the collaboration network among countries. To claim that countries are cooperating with each other, they must have collaborated on at least one study. The size of the circular shapes representing countries indicates the level of their collaborative efforts, while the thickness of the lines signifies the extent of collaboration between countries. There appear to be 5 thematic clusters based on collaboration. In the blue cluster, it is evident that the United States is more active in terms of collaboration, and it collaborates with China, Australia, Italy, Saudi Arabia, France, the United Kingdom, Greece, Malaysia, and all other countries indicated in blue. In the second cluster shown in purple, India, Japan, Iraq, Spain, Ethiopia, Bahrain, Oman, and the Netherlands collaborate and form a cluster among themselves. Austria, Switzerland, and Romania's collaboration is depicted in the red-colored cluster. The green cluster includes Turkey and Azerbaijan collaborating together. The orange cluster shows the collaboration between Thailand and Indonesia.

Figure 11: Collaboration Network Among Countries



Just as in the case of collaboration among countries, to discuss collaboration among authors, it is necessary for authors to have co-authored at least one publication together. Figure 12 displays the collaboration among authors and the clustering based on collaboration among these authors. It is observed that there are a total of 11 thematic clusters, and there is no collaboration between these clusters. Authors mainly engage in pairwise and triple collaborations.

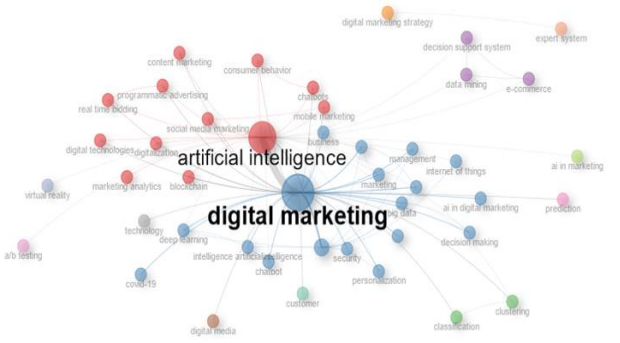
Figure 12: Collaboration Network Among Authors



In the network analysis, each node represents a keyword. The connections between nodes signify the co-occurrence of keywords; the thickness of these connections indicates the frequency of co-occurrence or the number of times these keywords appear together. The larger the size of a node, the greater the frequency of the keyword's occurrence; similarly, the thicker the connection, the more frequent is the co-occurrence of the keywords (Donthu et al., 2021, p. 293).

Figure 13 displays the co-occurrence network based on keywords generated by authors. Each color in the network represents a thematic cluster. In this analysis, it is evident that the keywords 'digital marketing', 'marketing', 'customer', 'big data', and 'internet of things', along with other keywords represented in blue, form a significant cluster. In this blue-colored cluster, 'digital marketing' is the most frequently co-occurring keyword. The red cluster encompasses keywords like 'artificial intelligence', 'social media', 'mobile marketing', 'marketing analytics', and 'consumer behavior', among others. Notably, 'digital marketing' and 'artificial intelligence' appear as common keywords across both the blue and red clusters, indicating their widespread usage and significance in the field.

Figure 13: Co-occurrence Network for Keywords



5.9. International Collaboration, Most Influential and Productive Countries

Table 7, covering the period from 2010 to 2024, illustrates the research collaborations between countries that have co-authored at least one paper. While there are no significant disparities in collaborations among countries, it is noteworthy that Australia, followed by Canada, has engaged in more collaborative efforts with diverse nations, participating in two studies, indicating a higher degree of collaboration between Australia and Canada.

Table 8 displays the top 20 most productive countries in terms of publication output. A closer look at the table reveals India as the most prolific country, with 197 publications, followed by the United States with 74, and Ukraine with 40 publications. Turkey ranks 11th with a total of 14 publications.

Table 7: Countries with the Most Collaborative Efforts

From	To	Freq	From	To	Freq
Australia	Canada	2	Canada	Finland	1
Australia	Finland	1	Canada	France	1
Australia	France	1	Canada	Germany	1
Australia	Germany	1	Canada	Ghana	1
Australia	Italy	1	Canada	Netherlands	1
Australia	Malaysia	1	China	Australia	1
Australia	Netherlands	1	China	Malaysia	1
Australia	Slovakia	1	China	Saudi Arabia	1
Australia	Sweden	1	China	United Arab Emirates	1
Bulgaria	Netherlands	1	Finland	France	1

Table 8: Most Productive Countries

Order	Country	Article	Order	Country	Article
1	India	197	11	Turkey	14
2	Usa	74	12	Romania	12
3	UK	40	13	Indonesia	11
4	China	35	14	Italy	9
5	Greece	28	15	Jordan	9
6	Portugal	18	16	Pakistan	9
7	Australia	16	17	Latvia	8
8	Malaysia	15	18	Saudi Arabia	8
9	Spain	15	19	United Arab Emirates	8
10	Ukraine	15	20	Canada	7

Table 9 delineates the most influential countries based on citations. Despite having only 7 publications, Finland leads as the most influential country with 597 citations. The United States follows with 445 citations for 74 publications, and the United Kingdom ranks third with 151 citations. Interestingly, despite being the most productive country with 197 publications, India ranks fifth in influence.

Table 9: Most Influential Countries

Country	TC	TC_per_Art	Country	TC	TC_per_Art
Finland	597	298,50	Italy	52	26,00
Usa	445	26,20	Australia	49	16,30
United Kingdom	151	18,90	Hong Kong	40	40,00
Spain	134	44,70	Greece	34	6,80
India	119	3,20	Brazil	29	29,00
Germany	91	45,50	Portugal	20	6,70
Switzerland	80	80,00	United Arab Emirates	18	6,00
China	64	4,90	Romania	17	17,00
Slovakia	63	63,00	Iran	14	14,00
Canada	60	20,00	Lithuania	14	14,00

TC: Total Citations, TC_per_Art: Total citations per article

6. Conclusion and Discussion

This study presents a comprehensive bibliometric analysis by examining studies published in the Scopus database between 2010 and 2024, aiming to explore the dynamic relationship between digital marketing and artificial intelligence (AI). Highlighting AI's impact on marketing strategies and business management, the study scrutinizes the academic developments and current status in these areas over the last fourteen years. Moreover, this research emphasizes the significance of the numerical increase in scientific studies at the intersection of AI and digital

marketing, demonstrating the status of this topic as a continuously evolving and engaging research subject. This study aims to equip academics, researchers, and industry representatives with extensive knowledge derived from merging artificial intelligence and digital marketing fields. It intends to provide a more detailed understanding of this area's current state, leading studies, and future perspectives.

The article is structured to cover several critical areas, including the current status and academic progress of AI and digital marketing, using a dataset from Scopus and analyzed through the bibliometrix package in R. It addresses various aspects such as annual publication trends, productive authors and journals, influential studies, and collaboration models. Findings reveal an increasing interest and citation trend in AI and digital marketing research, with specific focus areas such as improvements in customer service through AI, the role of AI in decision-making, and the significant growth potential of AI in the marketing sector. The analysis identifies publications concentrated in journal and conference series like 'Lecture Notes in Networks and Systems', 'ACM International Conference Proceeding Series', and 'Communications in Computer and Information Science'. Furthermore, authors such as Gupta S., Garg S., Li S., and Singh A. are highlighted as the most productive figures in this field. The study underscores the transformative effect of AI on marketing strategies and its growing significance in business management applications. These findings are anticipated to serve as an important resource in determining the future directions of AI and digital marketing research.

In the evolving landscape of digital marketing, the integration of Artificial Intelligence (AI) has marked a significant shift towards more dynamic, predictive, and personalized strategies. This transformation, as illuminated by our bibliometric analysis, underscores an exponential growth in both scholarly interest and practical applications, highlighting AI's pivotal role in reshaping marketing practices for the digital age. The increasing reliance on AI technologies facilitates a nuanced understanding of consumer behavior, enabling marketers to deliver highly targeted content, streamline operations, and enhance customer experiences.

Ethical considerations and social responsibility emerge as critical themes in the discourse on AI-driven marketing. Drawing upon Turker, D., and Altuntas, C. (2014) and Gold, S., et al. (2015), it's imperative to navigate the delicate balance between leveraging AI for marketing innovation and ensuring the protection of consumer privacy and data security. The potential for AI to intrude upon personal privacy calls for stringent ethical guidelines and robust regulatory frameworks, ensuring that marketing practices not only comply with legal standards but also uphold the highest ethical norms.

The regulatory landscape for AI in digital marketing, referenced through insights from Richardson, G. (2006), and Glaum, M., and Street, D. L. (2003), presents a mosaic of challenges and opportunities. As AI technologies evolve, so too must the regulatory frameworks that govern their use, ensuring transparency, accountability, and fairness in digital marketing practices. This necessitates a global dialogue among policymakers, industry leaders, and academics to forge standards that foster innovation while protecting consumer rights and promoting equitable access to technology.

Technological advancements in AI offer a dual-edged sword; while they provide unprecedented opportunities for marketing personalization and efficiency, they also introduce risks related to data accuracy, algorithmic bias, and the potential for misuse. Knechel, W. R., and Willekens, M. (2006) highlight that effective risk management strategies are paramount, requiring marketers to maintain vigilance over AI systems to prevent unintended consequences and ensure ethical use. Moreover, ongoing education and professional development, as suggested by Clarke, C., et al. (2012), are crucial for equipping marketers with the skills and knowledge necessary to navigate the rapidly changing technological landscape.

This study, while extensive, acknowledges certain limitations that pave the way for future research directions. Primarily, the bibliometric analysis focuses on literature from specific databases, which may not encapsulate the full spectrum of global research on AI in digital marketing. Future studies could broaden this scope by incorporating diverse sources, including literature and industry reports, to offer a more holistic view of the field. Additionally, empirical research examining the practical applications of AI in digital marketing across different industries could provide deeper insights into its effectiveness and challenges, further enriching the academic discourse and guiding practitioners in optimizing AI-driven marketing strategies.

In conclusion, the integration of AI into digital marketing heralds a new era of innovation, characterized by enhanced customer insights, operational efficiency, and personalized marketing strategies. However, this transformation also necessitates a concerted effort to address ethical, regulatory, and technological challenges. Future research should focus on developing sustainable, ethical AI applications that prioritize consumer welfare and contribute to the long-term growth of the digital marketing field. As we stand on the cusp of this technological revolution, it is incumbent upon academics, practitioners, and policymakers alike to steer the course of AI in marketing towards a future that is not only innovative but also inclusive, ethical, and socially responsible.

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