



DIGITALIZATION, SUSTAINABLE DEVELOPMENT AND MARKETING THROUGH THE LENS OF A SCIENTOMETRIC ANALYSIS OF RESEARCH TRENDS

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Abstract

In the context of the accelerated digitalization of economic processes and growing global challenges related to sustainable development, enterprises' marketing activities are increasingly shifting towards integrating commercial efficiency with environmental and social responsibility. In this context, scientific research at the intersection of marketing, digital transformation, and sustainable development has evolved rapidly over the past decade. However, most studies have focused on individual aspects, including digital marketing tools, green consumer behavior, the implementation of environmental, social, and governance (ESG) indicators, or technological drivers of digitalization. Despite the growing academic interest in these issues, the implications of these developments for the structure of the scientific literature have not yet been comprehensively examined from a scientometric perspective. This study analyzes publication activity, thematic structure, and scientific collaboration networks at the intersection of marketing, digitalization, and sustainable development over the period 2015–2026. Based on a unified dataset comprising 3,657 publications, the study examines chronological trends, international and institutional collaboration, co-authorship, and citation patterns while maintaining a consistent dataset across all analytical dimensions. To achieve the research objective, a bibliometric analysis was conducted for the specified period using Scopus, a widely recognized scientometric database, and VOSviewer software. The analysis confirms that the vast majority of scientific publications in this field were published after 2020. Between 2020 and 2025 alone, the annual number of publications increased from 92 to 1,006 documents, with publications from this period accounting for more than 80% of the entire dataset analyzed. Although no direct temporal correlation could be established between the adoption of specific strategic documents on sustainable development and the acceleration of publication activity, the findings indicate that the period 2022–2025 was characterized by the highest growth rates in scientific output compared with previous years. Furthermore, keyword density visualization revealed several thematic clusters within the research field connecting marketing, digitalization, and sustainable development: digital marketing and commerce; tourism and small and medium-sized enterprise performance; data analytics and machine learning; consumer behavior and supply chains; and trust, consumer psychology, and ESG-related issues. The analysis of international and institutional collaboration networks, together with co-authorship patterns, further confirmed the uneven and clustered nature of scientific collaboration, with research activity concentrated around a relatively limited number of countries, institutions, and authors. The findings, based on the most recent available data, provide an objective foundation for understanding the evolution, trends, and interconnections of academic research at the intersection of marketing, digitalization, and sustainable development. This research area is becoming increasingly important in the context of achieving the global Sustainable Development Goals (SDGs) by 2030.

KEYWORDS: digitalization; sustainable development; marketing; scientometric analysis; ESG; bibliometrics.

JEL classification: M31, O33, Q01

Introduction

The development of digitalization in economic processes and the intensification of global sustainability challenges are transforming marketing activity into an instrument that combines commercial efficiency with environmental and social responsibility. Kwilinski (2023), analyzing 9,527 Scopus publications for 1990–2023, confirms the exponential growth of scholarly interest in the relationship between digital technologies and sustainable development, noting an annual publication growth rate of about 36% and identifying five evolutionary stages of this field. Andriansyah, Anshori and Andiyani (2023), based on a bibliometric analysis of 218 Scopus publications for 2019–2023, similarly show that research on digital marketing combined with technological innovation and sustainability peaks in 2023 (79 documents). In parallel, digitalization of marketing is increasingly viewed as a direct factor of enterprise sustainability. Diez-Martin,

Blanco-Gonzalez and Prado-Roman (2019), reviewing the 2009–2018 literature, outline six key challenges at the intersection of digital marketing and sustainability: consumer orientation and value proposition, digital consumer behavior, digital "green" marketing, competitive advantage, supply chains, and organizational capabilities. Kumar, Sharma, Mishra, Sharma and Bhardwaj (2025), applying LDA topic modeling to 2,061 Scopus publications (1991–2025), show that digital technologies — IoT, blockchain, AI and digital platforms — catalyze the transformation of "green" marketing, forming clusters around sustainable consumption, digital marketing techniques, purchase intentions and green supply chains. Deng, Lan, Chen, Zheng and Zhang (2025), using structural equation modeling on data from 86 Chinese new-energy enterprises (2018–2022), demonstrate that digital transformation enhances sustainable marketing performance both directly and through strengthened market orientation.

Despite this growing body of work, a holistic conceptual model of the interaction among marketing, digital transformation and sustainable development remains underdeveloped. Existing studies mostly address one of the three areas in isolation — digital marketing, AI in marketing communications, or sustainable consumption — without a systemic, scientometrically grounded synthesis covering both leading databases (Scopus and Web of Science).

This study applies the bibliometric approach to analyze publications on the relationships among marketing activity, digital transformation and sustainable development, assessing the evolution of research priorities in digital marketing, the adoption of AI in marketing communications, and the integration of environmental and social responsibility into business practice.

Literature Review

The contemporary scholarly discourse on the relationship between marketing, digitalization and sustainable development is formed at the intersection of several research directions: sustainable and green marketing, digital marketing, digital business transformation, sustainable consumption, and digital technologies. Analysis of publications in recent years indicates a gradual shift from the study of individual marketing tools toward a comprehensive examination of digital technologies as a factor transforming the models of value creation, communication and consumption.

One of the directions that has formed the methodological foundation of contemporary research is the rethinking of the concept of sustainable marketing. Dyck and Manchanda (2021) examine sustainable marketing through the lens of virtue ethics, emphasizing the need to shift marketing orientation from short-term economic gain toward taking into account broader socio-ecological consequences of economic activity. Prothero and McDonagh (2021), in turn, develop the discussion on the ethical foundations of sustainable marketing and its compliance with contemporary social and environmental challenges. This approach broadens the traditional interpretation of marketing; however, it has a certain limitation: normative and ethical provisions do not always translate into measurable indicators of marketing performance. Thus, early studies of sustainable marketing largely concentrate on the conceptual substantiation of its principles, while the issue of quantitative evaluation of results remains insufficiently developed.

In parallel, a research line is being formed in which digitalization is regarded as a factor ensuring sustainability. George et al. (2021) link digital sustainability with entrepreneurship and the use of digital innovations to respond to climate and social challenges. Knudsen et al. (2021) investigate the impact of digitalization on the sustainability of competitive advantage, demonstrating that digital technologies can alter the mechanisms of forming and maintaining enterprises' competitive positions. Gomez-Trujillo and Gonzalez-Perez (2022) directly examine digital transformation as a strategy for achieving sustainability. The distinction of these approaches lies in the fact that digitalization is no longer confined to the functional improvement of business processes but is instead

considered in connection with long-term economic, environmental and social outcomes.

This direction was systematized by Guandalini (2022), who, on the basis of a systematic literature review, investigates the relationship between digital transformation and sustainable development. The author shows that digitalization can contribute to the achievement of sustainable development goals by increasing resource-use efficiency, fostering innovation, and transforming business models. At the same time, digital transformation does not have an unambiguously positive effect: its results depend on the organizational context, the nature of the technologies, and enterprises' ability to integrate digital solutions into an overall sustainable development strategy. This conclusion is of fundamental importance for marketing research, since the use of digital channels per se does not ensure the sustainability of marketing activity.

A separate body of literature is devoted to green marketing. Sharma (2021) systematizes research on consumer behavior and green marketing, demonstrating a close relationship among environmental attitudes, marketing stimuli and consumer intentions. Kaur et al. (2022) deepen this direction through an analysis of the relationship among green marketing strategies, environmental attitude and green purchase intention. Majeed et al. (2022) focus attention on the mediating effect of green brand image and consumers' environmental beliefs. García-Salirrosas and Rondon-Eusebio (2022) likewise link enterprises' marketing practices to consumers' behavioral characteristics.

Thus, existing studies provide a broad framework for explaining green purchase intention, but primarily focus on end-consumer behavior. The role of digital channels in modifying the influence mechanisms of green marketing messages remains insufficiently explored. Alkhatib et al. (2023), through a systematic review of green marketing in the digital age, demonstrate the gradual convergence of green and digital marketing during 2012–2022. Their findings indicate a shift from communicating environmental product characteristics toward the use of digital channels, social media and online consumer interaction, although the review largely reflects an earlier stage of digitalization. Therefore, further research is needed to examine contemporary issues such as AI, algorithmic personalization, influencer marketing, digital transparency and platform-based business models.

A more systematic view of the evolution of green marketing was presented by Bhardwaj et al. (2023), who conducted a bibliometric analysis of research for 2005–2022. The advantage of this work is the ability to trace not individual results of empirical studies but the structure of the scientific field, its thematic dynamics, and the relationships among research directions. At the same time, the considerable length of the period studied reduces the possibility of characterizing the very latest trends in detail. For an article focused on 2021–2025, the results of Bhardwaj et al. should be regarded as a baseline point of comparison rather than as a sufficient reflection of the current state of research.

Liu et al. (2023) similarly examine green marketing through a CiteSpace-based bibliometric analysis, identifying approximately 952 Web of Science publications during 2019–2023 and highlighting the structure of relationships among key concepts. However, the study focuses primarily on green marketing, leaving the digital dimension less systematically explored. This limitation creates an opportunity to broaden the bibliometric perspective by integrating digital marketing, digital transformation, digital sustainability, ESG and sustainable development. In 2023–2024, research increasingly shifts from the digitalization of individual marketing processes toward its implications for sustainable business models, innovation and enterprise performance, as demonstrated by Broccardo et al. (2023), Lu et al. (2023) and Xu et al. (2023). Consequently, digitalization is increasingly conceptualized not merely as a technological characteristic but as a mechanism for transforming the creation of economic and environmental value.

Particularly important for contemporary discourse is the work of Wang and Esperança (2023), which examines the impact of digital transformation on the market and ESG performance of small and medium-sized enterprises. This approach broadens the traditional understanding of digital marketing, since it links digital changes not only to communication effectiveness but also to non-financial outcomes of the enterprise. However, in this case ESG indicators remain predominantly an outcome characteristic of activity, while the specific contribution of marketing communications to their formation requires separate investigation.

In 2024, the direction associated with the convergence of digitalization and sustainable development intensifies. Mendez-Picazo et al. (2024) analyze the direct and indirect effects of digital transformation on sustainable development in the pre-pandemic and post-pandemic periods. Valero-Gil et al. (2024) focus attention on the convergence of digitalization and sustainability, which indicates the gradual formation of an integrated research field. Chen et al. (2024) examine the relationship between digital transformation and ESG decoupling, while Zhang and Huang (2024) investigate the role of supply chain resilience in the relationship between digital transformation and ESG performance. Taken together, these works demonstrate the expansion of the research subject from marketing activity to the entire system of corporate sustainability.

One of the new directions is the use of artificial intelligence in digital marketing. Gündüzyeli (2024) examines AI in digital marketing within the framework of sustainable management. At the same time, a methodological problem arises: digital technologies can simultaneously increase the effectiveness of marketing communications and generate new risks associated with excessive personalization, data privacy, digital inequality and the ethics of algorithmic decisions. Consequently, evaluating sustainable digital marketing requires taking into account not only economic outcomes but also social and ethical consequences.

Particular attention should be given to research published in 2025, which reflects the growing institutionalization of sustainable digital marketing (SDM). Rosário and Dias (2025), based on a systematic review of 84 Scopus publications, identify personalized messages, social media, influencer collaborations, environmental brand positioning and digital content as key mechanisms influencing sustainable consumer behavior, while also highlighting gaps concerning digital accessibility and ethical data management. Bashar et al. (2025) further develop the conceptualization of SDM by combining systematic review and bibliometric analysis, linking it to sustainable consumption, eco-friendly behavior, CSR, social equity, environmental education and sustainable business models. These studies demonstrate that sustainable digital marketing extends beyond the use of digital channels to promote environmentally friendly products and represents a broader integration of economic, social and environmental objectives. At the same time, the broad temporal coverage of existing reviews limits their ability to capture the most recent dynamics, highlighting the need for updated research on the evolution and integration of digital marketing and sustainable development.

Another aspect is presented by Ezeh and Dube (2025), who used VOSviewer for a bibliometric analysis of green and sustainability marketing. The authors focus attention on such concepts as sustainability marketing, green marketing, environmental responsibility, consumer attitudes, green products, green supply chain management, CSR and greenwashing. Digitalization does not act as a central category of this model, which leaves room for further research into the digital mechanisms of building trust in sustainability claims.

In parallel, the Digital ESG direction is being formed. Tan et al. (2025) conducted a bibliometric analysis of 455 documents indexed in Scopus devoted to the relationship between ESG and digitalization. The authors note the absence of a unified theoretical framework for Digital ESG and identify the main thematic directions of the development of this research field. This is of direct relevance to marketing research, since digital channels are increasingly used for ESG communications, the disclosure of non-financial information, and the formation of corporate reputation. At the same time, research on Digital ESG predominantly concentrates on corporate governance and reporting, while the marketing dimension of ESG communications remains less systematized.

An even broader approach was proposed by Kumar and Shah (2025), who combined a systematic review with a bibliometric analysis of 589 publications from Scopus and Web of Science for 2018–2025. The study shows a substantial acceleration of scholarly activity after 2020, and among the technological drivers it identifies AI, blockchain and IoT. The thematic clusters encompass digital governance, ESG transparency and the circular economy. At the same time, regional disproportions and an insufficient number of empirical studies in a number of sectors and countries were identified. The findings obtained make it possible to interpret Digital ESG as a direction that extends beyond corporate reporting and is gradually integrating with the broader SDG agenda.

Thus, the literature analysis makes it possible to identify three stages in the evolution of the research discourse. The first is characterized by the predominance of the concepts of green and sustainable marketing and a focus on the environmental behavior of consumers. The second is associated with the digitalization of marketing communications and the integration of digital marketing with green marketing. The third, most pronounced in 2024–2025, entails the formation of an integrated field at the intersection of sustainable digital marketing, digital transformation, ESG and the SDGs.

Consequently, what remains insufficiently studied is not so much each of the aforementioned directions individually as their structural interaction within a single scientific field. In particular, the relationships among digital marketing technologies, sustainable consumption, ESG communications, greenwashing, artificial intelligence and the achievement of the SDGs require further analysis. Moreover, most existing bibliometric studies use different time frames, databases and search strategies, which complicates a direct comparison of their results.

It is precisely this circumstance that substantiates the expediency of conducting the present scientometric analysis of publications for 2021–2025 in Scopus using a unified search based on the keywords "marketing," "digitalization" and "sustainable development." Such an approach makes it possible to determine not only the dynamics of publication activity but also the structure of thematic clusters, keyword relationships, and co-authorship and citation networks. In this context, bibliometric analysis becomes an instrument for identifying structural changes in the research field rather than merely a method of quantitatively describing publications.

Research Methods

The empirical basis was formed on the basis of the international Scopus scientometric database, which is characterized by a high level of structuring of bibliographic data, broad disciplinary coverage, and standardized metadata. The choice of this database is due to its extensive use in bibliometric studies of related problem areas and its capacity to enable multi-level analysis of scholarly publications. Compared with other sources of scientific information, Scopus provides a more representative reflection of the international scientific space, which is important for the analysis of interdisciplinary research in the field of marketing, digitalization and sustainable development.

The empirical basis of the study was developed through a systematic search of scientific publications indexed in the Scopus database. The search strategy was designed to identify studies addressing the intersection of marketing, digitalization, and sustainable development. The search was conducted across publication titles, abstracts, and author keywords using the following combination of terms: ("marketing" OR "digital marketing" OR "green marketing") AND ("digitalization" OR "digital transformation") AND ("sustainable development" OR "ESG").

This search configuration was selected to ensure the inclusion of publications in which marketing activities, digital transformation processes, and sustainability-related issues are examined within a common conceptual or analytical framework. The search was performed in Scopus on 3 September 2026.

The inclusion criteria covered peer-reviewed journal articles published in English and available in their final publication version. Records not corresponding to these criteria were excluded from the dataset. To improve data quality and ensure the consistency of the bibliometric sample, the retrieved records were additionally checked for duplicate entries. In addition to the automated data-processing procedures available in Scopus, a manual verification of bibliographic metadata was carried out to identify possible inconsistencies in publication records.

Scopus was selected as the primary data source because of its broad multidisciplinary coverage, standardized bibliographic structure, extensive citation data, and availability of metadata suitable for bibliometric and scientometric analysis. These characteristics make the database appropriate for examining interdisciplinary research trends and collaboration patterns at the intersection of marketing, digitalization, and sustainable development.

Although Web of Science is also widely used in bibliometric research, the present study was deliberately limited to Scopus in order to maintain methodological consistency within a single bibliographic environment. Combining data from Scopus and Web of Science would require additional procedures for data harmonization, duplicate removal, author and institutional disambiguation, and standardization of metadata structures. Therefore, cross-database comparison and integration are considered a potential direction for further research.

The final dataset comprised 3,657 publications. The dataset represents a static snapshot of Scopus indexing as of 3 September 2026 and was not updated during the subsequent stages of analysis. Accordingly, all bibliometric indicators presented in the study refer to this fixed dataset.

The analysis covered the period from 2015 to 2026 and included the examination of publication dynamics, thematic structure, citation patterns, co-authorship, international scientific collaboration, and institutional cooperation. A single dataset was retained throughout all analytical stages in order to ensure comparability of the results and to avoid changes in the composition of the sample depending on the specific dimension of bibliometric analysis.

Particular caution was applied to the interpretation of data for 2026. As the dataset was retrieved before the end of the calendar year, the number of publications indexed for 2026 (794 documents) is preliminary and should not be interpreted as a complete annual publication output. The corresponding value reflects only the publications indexed in Scopus as of the date of data retrieval.

The collected array of publications covers 3,657 sources with a time span corresponding to the period of formation of the scientific discourse on the problems of digital marketing and sustainable development (approximately 2015–2026), which provides the capacity to analyze long-term trends in the development of scientific thought in the field of the digital transformation of marketing practices and their alignment with the principles of sustainable development.

VOSviewer software was used for the visualization and analysis of the bibliometric data, providing for the construction of networks of relationships among keywords, co-authors, cited publications and bibliographic links (Broccardo, L., Zicari, A., Jabeen, F., and Bhatti, Z.A., 2023). The application of this tool provides the capacity to identify thematic clusters, determine the centers of scientific activity, and map the structure of research directions at the intersection of marketing, digitalization and sustainable development.

Bibliometric analysis is a descriptive method of studying scientific communication, as its primary object is the body of scientific publications and their structural characteristics rather than the economic, marketing, environmental, or social processes discussed in those studies. Accordingly, the results can be interpreted at two main levels: a descriptive level, covering publication volume, temporal dynamics, and subject-area distribution based on Scopus metadata, and a structural level, including thematic clusters, co-authorship, institutional collaboration, and citation networks identified through VOSviewer. These findings provide an empirical basis for characterizing the organization and relationships within the research field, while remaining subject to the methodological limitations of bibliometric analysis.

At the interpretative level, bibliometric data may indicate emerging research trends and relationships between digital transformation, marketing, sustainability, and related areas; however, they cannot independently establish causal effects on firms' economic, environmental, or social performance. Such findings should therefore be treated primarily as a basis for generating research hypotheses, while their empirical verification requires additional methods, including panel econometric analysis, structural equation modelling, or sector-specific case studies. Thus, bibliometric results are mainly used to describe the dynamics and structure of the scientific field, whereas conclusions regarding the real-world effects of digitalization require further empirical testing.

Research Results

Analysis of the chronological dynamics of publications on the topic of marketing, digitalization and sustainable development (Fig. 1) indicates a gradual expansion of scholarly interest in this problem area. In 2015–2019, the number of publications remained relatively low, ranging from 1 to 38 documents per year, which characterizes the initial stage of the formation of this interdisciplinary research direction.

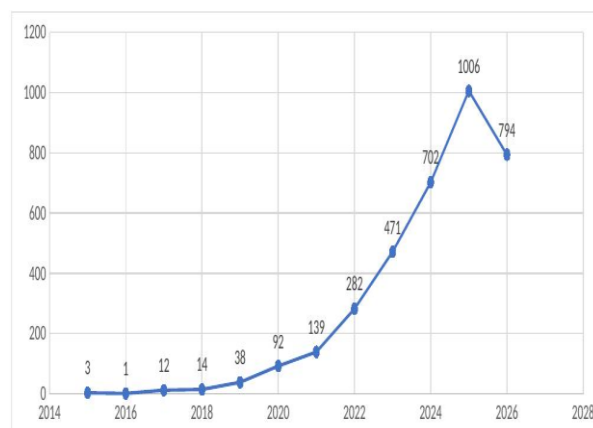


Fig. 1. Dynamics of the number of scholarly publications retrieved using the terms "marketing," "digitalization" and "sustainable development," 2015–2026, (the 2026 figure is preliminary, as of 3 September 2026)

Source: compiled based on Scopus data

Starting in 2020, a substantial acceleration of publication activity is observed: the number of documents grew from 92 in 2020 to 139 in 2021, 282 in 2022, 471 in 2023, and 702 in 2024. The highest figure was recorded in 2025 – 1006 publications – indicating a substantial intensification of scholarly attention to the relationship among marketing practices, digital transformation and sustainable development. In 2026, the Scopus database already contains 794 documents; however, this figure is not final, since the year has not yet ended.

Thus, over the period studied, a steady upward trend in publication activity can be traced. Particularly intensive growth occurs in 2020–2025, when the digitalization of business processes, sustainable development, ESG orientation and the transformation of marketing models became the subject of active interdisciplinary research.

To assess the dynamics of publication activity over the 2020–2025 period, the compound annual growth rate (CAGR) was calculated at 61.3%, reflecting an increase from 92 publications in 2020 to 1006 publications in 2025.

The dynamics of publications indicate a transition from the separate study of digital marketing and sustainable development toward a comprehensive investigation of their interrelationship, in particular in the context of sustainable consumption, digital technologies, ESG, and the digital transformation of business.

Given the descriptive nature of the study and the absence of an experimental assessment of causal relationships, the identified correlation between the adoption of strategic documents in the field of sustainable development and the dynamics of publication activity cannot be interpreted as evidence of a causal effect. It reflects only the statistical correspondence between temporal changes in the indicators under study.

Assessing the existence and nature of such a relationship requires the application of an interrupted time series analysis, accounting for the overall trend in publication activity, changes in indexing practices, and the time lag between the adoption of strategic documents and their potential reflection in scientific publications.

Considering the duration of the publication cycle in the social and economic sciences, a lag of approximately 12–24 months should be taken into account.

According to Fig. 2, the problem area under study is characterized by pronounced interdisciplinarity. The largest number of publications falls within Business, Management and Accounting - 1,975 documents, Social Sciences - 1,079, and Economics, Econometrics and Finance - 1,042. This structure confirms the predominance of an economic-and-managerial approach, within which marketing, digital transformation and sustainable development are regarded as interrelated components of contemporary business models.

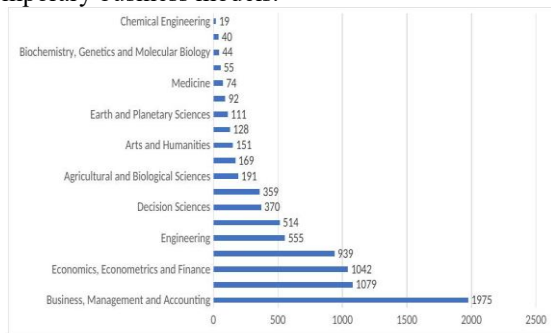


Fig. 2. Structure of the number of scholarly publications by subject area, retrieved using the terms "marketing," "digitalization" and "sustainable development," 2015–2026, (the 2026 figure is preliminary, as of 3 September 2026)
Source: compiled based on Scopus data

Also substantially represented are Computer Science - 939 documents, Engineering - 555, and Environmental Science - 514. Their combination reflects the technological and environmental components of the research, in particular the use of digital technologies, the development of digital business processes, the greening of activity, and the formation of sustainable business models. Fewer publications are concentrated in Decision Sciences (370), Energy (359) and Agricultural and Biological Sciences (191), which indicates the expansion of the research field into related directions.

Overall, the distribution of publications by subject area attests to the interdisciplinary character of contemporary research in the field of marketing, digitalization and sustainable development. The combination of managerial, economic, social, technological and environmental directions reflects the gradual formation of a comprehensive scientific discourse in which digital marketing tools are considered in relation to economic efficiency, environmental responsibility and the long-term sustainability of business.

The network of scientific collaboration by country in the field of marketing, digitalization and sustainable development (Fig. 3) demonstrates a geographically extensive structure of research activity and the formation of several interconnected clusters.

The largest nodes of the international scientific collaboration network are the United Kingdom, India, Indonesia, Portugal, Spain and Ukraine, which indicates high publication activity and established interstate links in research on marketing, digitalization and sustainable development.

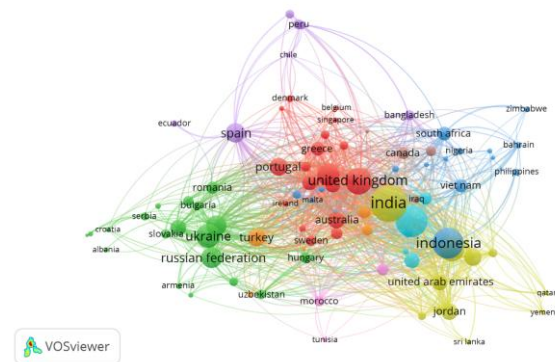


Fig. 3. Mapping of the international scientific collaboration network of countries in the field of marketing, digitalization and sustainable development, 2015–2026, (the 2026 figure is preliminary, as of 3 September 2026)

Source: compiled based on Scopus data using VOSviewer software

The central position of the United Kingdom and its numerous links with European, Asian and African countries characterize it as one of the main centers of international cooperation. The considerable presence of India and Indonesia reflects the activation of the Asian scientific community in this problem area.

The European segment of the network unites the United Kingdom, Portugal, Spain, Greece, Denmark, Belgium, Ireland, Sweden, Hungary and Romania, forming a dense environment of scientific interaction. Ukraine is integrated into a separate European–Eastern European direction and has links with a number of countries in the region, which attests to its participation in the international research space.

Overall, the network structure is characterized by a high density of international links and the absence of isolated national groups. At the same time, the concentration of the largest nodes in the United Kingdom, India, Indonesia, Portugal, Spain and Ukraine demonstrates an uneven distribution of scientific activity. The geographical structure of the network also attests to a gradual transition from the separate study of digital marketing and sustainable marketing toward interdisciplinary research on their relationship in the context of ESG, sustainable consumption and the digital transformation of the economy.

Visualization of the institutional collaboration network in the field of marketing, digitalization and sustainable development (Fig. 4) demonstrates the formation of two main clusters, characterized by different density and structure of relationships. The red cluster brings together mainly units associated with research on electronic marketing, in particular the *Department of Electronic Marketing*, the *College of Business Administration*, *INTI International University*, and related structural units. The green cluster is represented by the *Faculty of Business and Communication* and related smaller nodes.

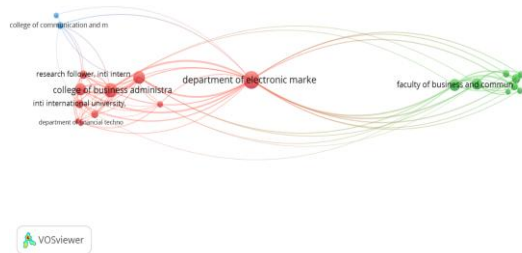


Fig. 4. Mapping of the international scientific collaboration network of organizations in the field of marketing, digitalization and sustainable development, 2015–2026, (the 2026 figure is preliminary, as of 3 September 2026)

Source: compiled based on Scopus data using VOSviewer software

The network structure is characterized by a concentration of links around individual institutional centers. The greatest density of interactions is observed within the red cluster, which attests to established research links among the units and institutions represented in the sample. At the same time, the presence of links between the red and green clusters attests to their interaction and the formation of inter-institutional channels of cooperation. A separate light-blue node, *College of Communication...*, which has a limited number of links, characterizes a peripheral segment of the network.

Overall, the resulting network attests to an uneven and clustered structure of institutional collaboration in research on marketing, digitalization and sustainable development. Scientific interaction is concentrated around individual university units and research groups, while part of the institutions occupy a peripheral position. Such a configuration characterizes the contemporary scientific discourse as one formed through a combination of localized research hubs with inter-institutional links among them.

The co-authorship network of the most productive authors in research on marketing, digitalization and sustainable development, presented in Fig. 5, reflects the structure of established scientific links among the authors whose publications were included in the analyzed Scopus sample. The visualization demonstrates the presence of two clusters, which differ in the level of internal integration and the intensity of co-authorship links.

The most developed is the red cluster, within which a dense collaboration network has formed around the authors Al-Babneh, Hassan Ali, Alrhaimi, Salem A. S., Mohammad, Suleiman Ibrahim, and Vasudevan, Asokan. The largest nodes of these authors and the numerous links among them attest to a higher intensity of joint publication activity. This research group also includes Al Adwan, Muhammad Noor, and Aburuman, Asad, who have links with the central participants of the network but are characterized by fewer co-authorship interactions.

A separate green cluster is represented by the authors Al-Daoud, Khaleel Ibrahim; Mohammad, Suleiman Ibrahim Shlash; and Mohammad, Anber Abraheem

Shlash. This group is characterized by close internal links; however, its integration with the overall network is less pronounced.

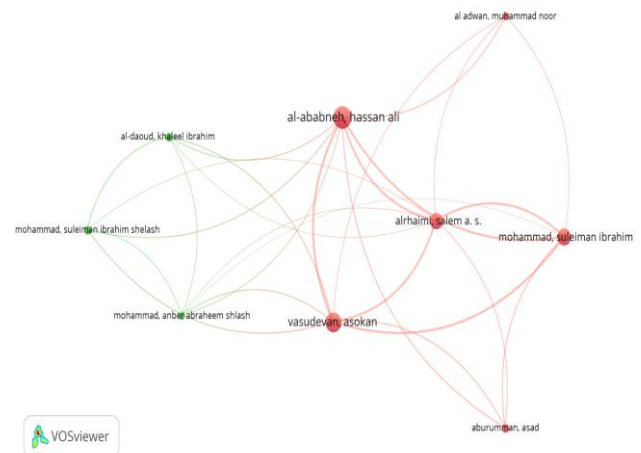


Fig. 5. Co-authorship network of researchers in the field of marketing, digitalization and sustainable development, 2015–2026, (the 2026 figure is preliminary, as of 3 September 2026)

Source: compiled based on Scopus data using VOSviewer software

Overall, the structure of the co-authorship network is characterized by a concentration of scientific collaboration around a limited group of authors who form the centers of research activity. The predominance of one denser cluster alongside a separate smaller group attests to the relative fragmentation of international scientific cooperation in research on marketing, digital transformation and sustainable development. At the same time, the presence of inter-cluster links attests to the interpenetration of thematic directions and the formation of broader research networks combining the problem areas of digital technologies, marketing practices and sustainable development.

Fig. 6 shows a polycentric structure of the author network, within which the main concentration of nodes forms the dominant core of research on marketing, digitalization and sustainable development. The most represented clusters are those associated with strategic management and dynamic capabilities theory, digital technologies and artificial intelligence, marketing and brand management, and tourism and sustainable development. Their mutual arrangement attests to a combination of several scientific traditions within the subject field under study.

Individual clusters, in particular those formed around Pimonenko T., Mohammad A.A.S./Al-Ababneh H.A., and Chiu D.K.W./Chan C.T., occupy a more peripheral position and have a limited number of links with the central part of the network. This characterizes the relative autonomy of the corresponding thematic directions and, at the same time, attests to the insufficient integration of individual research groups into the overall structure of scientific relationships.

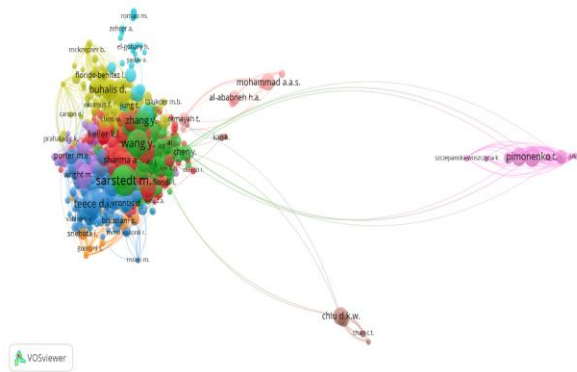


Fig. 6. Citation network of researchers in the field of marketing, digitalization and sustainable development, 2015–2026, (the 2026 figure is preliminary, as of 3 September 2026)

Source: compiled based on Scopus data using VOSviewer software

The distribution of node sizes demonstrates an uneven concentration of scientific activity and citation influence: the most represented authors form the core of the thematic discourse, while a significant proportion of researchers occupy peripheral positions. Such a structure reflects a combination of established theoretical approaches with newer directions associated with digitalization, sustainable consumption, artificial intelligence, and the transformation of business models.

Overall, the resulting network characterizes research on marketing, digitalization and sustainable development as an interdisciplinary and polycentric scientific field in which, alongside established research hubs, specialized thematic clusters emerge. The presence of weakly integrated directions attests to the promising nature of further combining marketing, digital and ESG-oriented research and expanding interdisciplinary scientific cooperation.

Fig. 7 shows a network visualization constructed on the basis of keyword co-occurrence analysis, which represents the thematic structure of the scientific field at the intersection of marketing, digitalization and related research directions. In accordance with the methodological principles of constructing such maps, node size is proportional to the frequency of use of the corresponding term in the analyzed array of publications, the thickness of the connecting lines reflects the strength of the semantic relationship between concepts, while color coding (five clusters identified) indicates the belonging of terms to relatively independent thematic groupings.

The peripheral position of nodes associated with sustainable development issues, such as “carbon footprint” and “ESG market”, together with their lower representation compared with dominant terms such as “marketing”, “digital marketing”, and “commerce”, indicates that sustainability-related terminology is not yet fully integrated into the core of the examined terminological space. This configuration reflects the level of lexical representation of sustainable development issues within the marketing research discourse, but it does not

provide sufficient grounds for assessing the extent of their practical implementation by firms.

The relationship between scientific discourse and marketing practice requires separate empirical verification, since keyword co-occurrence analysis does not make it possible to determine either the nature or the intensity of this relationship.

Analysis of the network topology makes it possible to identify five substantively differentiated clusters. The red cluster (“covid-19,” “literature review,” “bibliometric analysis,” “sharing economy,” “case study,” “China”) combines a methodological component (bibliometric and literature reviews) with the topic of pandemic-driven transformations of business models, in particular the sharing economy.

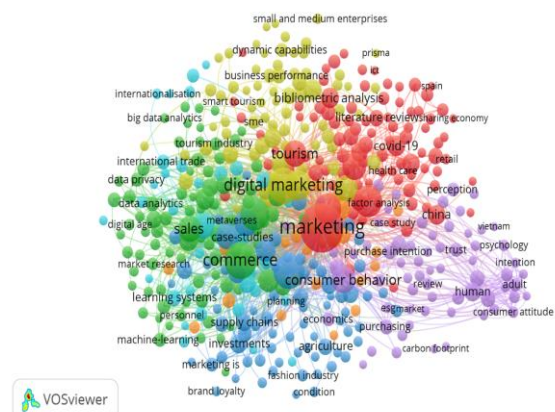


Fig. 7. Network of keyword relationships in the field of marketing, digitalization and sustainable development, 2015–2026, (the 2026 figure is preliminary, as of 3 September 2026)

Source: compiled based on Scopus data using VOSviewer software

The olive-yellow cluster (“tourism,” “SME,” “business performance,” “dynamic capabilities,” “smart tourism,” “internationalisation”) forms a direction associated with the impact of digitalization on the performance and internationalization of small and medium-sized enterprises, in particular in the tourism industry. The green cluster (“sales,” “case-studies,” “data analytics,” “machine-learning,” “learning systems,” “market research”) represents a technologically oriented component — the application of data analytics and machine learning in marketing research and sales. The blue cluster (“consumer behavior,” “supply chains,” “investments,” “agriculture,” “brand loyalty,” “fashion industry”) encompasses applied sectoral studies of consumer behavior and supply chains, while the purple cluster (“human,” “trust,” “psychology,” “consumer attitude,” “purchase intention,” “esg market,” “carbon footprint”) concentrates the psychological determinants of consumer behavior in connection with environmental and ESG issues.

Notably, the term “marketing” acts as a bridging node among all five clusters, which confirms the integrative, interdisciplinary character of the field under study: the marketing problem area simultaneously intersects with technological innovation (data analytics, artificial intelligence), the economic sustainability of enterprises

(dynamic capabilities, business performance), and environmental and social responsibility (carbon footprint, ESG market).

Research limitations

The interpretation of the obtained results requires consideration of methodological limitations related to the source of bibliographic data, the parameters used to construct the sample, and the specific characteristics of the bibliometric indicators applied. Taken together, these factors may affect the structure of the identified research field; therefore, the findings should be interpreted within the boundaries of their representativeness.

The empirical basis of the study was constructed exclusively using Scopus data. Despite the broad disciplinary coverage of this database, its indexing policy may result in the uneven representation of regional and non-English-language scientific journals. Consequently, the geographical concentration of publication activity identified within the analysed dataset may partly reflect the characteristics of Scopus indexing coverage rather than solely the actual intensity of research activity in individual countries. Applying the same search strategy to Web of Science or Google Scholar data in future studies would make it possible to assess the robustness of the identified geographical and thematic patterns.

An additional limitation concerns the language of publication. The inclusion of English-language publications only restricts the coverage of research findings published in national languages and may reinforce the geographical asymmetry of the resulting dataset. Under these conditions, the findings primarily characterize the English-language segment of international scientific discourse, whereas specific research traditions developed within particular European and Asian academic communities may be underrepresented.

The structure of the publication dataset may also be affected by publication bias. The identified thematic configuration reflects not only prevailing research interests but also the conditions under which the academic publishing system operates, including editorial priorities and manuscript selection practices. Therefore, the predominance of publications reporting positive outcomes of digitalization should not be interpreted directly as evidence that this perspective dominates the entire body of research. Likewise, the frequency with which a particular term occurs should not be treated as an independent indicator of its theoretical or practical significance.

The interpretation of citation relationships should account for the unequal accumulation of citations over time. Earlier publications, all else being equal, have had more time to accumulate citations, which may lead newer research areas to occupy peripheral positions regardless of their substantive potential. The configuration of citation networks may also be influenced by self-citation, reciprocal citation within the same research group, and disciplinary differences in citation practices. Accordingly, the position of an author, institution, or thematic cluster within a citation network should be interpreted with due consideration of publication chronology and disciplinary context.

Specific limitations also apply to keyword co-occurrence analysis. The frequency of terms and the structure of their relationships reflect the organization of scientific discourse but do not directly characterize the actual state of the economic, marketing, social, or environmental processes under investigation. The results of such analysis depend on the parameters used to construct the network, including the minimum term-frequency threshold, the quality of synonym and spelling-variant normalization, and the selected clustering parameters. Changes in these settings may lead to differences in the number, boundaries, and composition of thematic clusters. Therefore, the resulting network configuration should be interpreted as an outcome of specific methodological procedures rather than as a definitive and unambiguous representation of the structure of the research field.

Taken together, these limitations define the boundaries within which the findings can be generalized. The analysis makes it possible to characterize trends, thematic structures, and relationships within the English-language body of publications indexed in Scopus; however, the results cannot be directly extrapolated to the entire global scientific literature or used to establish causal relationships between digitalization, marketing activities, and sustainable development outcomes.

Conclusions

The scientometric analysis of the research field at the intersection of marketing, digitalization and sustainable development demonstrates that this is a quantitatively mature but structurally fragmented area of scholarly inquiry. Publication activity increased exponentially, from 92 documents in 2020 to 1,006 in 2025, indicating a transition from an emerging interdisciplinary field to an actively developing research domain. The subject-area distribution is dominated by Business, Management and Accounting (1,975), Social Sciences (1,079), and Economics, Econometrics and Finance (1,042), whereas Environmental Science (514), Energy (359), and Agricultural and Biological Sciences (191) remain less represented. This indicates the predominance of a managerial and economic perspective and the insufficient integration of the natural-science and technical dimensions of sustainable development.

International collaboration is concentrated around the United Kingdom, India, Indonesia, Portugal, Spain and Ukraine, while Latin America, most African countries and the Middle East remain comparatively underrepresented. Institutional and co-authorship networks demonstrate a similar concentration around a limited number of universities and researchers, leaving many institutions and authors in peripheral positions.

The citation network has a polycentric but uneven structure. Its core encompasses strategic management, digital technologies, marketing and brand management, tourism, and sustainable development, while several peripheral clusters remain weakly integrated.

Overall, the findings demonstrate that the field is quantitatively mature but fragmented in content, geography and research-community structure. The main research gap concerns the insufficient integration of

marketing, technological and environmental dimensions, as well as the concentration of research within a limited group of authors, institutions and countries. Such a model should connect digital marketing practices—including personalization, communication automation and platform-based consumer interaction—with measurable environmental and social performance indicators. Its empirical validation could reduce the fragmentation of existing research and strengthen the conceptual and practical integration of digital marketing with ESG and sustainable development objectives.

Given the unevenness of the geographical structure of the international collaboration network, an important direction for further work is to conduct comparative cross-country studies covering regions that are insufficiently represented in the existing scientific discourse — primarily the countries of Latin America and Africa. Such studies would make it possible to verify whether the conclusions obtained predominantly on the basis of materials from the European and Asian scientific space (the United Kingdom, India, Indonesia, Portugal, Spain, Ukraine) are universal or are instead conditioned by the specific institutional and technological context of individual countries.

No less promising, given the relative isolation of applied clusters in the keyword network ("agriculture," "fashion industry," "smart tourism"), is the sectoral verification of the proposed models in sectors with heightened environmental sensitivity of production processes - the agricultural sector, the fashion industry, and tourism - including with regard to the latest technological platforms (the metaverse, the platform economy). This would make it possible to establish the limits of generalizability of the identified patterns and to reveal sectoral specificity in the implementation of sustainable digital marketing.

The implementation of the aforementioned directions requires a corresponding organizational precondition — the expansion of interdisciplinary and inter-institutional research infrastructure, since the identified fragmentation of the co-authorship network and the concentration of institutional collaboration around a limited circle of units constrain the potential for a comprehensive study of the problem area.

Finally, an independent avenue for further research is the study of the potential of social marketing as an instrument for achieving the Sustainable Development Goals in combination with digital communication channels - social networks and influencer marketing - which logically complements the proposed integrated model and expands the applied significance of the results obtained for the formation of public policy and corporate sustainable-development strategies.

Overall, the outlined prospects follow directly from the empirically identified structural disproportions of the scientific field and are consistent with the logic of sequential scholarly inquiry - from theoretical generalization, through the development of measurement tools, to empirical verification at the cross-country, sectoral and institutional levels - which creates a coherent program of further research at the intersection of marketing, digitalization and sustainable development.

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