

Business Model Innovation through Artificial Intelligence in Small and Medium-Sized Enterprises A Bibliometric Review for the Period 2022–2026: Analysis Using VOSviewer

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Abstract:

This bibliometric study examined scientific output during 2022–2026, focusing on the role of artificial intelligence in business model innovation in small and medium-sized enterprises (SMEs). It sought to map knowledge in order to identify international and institutional collaboration and trace the evolution of concepts, reviews, and studies on the topic, using VOSviewer and data retrieved from the Scopus database.

The findings show that research on this topic has developed significantly. Country-network analysis revealed European leadership, led by the United Kingdom, Italy, and Germany as strategic centers of knowledge production, with collaboration extending to emerging economies such as China, India, Saudi Arabia, and Colombia. At the institutional level, the results showed clustering among leading universities, compared with the thematic and temporal dispersion of individual authors. Keyword-network and temporal-gradient analyses revealed a shift from technological adoption and digital transformation in general—and artificial intelligence in particular—in 2024 toward field studies of AI's impact and use in SMEs, as well as support for entrepreneurial orientation and sustainable development, especially during 2025–2026. Research has therefore moved from theorization toward quantitative measurement and field testing.

The study recommends that academics and policymakers expand the integration of AI technologies into operational processes, strengthen international research networks with emerging markets, and direct future research toward longitudinal and cross-sectoral studies.

Keywords: business model innovation, artificial intelligence, small and medium-sized enterprises, bibliometric review, VOSviewer

1. Introduction:

Modern innovations are producing radical changes. Artificial intelligence is among the most prominent forces of the present era and is reshaping the rules of competition across industries. AI-related opportunities are among today's most important technological developments because of their enormous potential and the value they can create for organizational advantage (Brock & Von Wangenheim, 2019).

AI technologies are a major driver of change in organizations' competitive environments. They create new opportunities to improve operational efficiency, strengthen decision-making, and develop products and services that respond more effectively to customer needs. They can also help redesign

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business models by supporting innovative methods of creating, delivering, and capturing value, thereby strengthening organizational agility and the capacity for sustainable growth amid accelerating digital transformation.

Integrating AI technologies with traditional business strategies combines innovation with managerial practice. This integration is not limited to improving tools; it has produced a fundamental transformation, particularly in the SME sector.

Scientific knowledge about the relationship between AI and business model innovation in SMEs remains dispersed across fields such as business administration, innovation, computer science, and digital transformation. This diversity makes it difficult to build a coherent picture of how research on the topic has evolved.

There is therefore a need for a systematic bibliometric analysis of recent scientific literature to map studies on the topic and identify its trends and intellectual structure. Bibliometric analysis uses reference data to reveal patterns of scientific production, collaboration networks, and links among concepts and research topics.

1.1 Study Objectives:

This study seeks to achieve the following objectives:

- Analyze the scientific structure and thematic evolution of research on AI-enabled business model innovation in SMEs within the study's scope.
- Identify the leading researchers, research institutions, and countries with the greatest influence in this field.
- Reveal the conceptual structure and principal themes shaping the field.
- Identify promising research areas and trends related to the topic.

1.2 Study Scope:

To ensure accurate results and achieve its objectives, the study observes the following boundaries:

- Thematic scope: The study is limited to business model innovation through the use of AI technologies within SMEs.
- Time scope: The study focuses on research published from 2022 to 2026 in order to capture the latest rapid developments and emerging trends in the field.
- Document source: Data collection was limited to Scopus, one of the largest and most comprehensive reference databases compatible with the VOSviewer bibliometric-analysis software.
- Document type: Articles and reviews were selected because of their quality and rigorous peer-review process.
- Language: English was selected to reach the broadest possible body of scientific research while avoiding terminological dispersion that could result from including other languages.

1.3 Research Questions:

In light of the foregoing, the study's central problem can be formulated as follows:

How did scientific output on AI-enabled business model innovation in SMEs evolve within the study's scope?

To answer the central question and achieve the study objectives, the following sub-questions are posed:

- Who are the leading researchers, research institutions, and countries contributing to this research?
- Which keywords are used most frequently, and how are they related?
- Which promising research topics require further study?

1.4 Study Contributions:

This study tracks the development of scientific output on AI-enabled business model innovation in SMEs and provides a systematic bibliometric analysis of the related research. It identifies leading contributors and promising research trends and helps guide future research.

2. Literature Review:

Mastery of AI has become both a competitive weapon and an opportunity for differentiation among organizations. AI has moved beyond being a technical tool to become capable of recreating value and generating competitive distinction. Most organizations still lack clear frameworks for adapting AI technologies to their business models. Research indicates that AI can accelerate internal processes and improve efficiency, yet systematically activating this effect to develop sustainable business models remains a challenge requiring tailored frameworks (Kim, 2023). Technology-adoption capacity is itself a major challenge because limited operating scope can constrain the use of modern technologies to improve overall performance. Organizational factors such as management strategies and human-resource training are therefore decisive. Rapid environmental change also affects the ability of SMEs to overcome scale constraints and achieve performance improvements that lead to qualitative transformation of their business models (Hrubý, 2024). Recent studies show that business model transformation requires alignment between value creation and value capture to attain high competitiveness and fully realize gains from innovative technologies (Chin et al., 2024).

The core challenge lies not only in adopting technology but also in fundamentally reengineering organizational culture so that intelligent automation aligns with the distinctive needs of SMEs. Empirical studies show that technological readiness and organizational preparation—mobilizing available resources and capabilities under supportive leadership—form a strategic axis for developing product innovation in resource-constrained environments (ul Haq & Suki, 2025). Research has also expanded toward innovation-ecosystem approaches, emphasizing that AI's value within organizations is not realized in isolation from external networks and digital collaboration with technology firms. Success depends fundamentally on the dynamic interaction among infrastructure readiness, strategic leadership vision, and the ability to overcome entrenched organizational constraints in emerging markets (ul Haq et al., 2026).

Amid intensifying competition and the demands created by today's environment, AI is not merely a means of reducing costs. It is a mechanism for enhancing strategic flexibility and responding rapidly to changing customer behavior, expectations, and preferences through continuous engagement and the delivery of higher-value products and services aligned with market and sustainability requirements (Aljarboa, 2024).

With rapid technological development and the advent of the information-technology era, reviews show that adoption decisions depend on the interaction of many factors, including fit between technology and organizational needs, infrastructure, knowledge, resources, organizational culture, competitive pressures, regulatory frameworks, and innovation-ecosystem networks (Schwaecke et al., 2025). In this context, innovation does not result from the technology itself but from the organization's

ability to turn it into organizational and commercial practices. This highlights the need for more integrated analytical models and longitudinal studies that track effects over time and provide quantitative evidence. Innovative impact arises neither from AI nor business model design in isolation, but from the degree of interactive alignment between them, supporting a configurational perspective that identifies patterns linking technology and business design and their differing relationships with performance (Qu et al., 2021).

From an entrepreneurial perspective, AI use is linked to an organization's ability to anticipate opportunities, improve market sensing, regularly analyze potential risks, and develop strategic decisions based on high-quality data about the external environment. These dimensions make AI a resource for renewing business-environment activity rather than merely a supporting technical tool (Yesuf & Fields, 2025). Other reviews support this direction through models that link infrastructure, strategic alliances, and cultural factors with digital leadership, dynamic capabilities, entrepreneurial mindset, and data strategy. Together, these provide a path toward practical AI adoption, value reconfiguration, and sustainable competitiveness (Islam et al., 2025).

Nevertheless, the available evidence remains methodologically unbalanced. Quantitative surveys and case studies dominate the field, while longitudinal studies, international comparisons, and mixed-method analyses remain limited. This makes it difficult to determine how AI capabilities evolve into sustainable innovative outcomes over time (Chotisarn & Phuthong, 2025). The research gap therefore lies not in a lack of explanatory models but in testing their interactions across different institutional and sectoral contexts, while incorporating ethical and social considerations into assessments of AI-driven business model innovation (Sharma et al., 2025).

Recent classifications of AI-enabled business models further show that organizations play different roles: providers of data analytics, developers of software technologies, suppliers of intelligent products and services, or facilitators of AI application development. This requires qualitative and radical change to adapt innovation strategies to these operating patterns (Widayanti & Meria, 2023).

Innovation value is the decisive element and true key to converting operational or market data into actionable insight. The product-and-service model focuses on tailoring offerings, improving customer experience, automating interaction, expanding targeting, and strengthening customer relationships. The facilitation model, by contrast, develops methods and technologies for building an ecosystem of organizations, developers, and customers around digital infrastructure. Business model innovation here is not limited to changing the value proposition; it also reorganizes value-creation activities. The literature confirms that commercializing AI in support of entrepreneurship and creativity requires suitable conditions for value creation, mechanisms for capturing it, and development of the commercial offering (Åström et al., 2022).

3. Research Methodology

This section presents the steps used to collect and analyze data, from retrieving studies from Scopus to analyzing them with VOSviewer, in order to ensure accuracy and scientific rigor.

3.1 Research Method:

The study uses a hybrid approach combining quantitative data analysis with qualitative interpretation of content to provide a comprehensive and in-depth reading of the scientific literature. The method has two main components:

- Bibliometric analysis (using VOSviewer):

Bibliometric analysis is a scientific methodology for understanding the research landscape by applying quantitative statistical techniques to academic literature, enabling exploration of trends across

scientific fields (Kumar, 2025). It also supports knowledge mapping and clarifies the evolution of topics and reciprocal relationships among researchers and scientific institutions (Öztürk et al., 2024).

VOSviewer is a text-mining tool that represents links among concepts, researchers, and publications as knowledge maps, facilitating the identification of academic clusters and emerging trends within a dataset (Moral-Muñoz et al., 2020).

- Thematic analysis:

Thematic analysis is a qualitative research method concerned with identifying, analyzing, and classifying patterns in data in order to extract concepts reflecting the topic under study (Lochmiller, 2021). A theme is a descriptive element connecting ideas, and this method is valuable because it converts data into concepts that allow the researcher to answer the study questions (Vaismoradi & Snelgrove, 2019).

3.2 Data Collection:

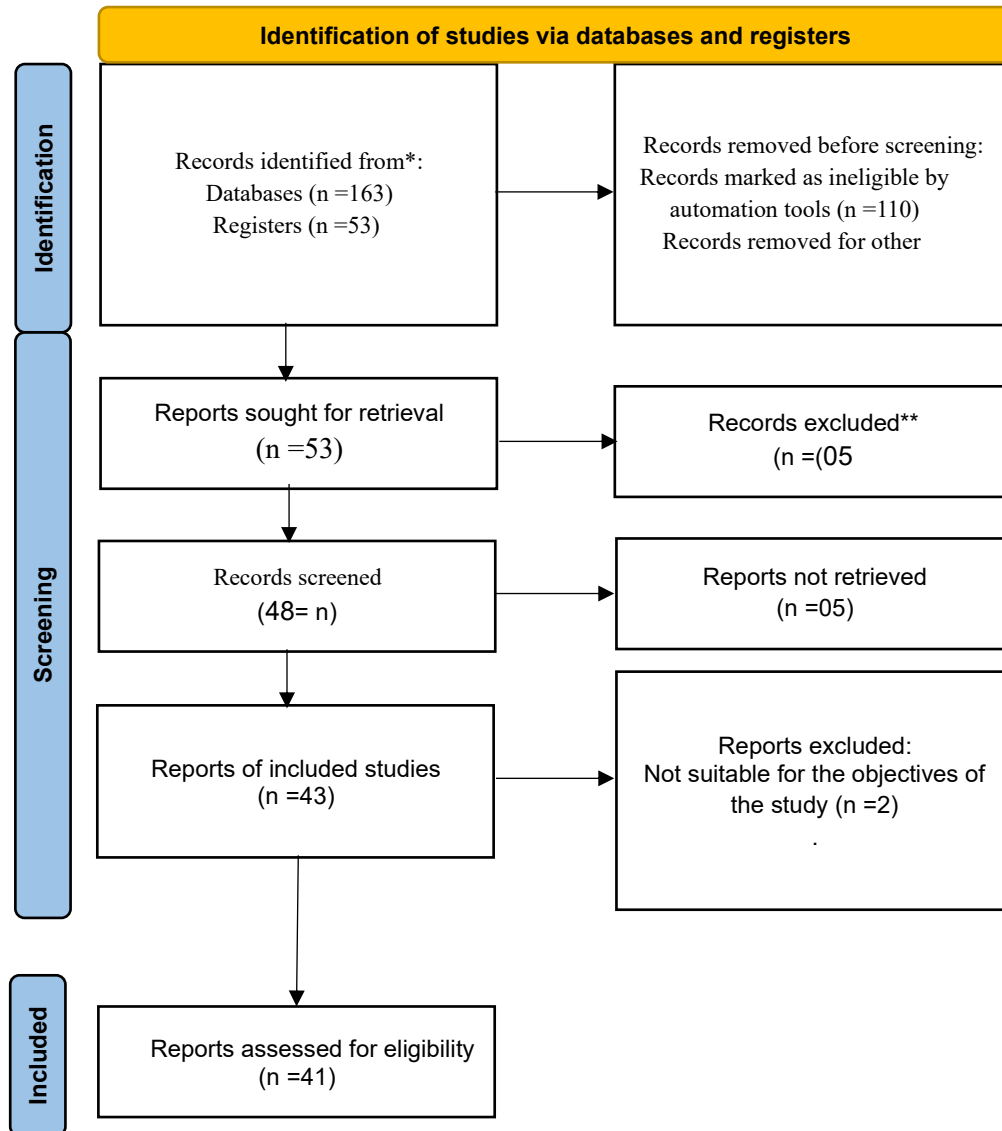
To select studies meeting the criteria defined by the study scope and organize the process systematically and clearly, the PRISMA flow model shown in Figure 1 was adopted. It helps document the stages of identifying, screening, evaluating, and assessing the eligibility of studies until the final studies are included. Table 1 presents the sequence leading to the final sample.

Table 1. Sample-screening stages according to the study scope

Procedure followed	Screening stages
TITLE-ABS-KEY (("artificial intelligence" OR "machine learning" OR "generative AI" OR "generative artificial intelligence") AND ("business model innovation" OR "business model transformation" OR "business model") AND (SME* OR "small and medium enterprise*" OR "small and medium-sized enterprise*" OR "small business*" OR MSME* OR "micro small and medium enterprise*"))	Stage 01 Applying the limits
TITLE-ABS-KEY (("artificial intelligence" OR "machine learning" OR "generative AI" OR "generative artificial intelligence") AND ("business model innovation" OR "business model transformation" OR "business model") AND (SME* OR "small and medium enterprise*" OR "small and medium-sized enterprise*" OR "small business*" OR MSME* OR "micro small and medium enterprise*")) AND (LIMIT-TO (DOCTYPE , "ar") OR LIMIT-TO (DOCTYPE , "re"))	Stage 02 Applying the limits
TITLE-ABS-KEY (("artificial intelligence" OR "machine learning" OR "generative AI" OR "generative artificial intelligence") AND ("business model innovation" OR "business model transformation" OR "business model") AND (SME* OR "small and medium enterprise*" OR "small and medium-sized enterprise*" OR "small business*" OR MSME* OR "micro small and medium enterprise*")) AND (LIMIT-TO (DOCTYPE , "ar") OR LIMIT-TO (DOCTYPE , "re")) AND (LIMIT-TO (LANGUAGE , "English"))	Stage 03 Applying the limits
TITLE-ABS-KEY (("artificial intelligence" OR "machine learning" OR "generative AI" OR "generative artificial intelligence") AND ("business model innovation" OR "business model transformation" OR "business model") AND (SME* OR "small and medium enterprise*" OR "small and medium-sized enterprise*" OR "small business*" OR MSME* OR "micro small and medium enterprise*")) AND (LIMIT-TO (DOCTYPE , "ar") OR LIMIT-TO (DOCTYPE , "re")) AND (LIMIT-TO (LANGUAGE , "English")) AND PUBYEAR > 2021 AND PUBYEAR < 2027	Stage 04 Applying the limits

Source: Prepared by the researchers

Figure 1. PRISMA flow diagram



Source: (PRISMA, 2025)

4. Data Analysis Using VOSviewer

Bibliometric analysis is a suitable quantitative method for studying the development of scientific knowledge because it enables the examination of patterns, research trends, publication characteristics, and relationships among components. This study uses bibliometric research to analyze and map scientific output on AI-enabled business model innovation in SMEs within the defined scope. It analyzes bibliographic data extracted from Scopus according to predetermined criteria concerning topic, period, document type, and language. After eligible studies are identified, the bibliographic data required to analyze the evolution of scientific output, researchers, institutions, countries, and keywords are collected.

Data analysis consists of three stages. The first is scientific-performance analysis, which describes the development of scientific output, research activity and distribution, and leading researchers, institutions, and countries through knowledge maps and ranking tables.

The second stage analyzes relationships among keywords through keyword knowledge maps and ranking tables to identify the most frequently addressed concepts and topics, reveal their relationships, and extract research clusters representing the field's principal themes.

The third stage identifies emerging research areas, trends, and promising topics deserving further study, using the same approach as the previous stages—analysis of maps and tables.

The study uses VOSviewer to create scientific maps and tables visualizing relationships among the elements studied. Network and cluster outputs are also used to interpret the thematic structure of the research.

The research design combines descriptive analysis of scientific output with network analysis of conceptual relationships. This aligns with the study objectives and questions and provides a systematic account of the field's development and leading actors within the study scope.

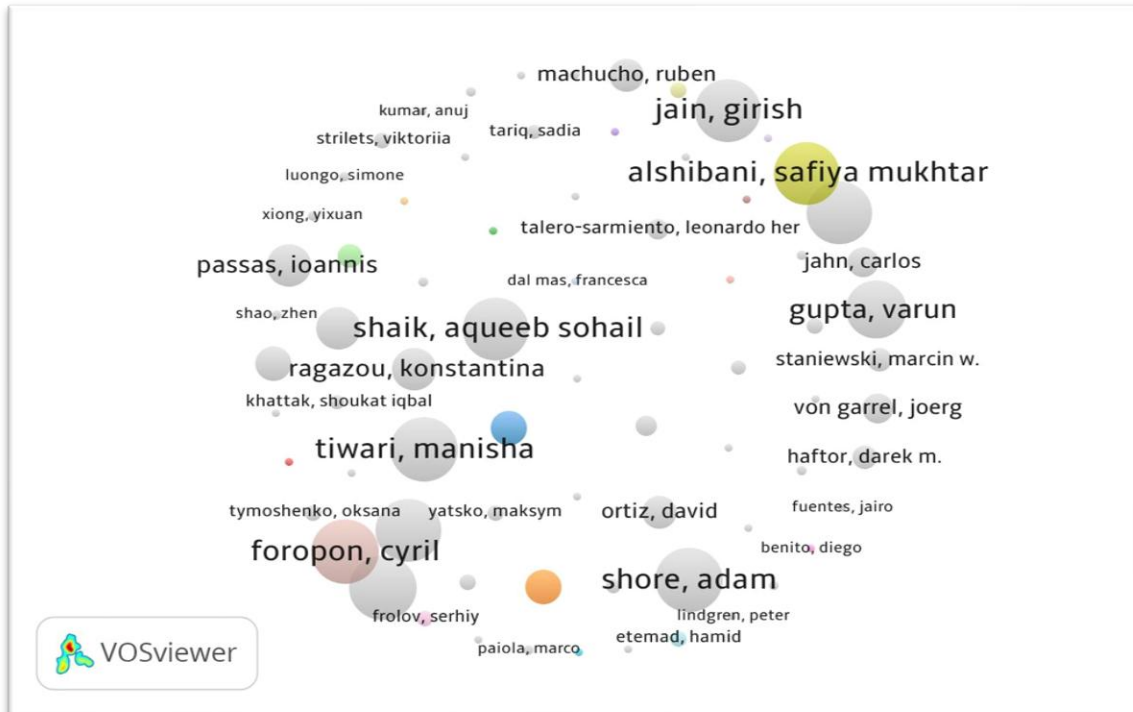
4.1 Leading Contributors to the Topic (Authors, Institutions, and Countries):

This section presents the bibliometric mapping results for scientific output by identifying the participants in the research process. It covers the most highly cited researchers, leading scientific institutions and universities, and the distribution of the most productive countries contributing to the academic literature on AI-enabled business model innovation in SMEs.

4.1.1 Authors:

This section presents a bibliometric analysis of the network of researchers who contributed to the topic. It identifies the most productive and highly cited authors, reflecting their scientific influence on research trends concerning AI-enabled business model innovation in SMEs.

Figure 2. Knowledge map of leading authors



Source: VOSviewer output

The bibliometric map of leading authors shows the formation of research teams and individual contributions as follows:

- The map shows no principal author network; most names appear as isolated nodes or small teams dispersed across the knowledge map.
- Some authors appear as slightly larger nodes, indicating greater scientific output than other authors, including Alshibani, Safiya Mukhtar; Shaik, Aqueeb Sohail; Tiwari, Manisha; and Foropon, Cyril.
- Collaboration is limited to small pairs or trios, such as Ragazou, Konstantina with Passas, Ioannis, or Shaik, Aqueeb Sohail with nearby names. This indicates that collaboration is largely confined to internal teams, with little broad participation.

Table 2. Ranking of the ten most-cited authors

Selected	Author	Documents	Citations ▼	Total link strength
☒	foropon, cyril	1	140	0
☒	shore, adam	1	140	0
☒	tandon, priyanka	1	140	0
☒	tiwari, manisha	1	140	0
☒	alshibani, safiya mukhtar	1	134	0
☒	gupta, bhumika	1	134	0
☒	jain, girish	1	134	0
☒	mehrotra, ankit	1	134	0
☒	shaik, aqueeb sohail	1	134	0
☒	gupta, varun	1	119	0

Source: VOSviewer output

The table confirms the knowledge-map findings for leading authors. It ranks the ten most-cited authors by citations, published papers, and total link strength:

First place, with 140 citations, is shared by four authors: Foropon, Cyril; Shore, Adam; Tandon, Priyanka; and Tiwari, Manisha.

Second place, with 134 citations, includes five authors: Alshibani, Safiya Mukhtar; Gupta, Bhumika; Jain, Girish; Mehrotra, Ankit; and Shaik, Aqueeb Sohail.

Third place, with 119 citations, is held by Gupta, Varun.

Each of the top ten authors has only one published paper, indicating that no leading author has multiple scientific works on the study topic. All names also record zero network-link strength, suggesting an absence of co-authorship among the most-cited authors within the study scope and confirming the dispersion shown in the preceding author map.

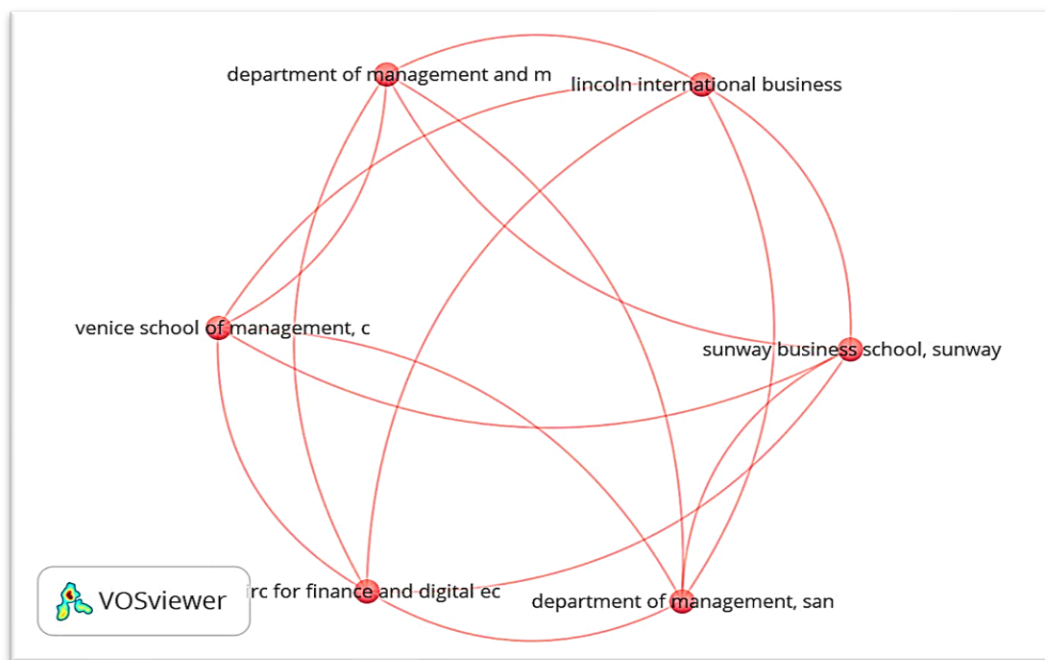
4.1.2 Research Institutions: This section provides a bibliometric analysis of the institutions that contributed to the topic. It identifies all institutions contributing research and highlights those whose work is most highly cited, reflecting their influence on the research field.

Figure 3. Map of the most-cited institutions

Source: VOSviewer output

The map shows that research was conducted across multiple institutions and countries rather than being concentrated in a small group. Several institutions have a clearer presence than others, reflecting the field's emerging nature and the diversity of institutional and geographic contexts in which the relationship between AI and business model innovation in SMEs is studied.

Figure 4. Map of the most strongly connected institutions



Source: VOSviewer output

The map shows connections among these institutions, indicating research collaboration. Node size reflects each institution's role in the collaboration network. Relationships are not limited to a single link; multiple links among institutions indicate an interconnected institutional collaboration network within this cluster.

Table 3. Ranking of the ten most strongly connected institutions

Organization	Documents	Citations	Total link strength
department of management and marketing, king fahd university of petroleum and minerals, dhahra...	1	6	5
department of management, san university, lodz, poland	1	6	5
irc for finance and digital economy, king fahd university of petroleum and minerals, dhahran, saudi ...	1	6	5
lincoln international business school, university of lincoln, lincoln, united kingdom	1	6	5
sunway business school, sunway university, selangor darul ehsan, malaysia	1	6	5
venice school of management, ca' foscari university of venice, venice, italy	1	6	5
birla institute of management technology, india	1	134	4
imt, paris, france	1	134	4
jaipuria institute of management lucknow, uttar pradesh, lucknow, india	1	134	4
jindal global business school, op jindal university, haryana, sonapat, india	1	134	4

Source: VOSviewer output

The VOSviewer statistics rank the academic and research institutions influential in the study literature in two groups according to network-link strength and citation rates:

- Group 1 (Total Link Strength = 5):

This group contains six universities and academic colleges with the highest network-link strength of 5. Each has one document and six citations. The group includes:

department of management and marketing, king fahd university of petroleum and minerals, dhahran, saudi arabia.

department of management, san university, lodz, Poland.

irc for finance and digital economy, king fahd university of petroleum and minerals, dhahran, saudi arabia.

lincoln international business school, university of lincoln, lincoln, united kingdom.

sunway business school, sunway university, selangor darul ehsan, Malaysia.

venice school of management, ca' foscari university of venice, venice, italy.

- Group 2 (Total Link Strength = 4; Citations = 134):

This group contains four institutions with network-link strength of 4 and 134 citations, each represented by one scientific paper. It includes:

birla institute of management technology, india.

canterbury christ church business school, christ church university, london, united kingdom.

christ church business school in canterbury christ church university (cccu), london, United Kingdom.

department of accounting and auditing, state higher educational institution "uzhgorod national university", ukraine.

4.1.3 Most-Contributing Countries:

This section analyzes the geographic structure of scientific output in order to observe the distribution of country contributions and the reach of collaboration networks, and to identify the leading research centers examining AI-enabled business model innovation.

Figure 5. Countries contributing to the study topic

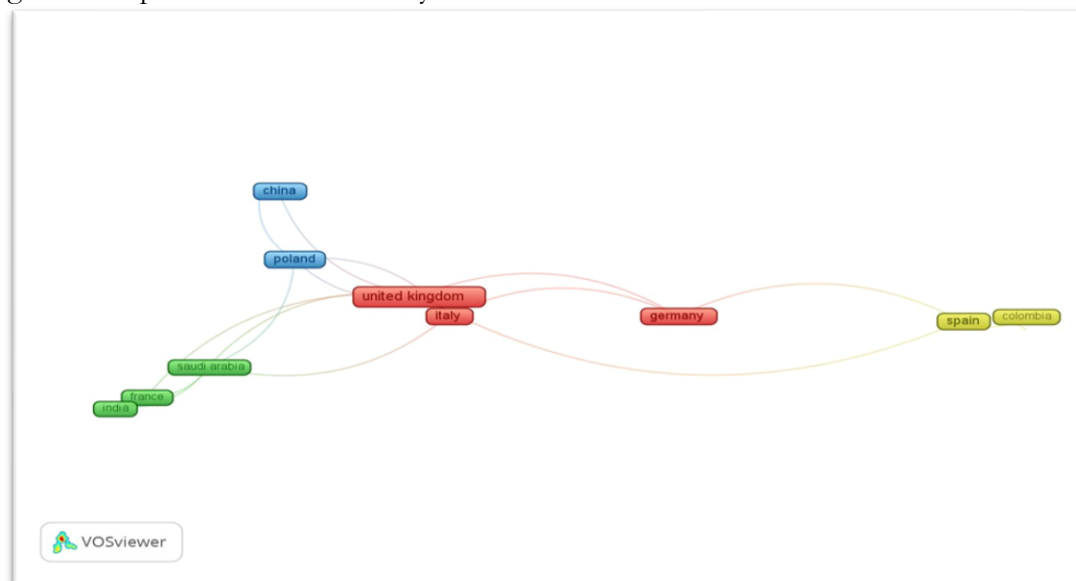
Source: VOSviewer output

The country research-partnership map reveals the geographic distribution and network connectivity of countries contributing to scientific output:

- On the left side of the map, a dense, overlapping cluster is led by the United Kingdom. Colombia and several other countries overlap around it in yellow, green, red, and blue, indicating a collaboration network linking these countries.

- At the edges of the map, far from the central cluster, isolated nodes have no connection lines to the main network. Romania appears at the far upper right and Mexico at the far lower right, reflecting independent research published in these countries without international partnerships with the central cluster.

Figure 6. Map of the central country cluster



Source: VOSviewer output

The central-cluster map shows the countries leading academic partnerships. The network is divided into four complementary color-coded clusters:

- The red cluster occupies the center of the network and contains two main linked nodes: the United Kingdom and Italy. It extends horizontally to the right to connect with Germany, making it a bridge between the right and left sides of the map.

- The green cluster extends across the lower left, linking Saudi Arabia, France, and India in sequence. This path connects directly to the European center formed by the United Kingdom and Italy.

- The blue cluster lies in the upper left and includes Poland as a link between the United Kingdom and China.

- The yellow cluster extends across the far right and includes Spain, which is connected to Colombia and linked to the network through Germany and Italy.

Table 4. Ranking of the ten most strongly connected countries

Country	Documents	Citations	Total link strength 
united kingdom	7	283	6
italy	4	23	4
saudi arabia	3	140	4
germany	4	164	3
poland	5	42	3
spain	4	141	2
china	6	30	1
india	3	138	1

Source: VOSviewer output

Table 4 presents countries by network-link strength, number of research papers, and total citations. The ranking is as follows:

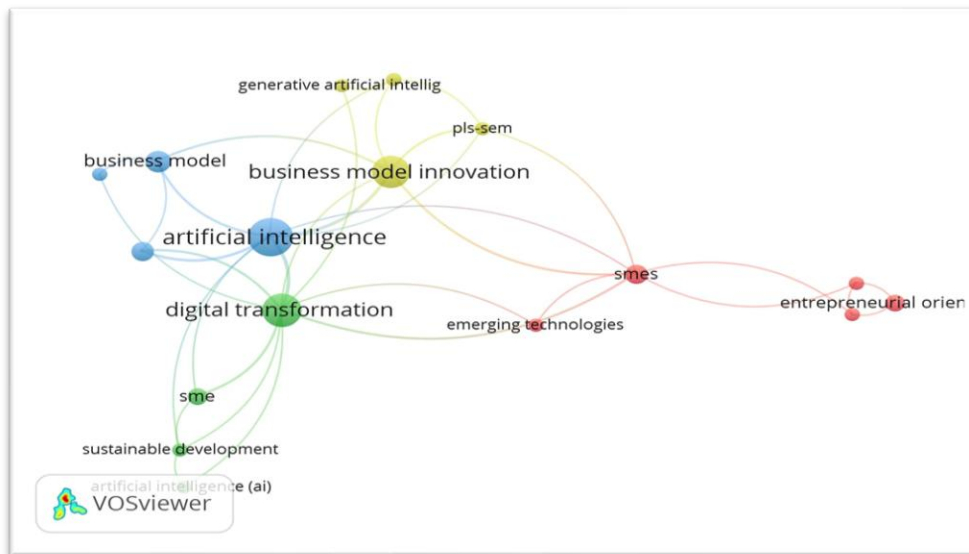
The United Kingdom leads as the principal center for studies in the field, with seven papers, 283 citations, and the highest network-link strength of 6.

The list also reveals differences between publication volume and knowledge impact. China produced six papers and Poland five, while other countries produced fewer papers but received more citations. Germany recorded 164 citations from four papers, and Spain 141 citations from four papers. They are followed by Saudi Arabia with 140 citations and network-link strength of 4, and India with 138 citations from three papers.

These figures show that academic leadership is distributed between Western countries with high citation counts and a scientific network connecting the United Kingdom, Germany, and Italy. Emerging countries—China, Saudi Arabia, and India—show growing ambition in scientific production, reinforcing the field's development as a promising research agenda.

4.2 Keyword Analysis:

Figure 6. Most frequently occurring keywords



Source: VOSviewer output

The map of the most frequently occurring keywords is divided into four principal color-coded clusters:

- Cluster 1, shown in blue, is led by artificial intelligence, its central theme, alongside business model and supporting terms. It forms the technical core linking technology adoption with traditional administrative structures.
- Cluster 2, shown in green, is led by digital transformation and is directly connected with sustainable development and environmental responsibility, indicating links between digitalization and environmental and social sustainability.
- Cluster 3, shown in yellow, centers on business model innovation linked to generative artificial intelligence and PLS-SEM. It forms a modern driver connecting business model innovation, advanced AI, and applied field measurement.
- Cluster 4, shown in red, extends across the right side of the map around SMEs, together with technology enterprises and entrepreneurial orientation. It shows the pivotal role of entrepreneurial characteristics in SMEs' responses to emerging technologies.

Table 5. Ranking of the most connected and frequently occurring terms

Source: VOSviewer output

Table 5 ranks the most connected and frequently occurring terms, as follows:

1. The three leading central themes:

- Artificial intelligence ranks first with 14 occurrences and the highest network-link strength, 18.
- Digital transformation ranks second with 11 occurrences and link strength of 16.
- Business model innovation ranks third with 10 occurrences and link strength of 12.

2. Terms used in different forms to describe the study sample:

SMEs: 4 occurrences and link strength of 9; business model: 5 occurrences and link strength of 6; small and medium enterprises: 4 occurrences and link strength of 6; and SME: 3 occurrences and link strength of 4.

3. Statistical tools and managerial terms:

PLS-SEM records two occurrences and link strength of 5.

Sustainable development and technology adoption each record two occurrences and link strength of 4.

Generative artificial intelligence and the technology–organization–environment framework each record two occurrences and link strength of 3.

Entrepreneurial orientation records occurrences and link strength of 2.

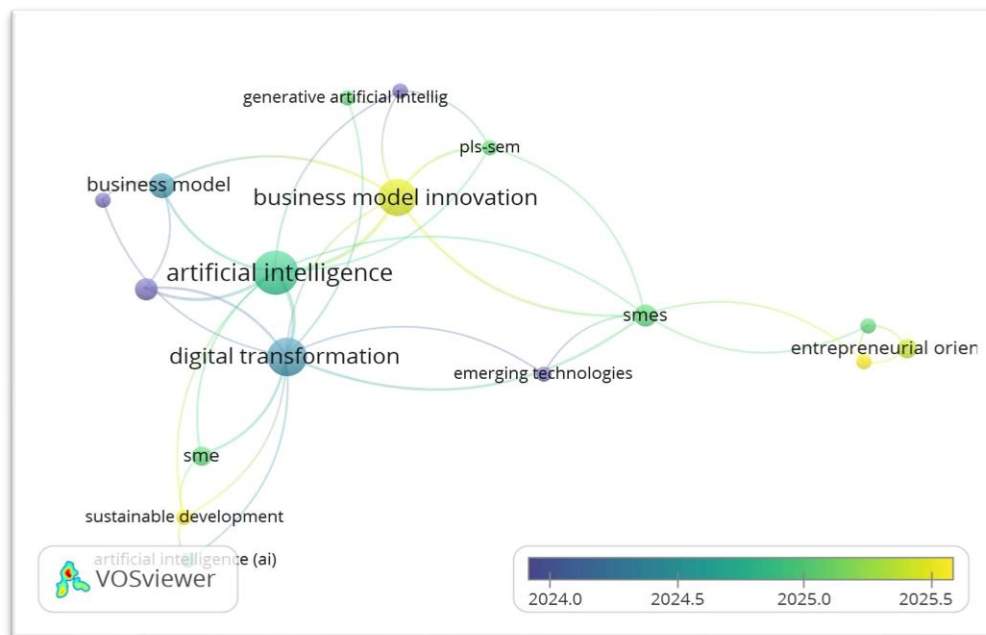
5. Emerging concepts:

Emerging technologies and machine learning each record two occurrences and link strength of 2.

These data show that the literature centers on three fundamental concepts—artificial intelligence, digital transformation, and business model innovation—within the SME environment, while testing emerging horizontal perspectives in organizational and entrepreneurial contexts.

5.1 Promising Research Directions: Tracking emerging research trends and prospects provides the basis for clarifying the future contours of the topic. Analyzing the most prominent keywords over time makes it possible to move from interpreting current reality to anticipating promising academic pathways.

Figure 6. Most frequently occurring keywords over time



Source: VOSviewer Output

The temporal distribution map shows a shift in research interests during 2024–2025, with the colour gradient reflecting gradual changes over time in the literature:

- **Foundational and traditional concepts (early 2024):** These are concentrated on the left side of the map around broad concepts such as business models and emerging technologies. They represent the initial foundations upon which academic research began framing the relationship between technology and business development.
- **Stable central themes (mid-2024 to early 2025):** These include artificial intelligence, digital transformation, and SMEs, marking a stage of research maturity focused on digital adoption mechanisms and the operational integration of AI in SMEs.
- **Recent trends (mid-2025 onward):** The current research frontier is led by advanced concepts such as business model innovation, generative artificial intelligence, sustainable development, and entrepreneurial orientation, along with applied methodological tools.

Methodologically, these results confirm a shift in the academic research agenda from studying the general adoption of emerging digital technologies to focusing on generative AI as a catalyst for business model innovation. This shift is supported by quantitative field analysis and is aimed at achieving sustainable development and strengthening entrepreneurial orientation in SME management.

5. Discussion of Results

The results reveal a structural shift in the literature on AI and business model innovation in SMEs. These findings are discussed across four dimensions.

5.1 Authors

The author network analysis demonstrates the exploratory and fragmented nature of this research topic, with no unified international collaboration network involving leading researchers such as Gupta, B. and Shaik, A. S.

5.2 Institutions

The institutional analysis reveals a model represented by a closed circular cluster among leading universities such as Lincoln, Venice, and Sunway. These results indicate that organised institutional collaboration precedes individual frameworks, with academic centres leading multi-party projects.

5.3 Countries

The principal findings demonstrate the dominance of the United Kingdom, Italy, and Germany as centres of knowledge production. More importantly, the network extends towards emerging economies, including China, India, Saudi Arabia, and Colombia. This reflects the need of SMEs in emerging markets for low-cost, adaptable AI solutions, making these countries rich field-testing environments for research originating from Western universities.

5.4 Keywords

The thematic clustering reveals a shift in research focus from technology adoption alone to structural change. Generative AI emerges as an influential variable that reshapes value chains and interacts with leaders' entrepreneurial orientation to ensure flexibility and responsiveness to sustainable development requirements.

5.5 Emerging Trends

The analysis of the 2024–2026 period reveals a methodological shift from literature-based studies towards quantitative field studies based primarily on modelling. This indicates growing research maturity and a movement beyond theoretical discussion towards the precise measurement of AI's impact on SME performance.

5.6 Answer to the Main Research Question

After addressing the sub-questions, the main research question of the present study can be answered as follows:

Scientific output from 2022 to 2026 evolved from a focus on technical adoption and digital transformation towards business model innovation through generative AI and sustainable entrepreneurial orientation. The literature shifted from theoretical and conceptual frameworks to applied quantitative measurement, testing causal relationships through partial least squares structural equation modelling (PLS-SEM). The geographical and institutional structure also became organised within an international collaboration network led by a European core centred on the United Kingdom and extending towards promising countries in Asia, the Middle East, and Latin America. Despite the evident dispersion in authors' scientific output, partnerships among international institutions emerged, characterised by strong links and citation levels that contribute to the field's maturation as an integrated global research agenda.

Conclusion

Between 2022 and 2026, scientific research underwent a qualitative shift in how business management literature approaches AI. These advanced technologies are no longer viewed merely as tools supporting operational efficiency; they have become a cornerstone for redefining strategy and innovating SME business models. This bibliometric study highlights this trajectory by providing an analytical examination of the field's knowledge structure, regional clusters, and temporal development.

The bibliometric results confirm that the field is developing rapidly. The international collaboration map demonstrates European leadership by the United Kingdom, Italy, and Germany, alongside expansion towards emerging economies in Asia, the Middle East, and Latin America. Keyword and temporal analyses show that academic attention shifted from theoretical frameworks concerning digital transformation and technical adoption, particularly in 2024, towards quantitative measurement and field

testing, with emphasis on AI's direct contributions to sustainable development and entrepreneurial orientation during 2025–2026.

Recommendations

Based on the study findings and the network and temporal analyses, the following practical and strategic recommendations are proposed:

1. Strengthen International Research Collaboration Networks

Move beyond limited clusters towards broader research partnerships involving researchers from emerging economies in South Asia, the Middle East, Africa, and Latin America so that findings can be generalised and adapted to diverse business environments.

Fund joint research projects between universities in advanced countries, such as the United Kingdom and Italy, and academic institutions in emerging markets to reduce the knowledge gap.

2. Focus on Generative AI Applications

Expand the integration of generative AI tools into operational processes and the redesign of organisational structures, moving beyond conventional digital adoption towards practices that achieve greater efficiency.

Provide targeted government support to strengthen entrepreneurial orientation among managers, together with the infrastructure and legislation required for the safe and ethical use of AI technologies.

3. Link Innovation with Sustainable Development

Direct future studies towards measuring the impact of AI-based business model innovation on sustainable development dimensions, particularly environmental efficiency and corporate social responsibility.

4. Develop Field Studies

Focus on quantitative analyses and test causal relationships between AI and business model innovation, moving from cross-sectional to longitudinal studies to track the effects of technology adoption over time.

Conduct studies examining sectoral differences in how SME business models respond to AI.

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