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MAPPING THE INTELLECTUAL LANDSCAPE OF ARTIFICIAL INTELLIGENCE IN E-COMMERCE: A BIBLIOMETRIC ANALYSIS

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Abstract
This study maps the scholarly landscape of Artificial Intelligence (AI) research within the e-commerce domain from 2000 to 2023, identifying key intellectual trends, leading contributors, and prospective research directions. Data were retrieved from the Web of Science (WOS) database, yielding 1,488 eligible articles drawn from 281 distinct publication outlets. Science mapping was conducted through bibliometric indicators encompassing citation counts, co-citation relationships, and bibliographic coupling, analysed via the R-package Biblio-shiny. Results reveal a pronounced upward trajectory in publication volume and collaborative authorship, while also foregrounding the dominant themes, high-impact AI applications, and emerging research frontiers within online retail. The study offers a structured reference point for scholars and practitioners seeking to orient AI development toward improving consumer trust and satisfaction in digital commerce.

1. INTRODUCTION
The emergence of Artificial Intelligence (AI) has fundamentally altered the nature of digital commerce [1]. Unlike human cognition, AI operates through rapid computation and data-driven inference, enabling systems to interpret inputs and translate them into goal-oriented decisions [3]. Broadly conceived, AI encompasses 'computational agents that act intelligently' [4], systems engineered to replicate human cognitive strengths while transcending human limitations in speed and precision [5]. This is accomplished through a suite of computational architectures designed to emulate biological intelligence processes [6].

Businesses are increasingly adopting AI-enabled, data-intensive technologies in response to heightened consumer expectations, accelerating competitive cycles, and mounting profitability pressures. This technological shift is redefining how organisations build and sustain relationships with their customers [7]. AI capabilities allow companies to decode consumer preferences and behavioural patterns with greater precision, ultimately elevating the quality of the shopping experience [8]. Both businesses and consumers

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therefore stand to benefit substantially from the strategic deployment of AI at key points of the consumer journey.

Within the retail sector, AI is applied across a wide range of functions including conversational agents (chatbots), automated content generation, and consumer analytics [9]. Prior research indicates that AI enables retailers to target premium customer segments, those accounting for disproportionate revenue shares through behavioural and contextual personalisation [10]. Industry forecasts projected retail AI investment to reach USD 7.3 billion by 2022, up from USD 2 billion in 2018 [11], with global retail AI spending anticipated to climb to USD 12 billion by 2023 from USD 3.6 billion in 2019 [12]. More than 325,000 retailers were projected to deploy AI systems within the same period [13].

By leveraging historical purchase data and individual preferences, AI enables the delivery of personalised product recommendations across sectors including cosmetics and fashion [14]. These capabilities carry transformative implications for business efficiency, customer relations, cost reduction, and operational flexibility [15]. Nevertheless, AI-mediated customer experiences may also introduce friction, including reduced human interaction and additional cognitive effort [16]. A more thorough investigation of these trade-offs remains warranted.

Despite the expanding body of literature on AI in retail and online commerce, no bibliometric synthesis of this domain existed over the past three decades prior to the present study. Bibliometric analysis offers a systematic, quantitative lens for examining the formal dimensions of knowledge fields [17, 18]. As noted by Albort-Morant and Ribeiro-Soriano (2016), such analyses support the discovery, organisation, and evaluation of large scholarly corpora while enabling retrospective and prospective interpretation of scientific trends. This study addresses that gap by offering a comprehensive bibliometric overview of AI in online retail from 2000 to 2023, with a view to informing future research trajectories and evaluating the intellectual evolution of this field.

The study employs science mapping, a systematic process for domain analysis and visual representation, alongside bibliographic coupling, drawing on 1,488 records from 281 sources indexed in the Web of Science (WoS), a globally recognised benchmark database [19]. Analytical outputs produced through the Bibliometric R-package and Biblio-shiny interface include conceptual structure maps [20], Sankey diagrams [21], trend topic analyses [22], word growth dynamics [23], word tree maps [24], and co-citation networks [25]. This multi-method approach allows for a richer understanding of the field's scope, temporal evolution, and emerging frontiers [26].

The study addresses the following research questions:

- What are the global patterns in publication volume and citation accumulation for AI in online shopping research?
- What collaborative networks and structural linkages exist across countries and authorship configurations?
- Who are the dominant journals, leading authors, and most productive nations in this domain?
- What novel applications of AI are reshaping the online purchasing experience?
- What thematic foci have researchers emphasised at different stages of the field's development?

The paper is structured as follows: Section 2 presents the methodology, data sources, and research design. Section 3 reports the bibliometric findings with graphical outputs. Section 4 discusses implications, limitations, and future research directions. Section 5 concludes the study.

2. METHODOLOGY

Data Organisation and Sampling

The Web of Science (WOS) was selected as the data repository for this study due to its comprehensive coverage and scholarly credibility

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[27]. WOS indexes more than 90 million academic records across 22,012 journals (including open-access titles), over 304,000 conference proceedings, and more than 143,000 books [28, 29]. A single-database approach was adopted deliberately, as integrating records from multiple databases introduces synchronisation challenges that can compromise the robustness of bibliometric outputs [30]. This practice aligns with established standards in the field [31].

A PRISMA flow diagram (Fig. 1) was employed to document the sequential screening of records through identification, eligibility assessment, and final inclusion stages. The initial search retrieved 1,823 documents pertaining to AI in online shopping. After removing records predating 2000, non-English articles, and duplicates, 1,488 documents meeting the inclusion criteria were retained. The dataset spans twenty-three years (2000–2023), a timeframe selected because AI-in-online-shopping discourse gained meaningful traction from 2009 onwards, with the 2000 baseline providing sufficient historical perspective.

PRISMA Flow Diagram

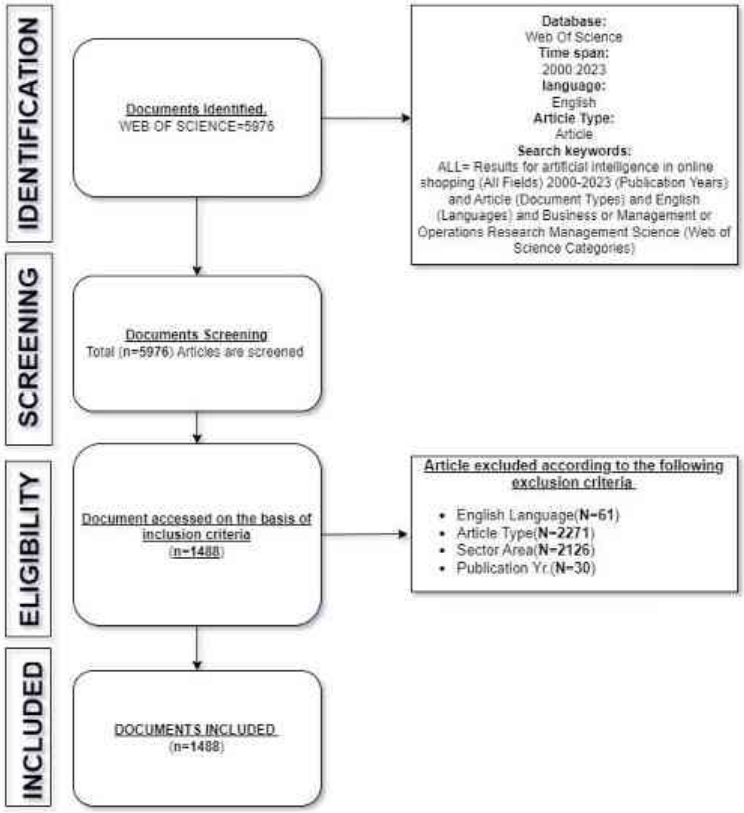


Fig. 1. PRISMA flow diagram illustrating the article selection process.

Bibliometric Research Design

Bibliometric analysis has become an indispensable instrument for evaluating the scientific outputs of academic entities — articles, authors, keywords, journals, institutions, and countries — and for tracing how the intellectual, social, and conceptual fabric of a research field evolves over time [30]. The central aim of this study is to systematically identify, appraise, and interpret the literature on AI in online commerce [32]. Scholars have increasingly used bibliometric approaches to

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generate concise, quantitative representations of disciplinary landscapes [33].

The Biblio-shiny interface, a web-based R-Studio environment designed for bibliometric research [34, 35], was used to conduct the following analyses: word cloud mapping [36], co-citation network analysis [37], thematic mapping [38], factorial (Multiple Correspondence) analysis [39], and three-field plot visualisation [40]. Table 1 below summarises the analytical units and their sub-components.

Table 1. Analysis units and sub-components.

Analysis Unit	Sub-Components
Dataset	Primary data summary; Annual scientific production; Average citations per year; Three-field plot
Sources	Most relevant journals; Citations per publication year
Authors	Leading authors (fractionated and full); Author contributions; Country production & citation analysis; Corresponding author countries
Documents	Most globally cited articles; Subject area and institutional affiliation; Keyword tree map
Conceptual Structure	Thematic map; Factorial analysis
Intellectual Structure	Co-citation network

3. DATA ANALYSIS AND KEY FINDINGS

Primary Data Overview

Fig. 2 presents a summary of the dataset spanning 2000 to 2023, comprising 281 source journals, 1,488 documents, 3,138 authors, 4,258 author keywords, and 56,078 cited references. Key bibliometric ratios include an annual growth rate of 19.42%, an international co-authorship rate of 27.15%, an average of 2.8 co-authors per document, and an average of 36.38 citations per document.



Fig. 2. Summary of initial dataset characteristics.

Annual Scientific Output

Bibliometric tracking of annual publication trends reveals a consistent and pronounced growth in scholarly output within this domain [41]. Table 2 presents the year-by-year article count, showing a modest beginning of 4 articles in 2000, expanding to 27 in 2009, and reaching 237 by 2023. Table 3 presents a decade-wise aggregation, demonstrating a substantial leap from 111 articles in the first decade to 647 in the second, with the partial third decade (2020–2023) already accumulating 730

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articles — underscoring the accelerating pace of research in this area.

Table 2. Annual scientific production.

Year	Articles	Year	Articles	Year	Articles
2000	4	2009	27	2018	101
2001	6	2010	34	2019	99
2002	6	2011	56	2020	115
2003	13	2012	36	2021	179
2004	7	2013	34	2022	199
2005	11	2014	38	2023	237
2006	14	2015	72		
2007	13	2016	87		
2008	10	2017	90		

Table 3. Decade-wise publication trend.

Decade	Articles	Articles per Year	Change in Trend
2000–2009	111	11.1	—
2010–2019	647	64.7	5.82×
2020–2023	730	182.5	1.12×

Average Citations per Year

Table 4 shows annual citation averages. The maximum mean total citations per article (604) was recorded in 2000, with a per-year citation average of 24.16 in that year. As expected, older publications accumulate more citations over time, while more recent articles show lower per-year averages due to limited citation windows.

Table 4. Average citations per year (N = number of publications, TC = Total Citations).

Year	Mean TC/Article	N	Mean TC/Year	Citable Years
2000	604	4	24.16	25
2001	575	6	23.96	24
2002	434.83	6	18.91	23
2003	211.77	13	9.63	22
2004	169	7	8.05	21
2005	92.36	11	4.62	20
2006	154.21	14	8.12	19
2007	124.62	13	6.92	18
2008	93.60	10	5.51	17

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2009	82.33	27	5.15	16
2010	58.94	34	3.93	15
2011	62.07	56	4.43	14
2012	77.64	36	5.97	13
2013	60.29	34	5.02	12
2014	53.39	38	4.85	11
2015	38.47	72	3.85	10
2016	36.44	87	4.05	9
2017	36.34	90	4.54	8
2018	28.96	101	4.14	7
2019	24.60	99	4.10	6
2020	20.37	115	4.07	5
2021	14.48	179	3.62	4
2022	7.12	199	2.37	3
2023	2.11	237	1.05	2

Three-Fields Plot

The Sankey diagram, originally developed by Captain Matthew Sankey in 1898 [42], visualises the flow of data across categories and has since become a prominent tool in economics and business research for unpacking multi-step processes [43]. Fig. 3 presents a three-fields plot linking sources (left), authors (centre), and keywords (right), with edge thickness proportional to frequency. Keywords such as 'e-commerce' and 'online shopping' generate the widest connections, indicating their cross-disciplinary prevalence. Journals including Internet Research and the Asia Pacific Journal of Marketing and Logistics contribute the most diverse keyword usage, while Wang X and Benbasat I emerge as the most connected authors in this network.

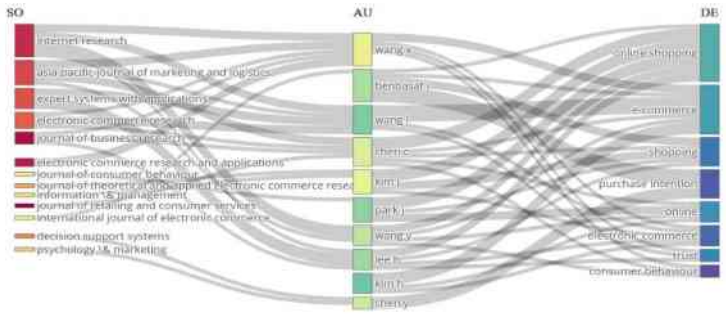


Fig. 3. Three-field plot: Sources — Authors — Keywords

Most Relevant Sources

Table 5 identifies the top ten journals by publication volume. The Journal of Retailing and Consumer Services leads with 84 articles, followed by the Journal of Business Research (53 articles) and Electronic Commerce Research and Applications (50 articles).

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Table 5. Most relevant publication sources.

Journal	Articles
Journal of Retailing and Consumer Services	84
Journal of Business Research	53
Electronic Commerce Research and Applications	50
Internet Research	43
International Journal of Retail & Distribution Management	36
Asia Pacific Journal of Marketing and Logistics	33
Expert Systems with Applications	32
Electronic Commerce Research	31
Journal of Internet Commerce	31
Pacific Business Review International	31

Annual Publications per Source

Fig. 4 presents a line graph ranking journals by cumulative publications and citations. The Journal of Retailing and Consumer Services and the Journal of Business Research consistently account for the highest publication volumes over the study period.

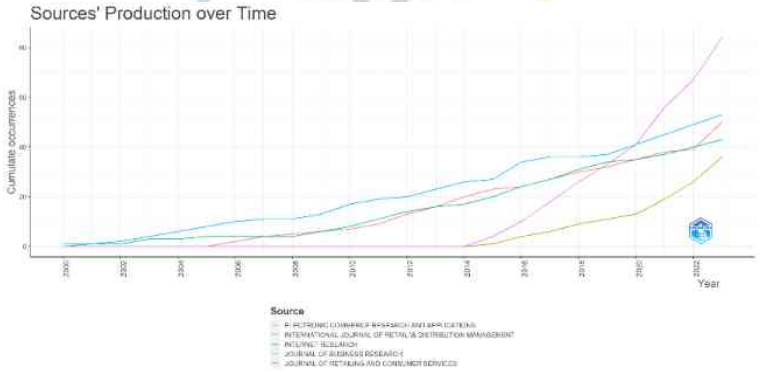


Fig. 4. Line graph of journal rankings by publication and citation volume.

Most Prolific Authors

Figs. 4a and 4b depict authorial output by total article count and fractionalised contribution, respectively. Wang X, affiliated with the Beijing Institute of Technology (China), ranks first with 19 articles and a fractionalised score of 5.2, with research concentrating on AI applications in the Chinese e-commerce context. Jee Yeon Kim, from National Sun Yat-Sen University, ranks second with 15 articles (5.9 fractionalised), covering text mining, big data, omnichannel retail, and digital marketing.

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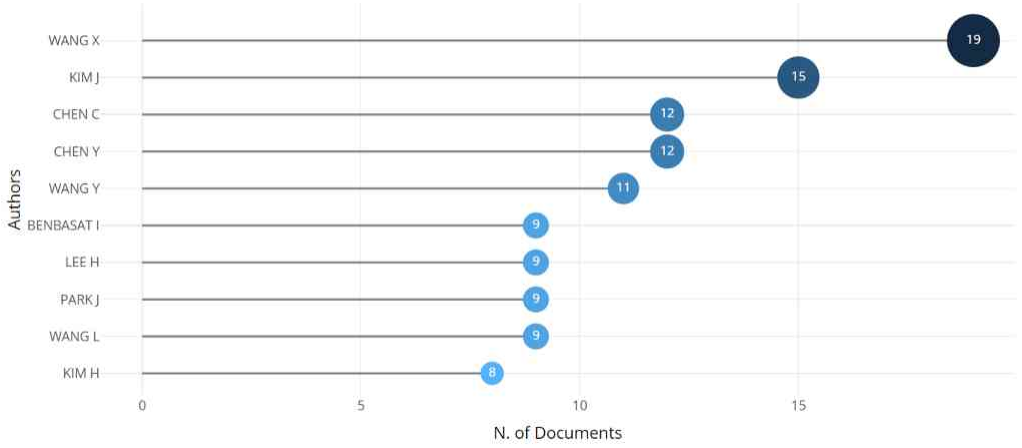


Fig. 4a. Leading authors by fractionalised publication count.

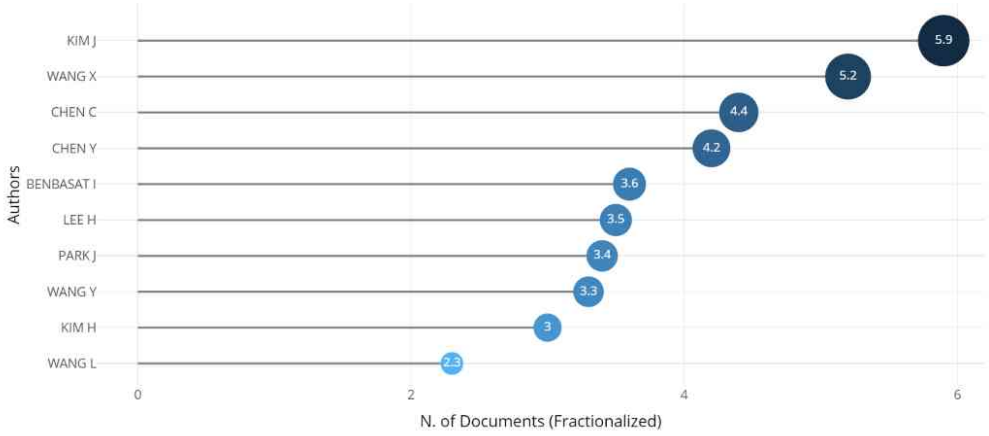


Fig. 4b. Leading authors by total article output.

Author Contributions to Key Issues in AI and Online Shopping

Table 6 summarises the thematic contributions of leading authors based on their most impactful publications.

Table 6. Author contributions to AI in online shopping research.

Author	Publication Title	Core Issue Addressed
Wang X	Sustaining customer loyalty of fresh food e-tailers: an empirical study in China	Examines how rapidly growing fresh food e-commerce platforms can retain customers in a highly competitive landscape.
Kim J	Understanding digital consumer wellbeing in Asia: the moderating roles of digital natives and privacy concerns	Investigates how digital technologies enable efficient connectivity while simultaneously generating risks of shallow social engagement, psychological harm, and privacy vulnerabilities.

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Chen C	Technology roadmap of AI applications in the retail industry	Documents how retailers are adopting AI to address unmet consumer expectations and introduce value-added shopping experiences.
Wang Y	Consumer search and purchase: an empirical investigation of retargeting based on online behaviours	Explores how marketers can leverage online search behaviour data to retarget consumers who browsed but did not complete a purchase.
Park J	Do parasocial relationships and communication quality with AI chatbots shape middle-aged women's continuance intentions?	Analyses the growing role of AI-powered assistants (e.g., Siri, Alexa, Bixby) in daily consumer life and their accelerated adoption in service contexts following the global pandemic.

Country-Level Scientific Production and Citation Analysis

Table 7 and Fig. 5 present country rankings by both publication volume and total citation count. China leads in total document output (983), followed by the United States (929) and India (500). However, the United States ranks first in total citations (21,107) despite placing second in volume, while China ranks second in citations (9,340). This divergence suggests that research from the United States and European countries tends to command greater scholarly influence relative to volume, indicating differences in research quality and international reach [44, 45].

Table 7. Country-level scientific production and citation rankings.

Country	Documents	Rank (Output)	Total Citations	Rank (Citations)	Avg. Citations/Article
USA	929	2	21,107	1	77.30
China	983	1	9,340	2	31.40
United Kingdom	171	4	2,960	3	67.30
Korea	168	5	2,483	4	45.10
India	500	3	2,335	5	13.70
Germany	134	6	1,955	6	45.50
Canada	103	8	1,733	7	59.80
Australia	120	7	1,044	8	25.50
Spain	102	9	1,038	9	28.80
Belgium	45	10	888	10	59.20

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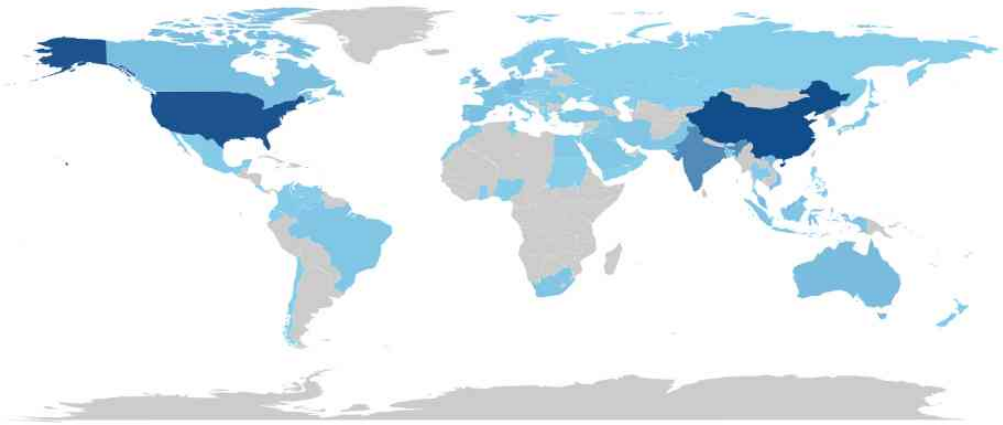


Fig. 5. World map of country-level scientific production.

Corresponding Author Countries: SCP and MCP Analysis

Table 8 disaggregates publications into single-country publications (SCP), representing independent national research efforts, and multiple-country publications (MCP), reflecting international collaboration [44]. Countries with higher MCP ratios — such as Australia (0.463), the United Kingdom (0.432), and Malaysia (0.405) — demonstrate stronger international collaboration patterns. Notably, the highest-volume producers, China and the United States, exhibit comparatively low MCP ratios, suggesting that volume and collaborative reach do not necessarily correlate [45]. Fig. 6 provides a comparative bar chart of SCP versus MCP counts.

Table 8. Corresponding author country analysis (SCP vs MCP).

Country	Articles	SCP	MCP	Freq.	MCP Ratio
China	297	215	82	0.200	0.276
USA	273	207	66	0.183	0.242
India	171	160	11	0.115	0.064
Korea	55	37	18	0.037	0.327
United Kingdom	44	25	19	0.030	0.432
Germany	43	33	10	0.029	0.233
Australia	41	22	19	0.028	0.463
Malaysia	37	22	15	0.025	0.405
Spain	36	31	5	0.024	0.139
Vietnam	31	26	5	0.021	0.161

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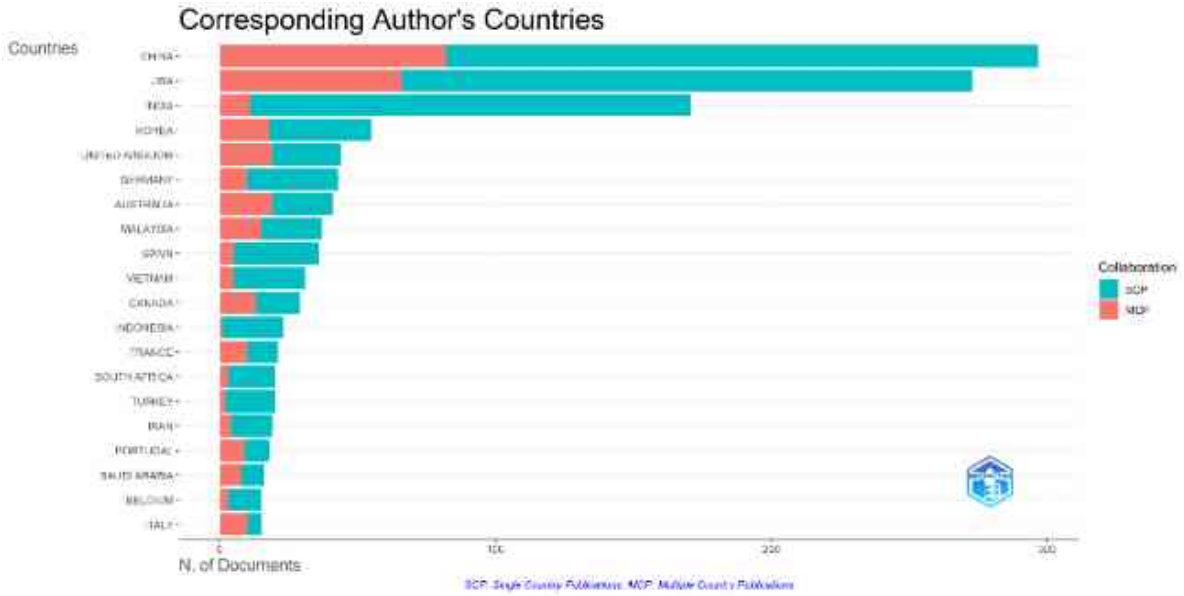


Fig. 6. Bar chart comparing single-country (SCP) and multiple-country (MCP) publications.

Most Globally Cited Documents

Table 9 lists the ten most cited articles in the field. Childers, Carr, Peck, and Carson (2001) holds the top position with 1,632 total citations, followed closely by Novak, Hoffman, and Yung (2000) with 1,578 citations.

Table 9. Most globally cited articles.

Authors & Year	DOI	Total Citations	TC per Year	Normalised TC
Childers et al., 2001	10.1016/S0022-4359(01)00056-2	1,632	68.00	2.84
Novak et al., 2000	10.1287/mksc.19.1.22.15184	1,578	63.12	2.61
Wolfinbarger & Gilly, 2003	10.1016/S0022-4359(03)00034-4	1,142	51.91	5.39
McKinney et al., 2002	10.1287/isre.13.3.296.76	1,040	45.22	2.39
Haubl & Trifts, 2000	10.1287/mksc.19.1.4.15178	808	32.32	1.34
Eroglu et al., 2001	10.1016/S0148-2963(99)00087-9	681	28.38	1.18
Devaraj et al., 2002	10.1287/isre.13.3.316.77	672	29.22	1.55
Forsythe & Shi, 2003	10.1016/S0148-2963(01)00273-9	623	28.32	2.94
Miyazaki & Fernandez, 2001	10.1111/j.1745-6606.2001tb00101.x	572	23.83	0.99
Wolfinbarger & Gilly, 2001	10.2307/41166074	559	23.29	0.97

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Document Distribution by Subject Area and Institution

Subject area classification derived from WOS data shows that 1,104 articles fall within business-related disciplines and 451 within management-related fields, confirming that AI in e-commerce research is concentrated primarily in these two domains. Institutionally, City University of Hong Kong leads with 24 publications, followed by Fudan University with 9. Figs. 7 and 8 present tree maps of subject area and institutional distributions, respectively.

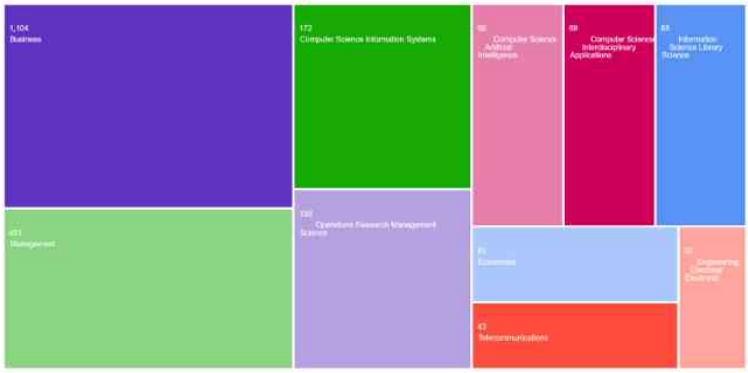


Fig. 7. Tree map of publications by subject area.



Fig. 8. Tree map of publications by institutional affiliation.

Keyword Tree Map

A tree map provides a space-efficient representation of hierarchical data by encoding information through nested rectangles scaled and coloured by relative frequency [46]. Fig. 9 displays the keyword tree map, offering a visual summary of the most prevalent conceptual categories within the corpus.

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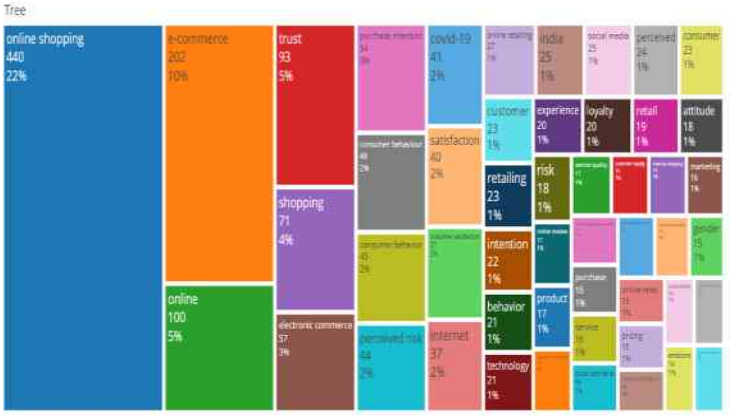


Fig. 9. Keyword tree map illustrating conceptual structure.

Thematic Map

The thematic map (Fig. 10) classifies research themes into four quadrants based on centrality (relevance to the field) and density (internal development) [44]:

Motor Themes (Q1 — High Centrality, High Density): These represent the established core of the field. Keywords such as 'online shopping', 'trust', 'e-commerce', and 'purchase intention' cluster here, indicating they are both well-developed and central to AI-related retail research.

Niche Themes (Q2 — Low Centrality, High Density): These are specialised, well-developed but peripheral themes. 'Perceived technology' and 'retailing' occupy this quadrant, indicating high internal development without strong linkage to other research areas.

Emerging or Declining Themes (Q3 — Low Centrality, Low Density): 'Consumer behaviour' and 'online retailing' appear here. Whether these are nascent or fading themes requires qualitative interpretation.

Basic and Transversal Themes (Q4 — High Centrality, Low Density): 'Trust', 'purchase intention', and 'electronic commerce' occupy this quadrant, signalling their foundational status and potential to emerge as dominant themes as publication volume grows.

The analysis suggests a need to develop stronger bridges between niche themes (e.g., 'perceived technology', 'online retailing') and the motor themes. Strengthening these connections has the potential to amplify AI's role in shaping consumer trust and purchasing behaviour in digital environments.

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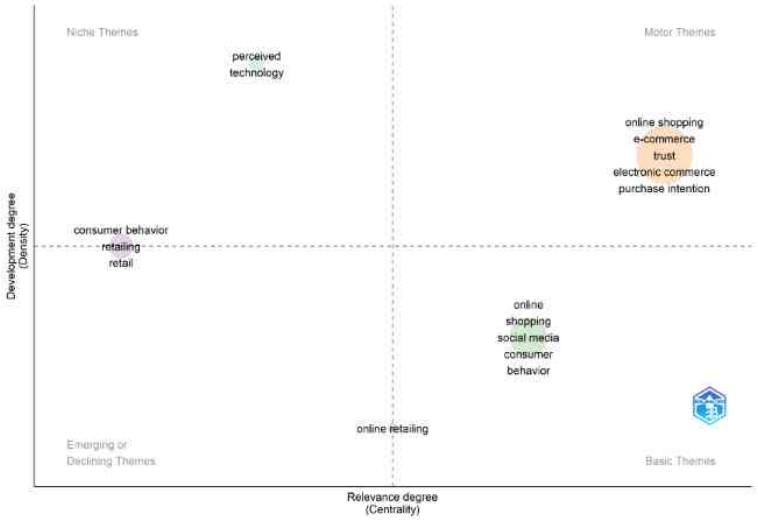


Fig. 10. Thematic map of AI in online shopping research.

Factorial Analysis

Multiple Correspondence Analysis (MCA) is a dimensionality reduction technique applied to categorical data, particularly suited to social science and marketing research contexts [47, 48]. Fig. 11 presents a conceptual structural map generated through MCA, comprising two thematic clusters. The red cluster encompasses concepts related to digital consumer behaviour — including 'satisfaction', 'purchase intention', 'trust', 'electronic commerce', 'adoption', and 'perceived technology' — suggesting that these constructs co-occur frequently across studies. The blue cluster groups terms such as 'loyalty', 'consumer perceptions', 'consumer satisfaction', and 'consequences', pointing to a distinct research strand concerned with post-adoption outcomes and attitudinal consequences of AI in retail.

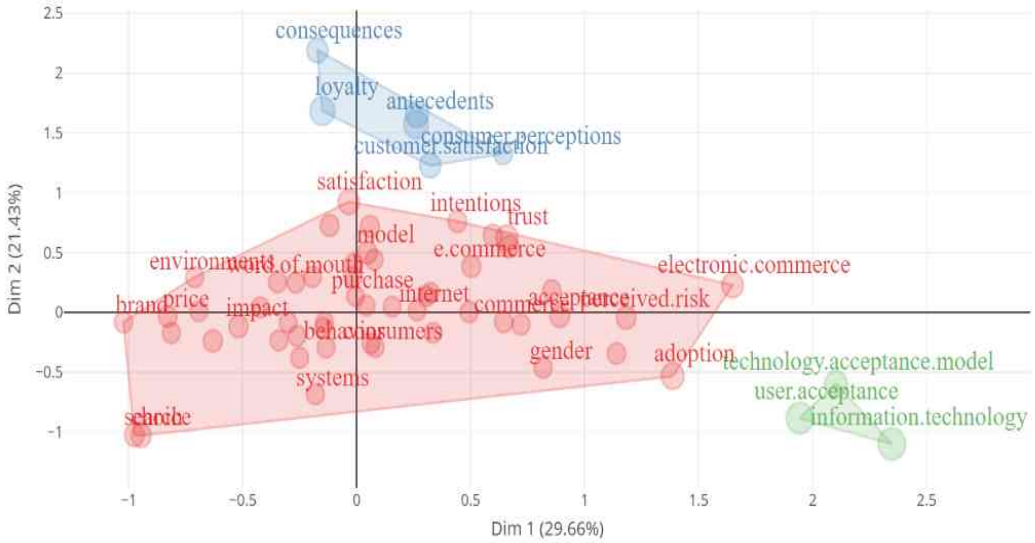


Fig. 11. MCA-based conceptual structure map (factorial analysis).

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Co-citation Network Analysis

Co-citation analysis is a bibliometric method used to map intellectual structure by identifying patterns in which two or more sources are cited together within a third document [49, 50]. These co-citation relationships reveal thematic clusters and foundational influences that shape a field's intellectual trajectory [51].

Fig. 12 reveals three primary clusters. The blue cluster centres on consumer loyalty, satisfaction, perception, and the downstream consequences of online shopping. The green cluster is anchored by the Technology Acceptance Model (TAM) and information technology adoption. The red cluster focuses on e-commerce, internet behaviour, perceived technology, and consumer attitudes. While the blue and red clusters share overlapping research concerns, the green cluster engages with both through citation, demonstrating a broader integrative perspective on AI in digital retail.

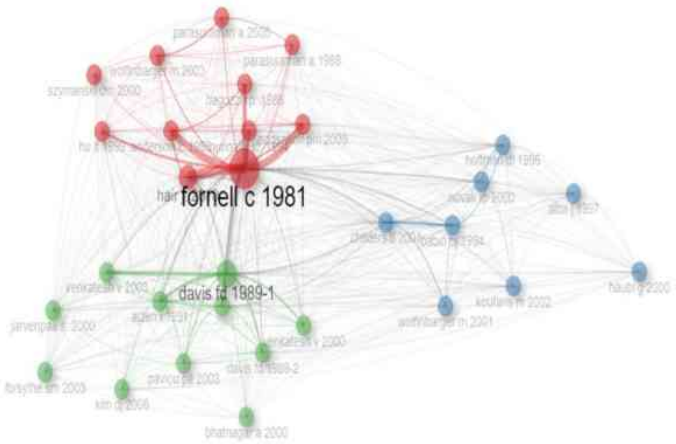


Fig. 12. Co-citation network showing intellectual clusters in AI and e-commerce research.

4. DISCUSSION

The growing maturity of AI technologies makes it increasingly important to rigorously assess their contribution to the efficiency and competitiveness of e-commerce [52]. This study has employed bibliometric analysis to identify the principal contributors, dominant nations, emerging trends, and influential collaborations within the AI-in-online-shopping literature.

The findings reveal that early scholarship in this domain concentrated primarily on the internal operational and external market dimensions of online businesses. More recently, AI has assumed a strategic role within digital retail organisations, with its capacity to leverage data analytics and digital tools enabling the identification of specific areas for service improvement. Several macro-level forces are expected to shape this field's future: ongoing transformation of the global online business ecosystem, the rising prominence of entrepreneurial and innovative orientations in digital commerce, and technology's deepening influence on buying behaviour. The results underscore the value of international research collaboration for maximising societal impact [53] and highlight the particular salience of AI-enabled online commerce within China's consumer economy.

From a practical standpoint, the study offers scholars, practitioners, and policymakers structured insight into the global coalitions, leading journals, key contributors, and countries driving this field. It demonstrates how AI is functioning as a critical enabler in e-commerce by facilitating the analysis of large-scale data to surface areas of concern. Consistent with Table 10, China and the United States dominate in publication output, while the United States and United Kingdom lead in citation-based influence,

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suggesting that research quality and international reach are unevenly distributed.

Emerging AI innovations in online retail include several noteworthy developments. AI-powered fraud detection systems strengthen transaction security and build consumer trust [54]. Intelligent chatbots and virtual assistants enable real-time customer support, including query resolution, order tracking, and personalised recommendations [55]. AI-driven visual search tools allow consumers to find products using image inputs rather than text [56]. Voice-activated systems such as Amazon Alexa and Google Assistant facilitate purchase completion through natural language commands [57]. AI-based demand forecasting and inventory optimisation algorithms allow retailers to automate restocking and reduce overstock or stockout events [58]. Finally, dynamic pricing systems powered by AI algorithms continuously analyse competitor behaviour, market conditions, and consumer response patterns to calibrate pricing in real time, maximising both revenue and competitive positioning [59].

5. CONCLUSION

E-commerce has emerged as a dominant sales channel for consumer goods globally, particularly in China, where online retail plays a central role in the consumption economy. Digital platforms provide consumers with convenient access to an extensive range of goods and services — from electronics and food to apparel and household services — reshaping how markets operate.

The digital economy has become a strategic instrument for nations and regions seeking to redefine their competitive positioning. This transformation has renewed traditional industries while simultaneously catalysing the emergence of new digital-native enterprises. Online retail has had measurable effects on conventional retail markets, including reduced distribution costs, enhanced product variety, accelerated commodity circulation, greater market efficiency, and improved logistics infrastructure.

Nevertheless, digital retail is not without its challenges. The propensity for impulsive purchasing that online environments encourage can lead to unnecessary consumption and waste. Variability in merchant quality creates ongoing challenges for ensuring commercial integrity. Weaknesses in digital information security expose consumers to risks of data compromise. Addressing these concerns requires strengthening regulatory frameworks governing e-commerce, intensifying oversight of online market conduct, and improving consumer literacy in evaluating digital shopping environments.

Looking ahead, the continued proliferation of 5G and related technologies will progressively optimise the market environment, improve platform ecosystems, and elevate product quality and brand credibility. The further expansion of social e-commerce presents particularly significant opportunities for China's online retail sector. AI will remain central to these developments, shaping both the infrastructure and the experience of digital commerce for the foreseeable future.

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