MIX: Jurnal Ilmiah Manajemen

Management Scientific Journal
ISSN (Online): 2460-5328, ISSN (Print): 2088-1231
https://publikasi.mercubuana.ac.id/index.php/jurnal_Mix

A Mixed Analytical Approach to Synthesizing Evidence in Digital Transformation Research on Traditional Markets

Safarudin Hisyam Tualeka[1*)]; M. Rizki Pratama[2)]; Naufal Farras Alfattahu[3)]; Reika Happy Pudjiastuti[4)]; Nesya Nandini Maulida Widitya[5)]

[1)] safarudinhisyam@ub.ac.id, Universitas Brawijaya, Indonesia
[2)] pratamarizkim@ub.ac.id, Universitas Brawijaya, Indonesia
[3)] farrasnaufal31@gmail.com, Universitas Brawijaya, Indonesia
[4)] reikahappy.s@ub.ac.id, Universitas Brawijaya, Indonesia
[5)] nesyanandadinimw@gmail.com, Universitas Brawijaya, Indonesia
**) Corresponding Author*

ABSTRACT

Objectives*: This study is to examine how traditional markets globally are navigating digital transformation and identify conceptual trajectories relevant for Indonesia's context.*
Methodology*: The study employs an integrated mixed analytical approach combining bibliometric analysis with probabilistic topic modelling. Bibliometric techniques are used to map publication structures, intellectual relationships, and thematic evolution, while Latent Dirichlet Allocation (LDA), followed by interpretive topic labelling, is used to identify latent semantic patterns within the corpus. A total of 84 Scopus-indexed publications were analyzed using Bibliometrix and topic modelling in Python to map intellectual structures, thematic evolution, and knowledge clusters within the literature.*
Finding*: The findings indicate an increasing presence of themes associated with artificial intelligence, governance, sustainability, and consumer analytics within the analysed literature. Rather than demonstrating a uniform transition toward intelligent market systems, these patterns suggest an emerging diversification of research beyond basic technology adoption toward broader institutional, behavioural, and data-driven concerns. The analysis also shows that digital transformation in traditional markets remains constrained by gaps in digital literacy, uneven infrastructure, and the need for inclusive policy frameworks.*
Conclusion*: The study concludes that successful modernization requires aligning technological innovation with social inclusion, particularly by strengthening digital literacy, expanding equitable infrastructure, and embedding ethical AI governance. These insights provide a foundation for building sustainable and socially resilient pathways for the future of traditional market digitalization.*

Keywords*: Bibliometric; Digital Transformation; Topic Modelling; Traditional Market.*

Submitted: 16-11-2025	Revised: 29-09-2026	Accepted:19-10-2026

Article Doi:
http://dx.doi.org/10.22441/jurnal_mix.2026.v16i3.013

p-ISSN: 2088-1231
e-ISSN: 2460-5328

INTRODUCTION

The rapid advancement of digital technologies has substantially reshaped contemporary markets, altering how firms, consumers, and market institutions interact. Worldwide e-commerce retail sales were projected to reach approximately USD 6.4 trillion by 2024, accounting for more than 20 percent of total retail sales (Feger, 2024). This expansion illustrates the growing importance of digital channels in commercial activity and places increasing pressure on conventional market systems to adapt. In Indonesia, traditional markets remain important economic and social spaces for local communities and small-scale vendors, yet many operate under conditions that differ substantially from modern retail environments in terms of infrastructure, technological capability, business practices, and institutional support. The urgency of digital adaptation became particularly visible during the COVID-19 pandemic, which accelerated the adoption of digital channels while simultaneously exposing the vulnerability of small vendors and traditional market structures to economic disruption and exclusion (UNCTAD, 2021).

Conceptually, this study distinguishes digitisation, digitalisation, and digital transformation rather than treating these terms as interchangeable. Digitisation refers to the conversion of analogue information, transactions, or activities into digital form, whereas digitalisation concerns the use of digital technologies to modify or improve particular processes and practices. Digital transformation represents a broader level of change in which digital technologies contribute to substantial organisational, institutional, market, or value-creation reconfiguration (Vial, 2019; Verhoef et al., 2021). Accordingly, the adoption of an individual technology, such as a QR-based payment system, is treated in this study as evidence of digital adoption or digitalisation rather than, by itself, as evidence of comprehensive digital transformation. Such adoption may contribute to broader transformation when it is accompanied by changes in organisational capabilities, governance arrangements, business practices, stakeholder relationships, and mechanisms of value creation. This distinction is particularly important in traditional market settings, where the adoption of specific digital tools may occur incrementally without necessarily producing systemic transformation.

Theoretical perspectives on digital transformation further emphasise that organisations must continuously adapt their structures, capabilities, and processes as digital technologies reshape competitive and institutional environments (Loonam, Eaves, Kumar, & Parry, 2018). In Indonesia, several policy initiatives illustrate the increasing emphasis on digitalisation within traditional market environments. The Government of Indonesia, through the Regulation of the Minister of Trade No. 21 of 2021 on the Development and Management of Trade Facilities, has encouraged the modernisation of trade facilities and the adoption of digital payment mechanisms (Kementerian Perdagangan Republik Indonesia, 2021). Similarly, Bank Indonesia's Quick Response Code Indonesian Standard (QRIS) programme has expanded digital payment acceptance among small traders and traditional markets nationwide (Bank Indonesia, n.d., 2025). More recently, the Ministry of Cooperatives and SMEs launched the SAPA UMKM super-app, which incorporates artificial intelligence to support local vendors, including traditional market traders, in marketing and selling their products digitally (Liputan6, 2025). These initiatives demonstrate an expanding ecosystem of digital adoption; however, they should not automatically be interpreted as evidence that traditional markets have already undergone comprehensive digital transformation. Rather, they represent technological and institutional enablers whose transformative effects depend on broader changes in market capabilities, governance, infrastructure, and participation.

p-ISSN: 2088-1231
e-ISSN: 2460-5328

Empirical evidence likewise suggests that digital adoption among traditional and small-scale market actors remains uneven. Some traditional retail environments in Indonesia have adopted digital platforms and payment technologies, yet substantial disparities persist across regions, market segments, and groups of vendors (Adiwibowo et al., 2019; Halisa, Rusvitawati, & Irwansyah, 2025). These differences indicate that technological availability alone does not determine the trajectory of digital change. Digital literacy, infrastructure, organisational capability, institutional support, consumer behaviour, and local socio-economic conditions may shape how digital technologies are adopted and integrated into existing market practices. Consequently, understanding the digital transformation of traditional markets requires attention not only to technological adoption but also to the wider institutional, behavioural, and socio-cultural conditions within which such technologies are embedded.

Despite growing scholarly attention to digitalisation and market transformation, three interrelated research gaps remain. First, a knowledge-fragmentation gap persists because relevant studies are dispersed across management, marketing, governance, sustainability, innovation, consumer behaviour, food systems, and technology-related research streams. This fragmentation makes it difficult to identify the overall intellectual structure of the field and the relationships among its major themes. Second, a methodological gap remains because existing studies tend to examine either bibliometric structures or substantive thematic content separately, providing limited integration between structural knowledge mapping and the identification of latent semantic patterns within the literature. Bibliometric analysis can reveal publication dynamics, intellectual relationships, and thematic networks, whereas topic modelling can uncover recurring semantic structures embedded in titles and abstracts. Integrating these analytical perspectives can therefore provide a more comprehensive representation of how the field has evolved. Third, a contextualisation gap concerns the extent to which patterns identified in the global literature can inform discussions of traditional-market digitalisation in emerging economies such as Indonesia. Global research trajectories cannot be assumed to directly represent Indonesian market conditions, but they can provide a comparative knowledge base through which locally relevant opportunities, constraints, and research priorities may be interpreted.

Against this background, the present study primarily examines the global knowledge structure of research related to the digital transformation of traditional markets, while treating Indonesia as a contextual setting for interpreting the practical relevance of the global evidence rather than as the empirical unit of analysis. The study employs an integrated analytical approach combining bibliometric analysis and Latent Dirichlet Allocation (LDA) topic modelling. The bibliometric component systematically maps publication patterns, influential sources, intellectual structures, keyword relationships, and thematic evolution, while LDA is used to identify latent thematic patterns and conceptual linkages within the textual corpus. Accordingly, this study has two objectives: (1) to describe the intellectual and structural characteristics of global research on the digital transformation of traditional markets, and (2) to identify the evolving thematic and conceptual trajectories within this literature and discuss their potential relevance to the Indonesian traditional-market context. By explicitly distinguishing global evidence synthesis from Indonesian contextualisation, the study seeks to provide a more theoretically coherent and methodologically transparent understanding of digital transformation in traditional-market research while avoiding the assumption that internationally observed patterns constitute direct empirical evidence of conditions in Indonesia.

p-ISSN: 2088-1231
e-ISSN: 2460-5328

METHOD

This study employs a bibliometric analysis to systematically map and interpret large bodies of scientific literature, enabling the identification of both historical developments and emerging trends within the research domain (Donthu et al., 2021). The analysis follows a structured process of data collection, screening, and document selection, using performance analysis and science mapping as complementary techniques to evaluate publication patterns, influential sources, and intellectual structures. These quantitative procedures are implemented through the Bibliometrix® package in R, which provides an integrated environment for descriptive and network-based analyses. To complement this, the study applies Latent Dirichlet Allocation (LDA) topic modeling in Python to extract latent thematic patterns from textual data, offering a qualitative lens to explore conceptual evolution across the corpus. This mixed analytical design allows for a comprehensive understanding of both the structural and thematic dimensions of digital transformation research in traditional markets.

Data Collection

The data were retrieved from the Scopus database on October 20, 2025. Scopus was selected because of its broad coverage of peer-reviewed publications across management, business, and related disciplines. The exact search query used was: TITLE-ABS-KEY ("digital transformation" OR "digital change" OR "digitalization") AND ("traditional markets"). The search returned 125 records published between 1995 and 2025.

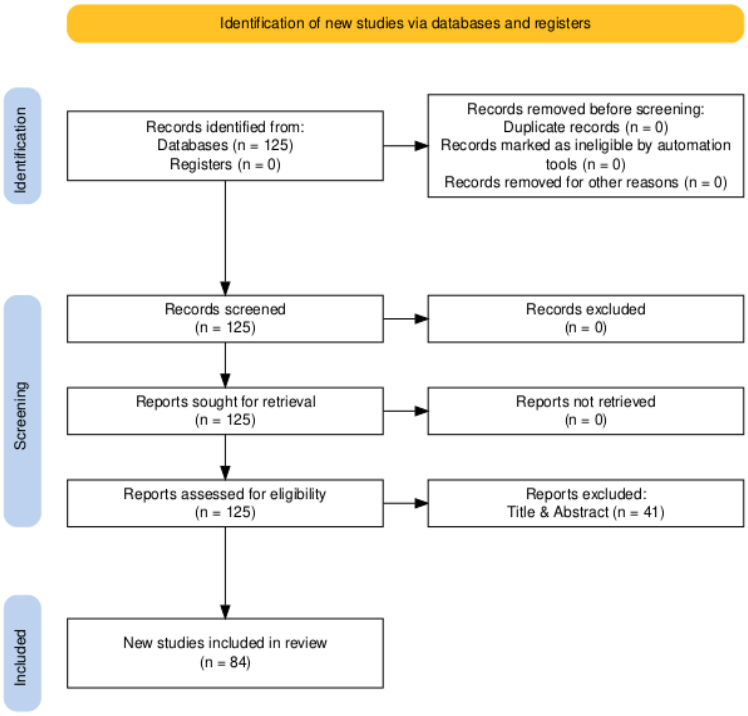
The retrieved records were subsequently subjected to manual relevance screening. Titles and abstracts were first examined to determine whether each publication substantively addressed digital change in relation to traditional-market contexts. When the relevance of a record could not be determined adequately from the abstract alone, the content of the article was further examined. A total of 41 records were excluded because their abstracts and/or substantive content did not correspond to the scope of digital transformation or digitalisation in traditional-market settings. Consequently, 84 documents were retained for the final bibliometric and topic-modelling analyses.

For screening purposes, a record was considered relevant when digital technology, digitalisation, or digital transformation constituted a substantive component of the study and was explicitly connected to a traditional-market context. Records in which the search terms appeared only incidentally, or in which the market context did not correspond to the scope of traditional markets examined in this study, were excluded. The final dataset included bibliographic information such as authors, titles, publication sources, affiliations, abstracts, keywords, and cited references.

After manual screening by title and abstract relevance (Figure 1), the final dataset comprised 84 documents published. As for the remaining 41 data that not been included, it is because the abstract and the content were not match with the purpose of this study. The metadata included bibliographic information (authors, titles, sources, affiliations), abstract and keyword data, and cited references.

p-ISSN: 2088-1231
e-ISSN: 2460-5328

Figure 1. Data Collection Process



Source: By Authors

Analytical Approach

Bibliometric methods are particularly well suited for analyzing and mapping fragmented research domains such as the digital transformation of traditional markets, where studies are dispersed across multiple disciplines, regions, and publication outlets. Following established bibliometric procedures (Aria & Cuccurullo, 2017), the analysis was carried out in two complementary stages: 1) Performance Analysis: This descriptive stage quantified the structural characteristics of the research field, including publication output, annual growth rate, citation performance, and authorship patterns. Indicators such as leading sources, most productive institutions, and country-level contributions were examined to assess the intellectual productivity and geographical distribution of research activity over time. 2) Science Mapping: The second stage explored the intellectual and conceptual structure of the field through co-word analysis, which identifies patterns of co-occurrence among author keywords and constructs clusters representing major thematic areas. Thematic maps and thematic evolution diagrams were generated to visualize the temporal development and interrelationships of these research fronts. To complement the bibliometric mapping, Latent Dirichlet Allocation (LDA) topic modeling was subsequently applied to uncover latent thematic patterns and conceptual linkages within the corpus. This integration of quantitative network mapping and probabilistic topic modeling provides a multidimensional understanding of the field's evolution—linking publication dynamics, thematic structures, and emerging intellectual trends.

Tools and Implementation

All bibliometric analyses were conducted with the Bibliometrix R-package (v5.0, AI) via Biblioshiny, which provides reproducible workflows for performance indicators and science mapping (Aria & Cuccurullo, 2017). To complement the quantitative bibliometric mapping with deeper thematic interpretation, this study applied Latent Dirichlet Allocation

p-ISSN: 2088-1231
e-ISSN: 2460-5328

(LDA) topic modeling in Python using the scikit-learn library. Topic modeling was employed to provide a qualitative layer of analysis, enabling the identification of latent conceptual structures within the corpus that are not captured through traditional bibliometric indicators.

For this purpose, the year, title, and abstract of each publication were combined into a single text corpus, comprising approximately 16,964 words stored in a CSV file. Prior to modeling, the text was carefully preprocessed, including lowercasing, tokenization, and lemmatization. A comprehensive stopword list was then applied to remove high-frequency, non-informative terms commonly found in academic writing—such as study, paper, result, findings, analysis, method, framework, model, literature, and journal—alongside domain-specific stopwords related to "digital," "market," and "transformation." This preprocessing step ensured that the model captured semantically meaningful terms rather than structural or procedural language. The cleaned text was vectorized using a bag-of-words model through CountVectorizer, after which LDA was implemented with the following parameters: 1) Number of topics (n_components) = 10, 2) Random state = 100, 3) Maximum iterations = 50, 4) Learning method = 'batch'These settings were chosen for their balance between computational efficiency and topic coherence. The model estimated both document–topic and topic–word distributions, producing ten distinct thematic clusters. Each topic was then qualitatively examined and labeled based on the most representative keywords generated by the LDA algorithm, forming the foundation for thematic interpretation and integration with the bibliometric findings. This mixed analytical design—quantitative bibliometric mapping combined with qualitative topic modeling—allowed the study to move beyond descriptive trends, offering a deeper and more nuanced understanding of the evolving intellectual landscape of research on digital transformation in traditional markets.

RESULT AND DISCUSSION

Descriptive Overview

The bibliometric dataset spans three decades (1995–2025), comprising 84 documents from 75 distinct sources (Table 1). This distribution, averaging 2.7 publications annually and an annual growth rate of 8.9%, reflects a steadily maturing research area. The collaboration index (≈2.6 authors per document) and international co-authorship (≈20%) suggest a moderately globalized network, though still regionally concentrated. The presence of 678 total keywords (295 author keywords and 383 Keywords Plus) reveals a highly diversified conceptual field encompassing governance, sustainability, marketing, and innovation adoption. This structural variety implies that the study of digital transformation in traditional markets has evolved from fragmented case-based explorations into a more integrated, cross-sectoral knowledge ecosystem.

Table 1. Descriptive Overview

Timespan	1995:2025
Sources (Journals, Books, etc)	75
Documents	84
Annual Growth Rate %	8.93
Document Average Age	6.52
Average citations per doc	14.21
References	4784
Keywords Plus (ID)	383
Author's Keywords (DE)	295
Authors	222
Authors of single-authored docs	18

p-ISSN: 2088-1231
e-ISSN: 2460-5328

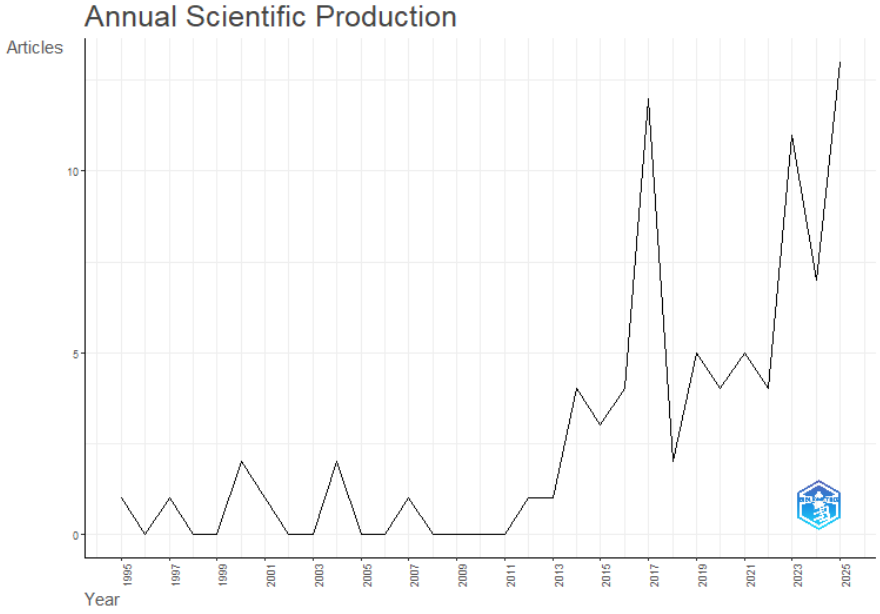
Single-authored docs	18
Co-Authors per Doc	2.67
International co-authorships %	20.24
article	56
book	4
book chapter	12
conference paper	10
review	2

Source: By Authors

Annual Scientific Production

The dynamics of annual publications in general indicate a steadily increasing interest in the topic of digital transformation of traditional market (Figure 2). The longitudinal trend in publication output indicates a distinct shift from sporadic exploration to consistent academic engagement. Early research (1995–2014) remained scarce, producing only two publications, while a notable inflection occurred between 2015 and 2017, coinciding with rising global attention to digital economies and post-Industry 4.0 adaptation. The surge continued into 2023–2025, reaching a record 13 publications, representing nearly a twentyfold increase from the initial phase. This upward trajectory aligns with policy-driven digitization efforts and the growing influence of artificial intelligence and digital payment ecosystems in emerging markets. Such dynamics confirm that the field is transitioning from peripheral interest to a recognized sub-domain within the broader digital transformation discours

Figure 2. Annual Scientific Production



Source: By Authors

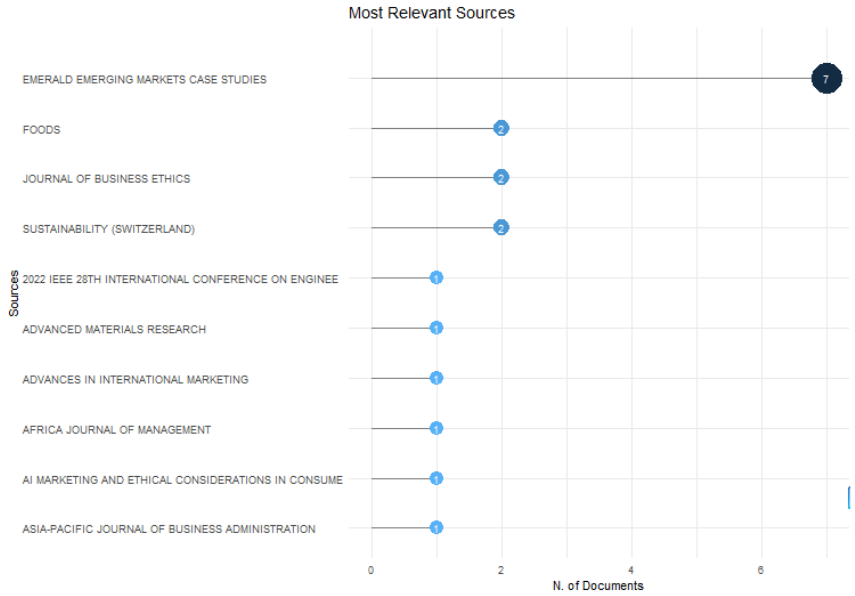
Most Relevant Sources

This highlights the journals with the highest number of publications on digital transformation of traditional market, identifying the main publication outlets in the field (Figure 3). The publication outlets demonstrate thematic pluralism rather than journal dominance, aligning with Bradford's "long-tail" distribution. Emerald Emerging Markets Case Studies (EEMCS) leads with seven articles, followed by FOODS, Sustainability (Switzerland), and the Journal of Business Ethics, each publishing two. This variety indicates

p-ISSN: 2088-1231
e-ISSN: 2460-5328

a field anchored in practice-based learning, sustainability science, and ethical discourse. The prevalence of EEMCS highlights the pedagogical role of digital transformation cases in emerging economies, while FOODS and Sustainability reflect growing interest in technological innovation across agri-food and energy sectors. The presence of Journal of Business Ethics connects digital innovation to legitimacy, governance, and consumer trust. Together, this diffusion of sources reveals that research on digital transformation in traditional markets is inherently cross-sectoral—bridging managerial, environmental, and ethical dimensions.

Figure 3. Most Relevant Source



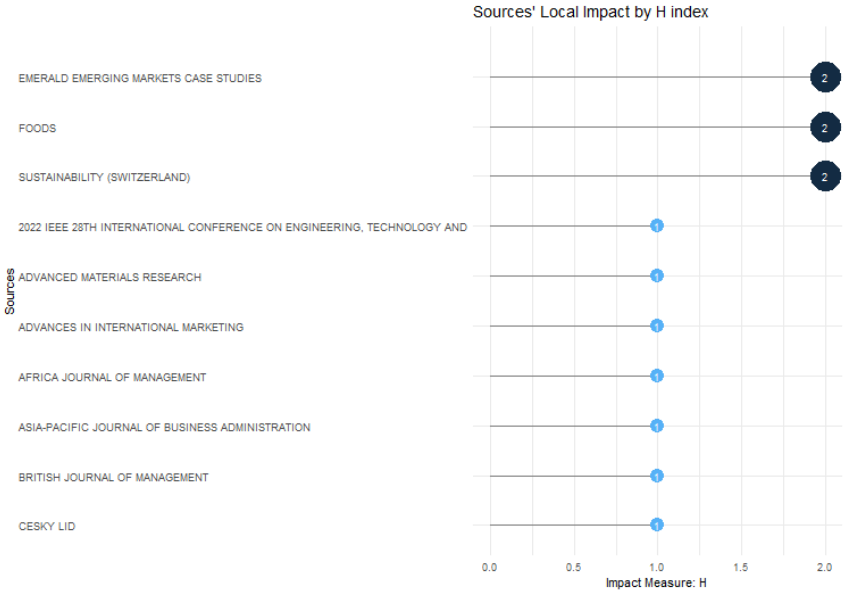
Source: By Authors

Source Local Impact

This shows the journals that are most influential specifically within the dataset based on local citation scores, revealing which journals are central in shaping the field even if they are not the most globally cited (Figure 4). Local citation analysis identifies FOODS, Sustainability (Switzerland), and EEMCS as the three most influential journals, each with a local h-index of two. While EEMCS contributes the highest publication count, its pedagogical focus limits internal citation depth. In contrast, FOODS and Sustainability—both emerging in the 2018–2021 window—exhibit faster citation velocity, reflecting strong thematic coherence around food supply chains, ESG performance, and energy transition. Globally impactful but locally underrepresented sources such as Energy Policy and Journal of Intellectual Capital highlight the need for cross-referencing and multi-disciplinary integration. Overall, local impact patterns suggest that sustainability- and food-focused research channels form the intellectual backbone of the corpus, linking market digitalization to environmental responsibility.

p-ISSN: 2088-1231
e-ISSN: 2460-5328

Figure 4. Source Local Impact



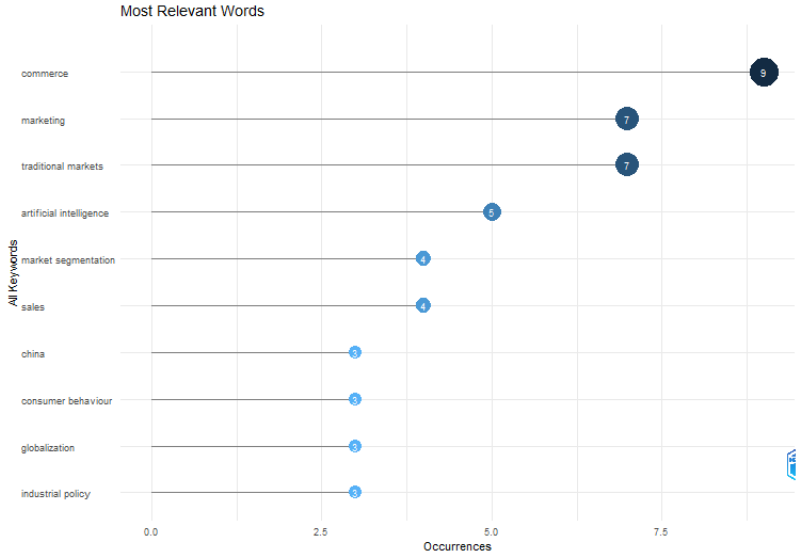
Source: By Authors

Most Frequent Keywords

This identifies the keywords appearing most often in the dataset, highlighting the main themes and concepts studied in the literature (Figure 5). The keyword frequency analysis (reveals ten dominant concepts that define the intellectual focus of research on the digital transformation of traditional markets. The term “commerce” (n = 9) remains the most prevalent, confirming that studies in this area are fundamentally grounded in trade, exchange systems, and market modernization processes. Closely following are “marketing” and “traditional markets” (n = 7 each), which indicate a dual emphasis: the managerial transformation of sales and consumer engagement, and the contextual specificity of local or informal market systems adapting to digitalization. The emergence of “artificial intelligence” (n = 5) marks a significant thematic evolution, suggesting that AI is increasingly being explored as an enabling technology for market analytics, digital payments, and personalized commerce. Keywords such as “market segmentation” and “sales” (n = 4 each) highlight the transition from broad digitalization studies toward micro-level examinations of customer behavior, targeting, and performance measurement. Geographically, “China” (n = 3) appears as a regional reference point, underscoring its global influence as a model for integrating traditional markets into digital ecosystems. Meanwhile, “consumer behaviour,” “globalization,” and “industrial policy” (n = 3 each) reflect broader macro- and micro-level linkages—connecting individual adoption patterns, global digital trends, and institutional policy frameworks. Overall, the pattern of keyword usage demonstrates a gradual conceptual shift from commerce-centered transformation to technology-driven personalization and policy-enabled digital inclusion. This evolution mirrors how traditional markets are increasingly viewed as dynamic nodes within global digital value chains, shaped by consumer analytics, industrial policy, and AI-enabled business models.

p-ISSN: 2088-1231
e-ISSN: 2460-5328

Figure 5. Most Relevant Words

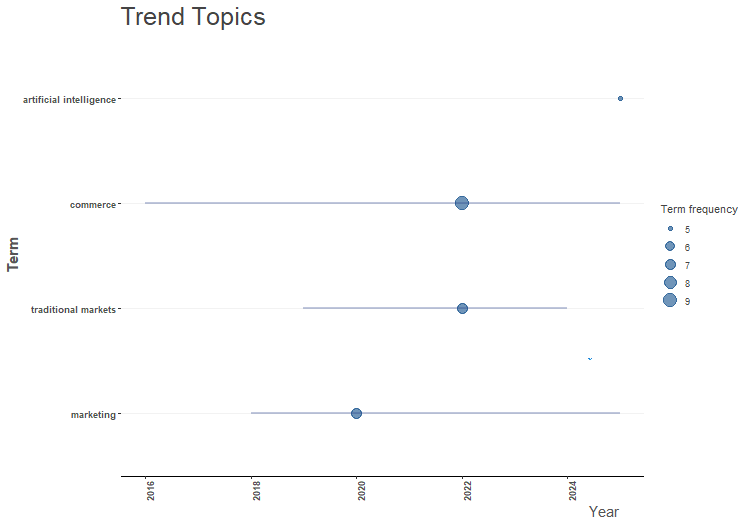


Source: By Authors

Trend Topics

This tracks how keywords or research topics have emerged, peaked, or declined over time, showing the evolution of research focus (Figure 6). Trend analysis demonstrates how the thematic focus evolved from "commerce" (2016 onward) toward "marketing," "traditional markets," and recently, "artificial intelligence." "Commerce" remains the foundational discourse, symbolizing digital exchange and modernization of trade mechanisms. The introduction of "marketing" (post-2018) signals a behavioral and managerial turn—exploring how digital technologies reshape consumer interaction and promotional strategies. The rise of "traditional markets" (2019–2024) contextualizes these mechanisms within informal or hybrid economies. The appearance of "artificial intelligence" in 2025 represents a frontier phase, linking AI adoption with market analytics, personalization, and predictive insights. Together, these trends show that research is migrating from descriptive transformation narratives to predictive and AI-driven optimization models.

Figure 6. Trends Topic



Source: By Authors

p-ISSN: 2088-1231
e-ISSN: 2460-5328

Keyword Co-Occurrence Network

This maps how often keywords appear together in the same papers, revealing clusters of related concepts and thematic connections (Figure 7). The co-occurrence network displays a robust "incentive–adoption–performance" triad at the center of the research landscape. Keywords such as policy instruments, R&D grants, and technology diffusion are recurrently connected to outcomes like productivity and environmental performance. Two dense clusters—sustainability/energy and food/supply chain—anchor the discourse in real economic and environmental contexts. Meanwhile, emerging co-occurrences between AI, marketing personalization, and ethics suggest a growing interest in responsible digitalization. The pattern highlights that incentives in traditional markets are no longer confined to policy mechanisms; they increasingly function as behavioral and technological catalysts for digital participation and value creation.

Figure 7. Keyword Co-Occurrence Network



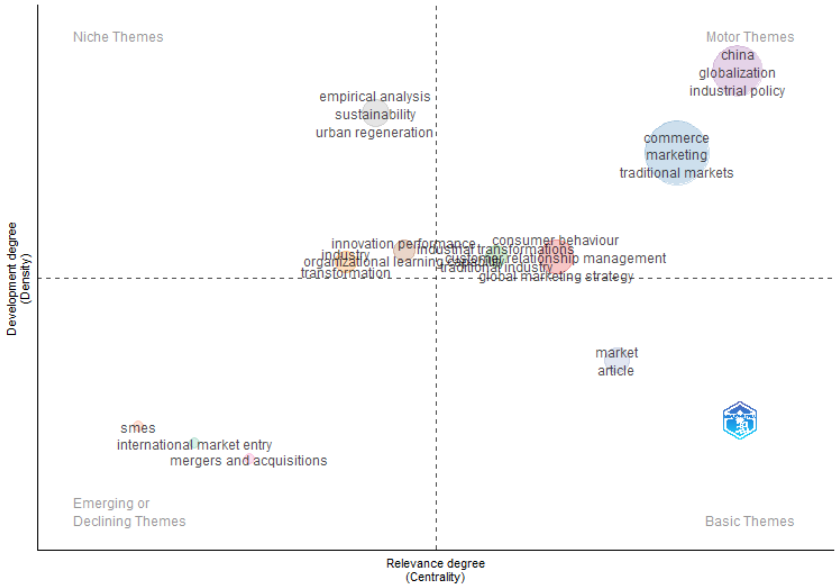
Source: By Authors

Thematic Map

This classifies themes based on relevance (centrality) and maturity (development), showing which themes are well-developed, emerging, or marginal in the field (Figure 8). Thematic mapping positions "commerce–marketing–adoption–performance" as the field's motor theme, balancing theoretical maturity and practical relevance. Basic themes—policy instruments, diffusion, and digital transformation—serve as the connective infrastructure linking multiple research streams. Niche clusters such as food traceability and green innovation exhibit high local coherence but limited network centrality, reflecting specialized yet influential contributions. The emerging AI cluster remains underdeveloped but demonstrates high potential for integration with established themes, particularly through its application to ethical governance, energy efficiency, and consumer analytics. This trajectory suggests that the field is gradually achieving conceptual equilibrium between macro policy design and micro-level market practices.

p-ISSN: 2088-1231
e-ISSN: 2460-5328

Figure 8. Thematic Map



Source: By Authors

Thematic Evolution

This illustrates how research themes have changed across different time periods, helping to track the continuity, emergence, or decline of themes (Figure 9). The field's evolution follows three chronological phases: (1) Commerce (2016–2022), (2) Marketing and Traditional Markets (2018–2024), and (3) Artificial Intelligence (2025–onward). The first phase established the foundation for studying digital adoption as a performance driver. The second expanded this focus toward consumer behavior and local market adaptation, influenced by SME digitalization and national e-commerce policies. The current phase introduces AI as both a methodological and conceptual frontier, linking automation, personalization, and ethics. This trajectory mirrors global digital economy transformations, showing how traditional markets are evolving from analog commerce to data-driven ecosystems.

Figure 9. Thematic Evolution



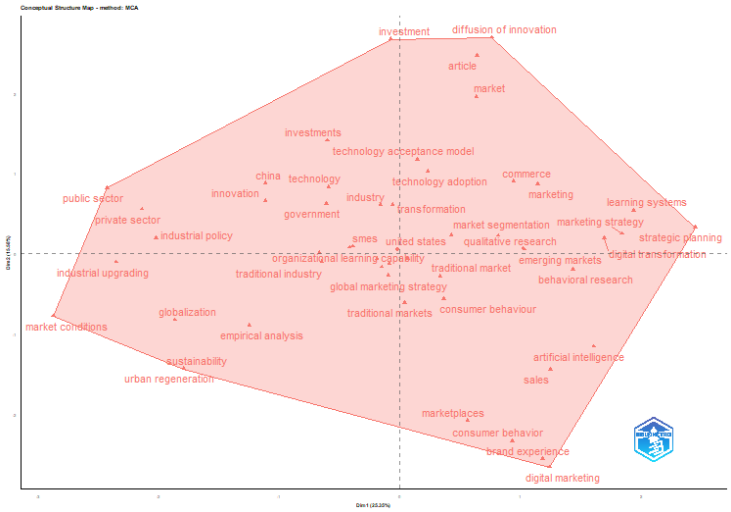
Source: By Authors

p-ISSN: 2088-1231
e-ISSN: 2460-5328

Factorial Analysis

This groups documents or keywords into conceptual clusters, identifying the intellectual structure and underlying patterns of the field (Figure 10). The factorial structure uncovers three interlinked knowledge domains: policy–industrial development, technology adoption mechanisms, and marketing–consumer behavior. The central cluster—anchored by innovation diffusion and adoption models—acts as a theoretical bridge connecting regulatory and market perspectives. Contextual sub-clusters such as sustainability, energy transition, and traditional markets enrich the conceptual map by situating technology adoption in socio-economic realities. The emerging AI–marketing nexus occupies the digital commerce periphery but shows potential to migrate toward the center as it becomes integrated with policy instruments and measurable performance indicators. Collectively, this structure illustrates that research on digital transformation in traditional markets is built upon a three-pillar architecture: governance, technological mechanisms, and market dynamics.

Figure 10. Factorial Analysis



Source: By Authors

Topic Modelling

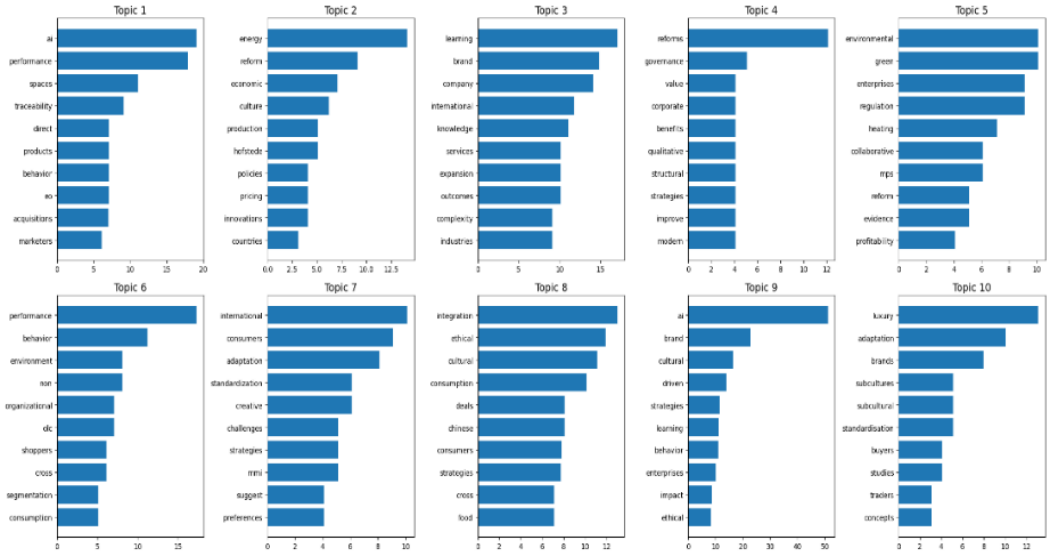
The Latent Dirichlet Allocation (LDA) model extracted ten latent topics that collectively capture the conceptual diversity and intellectual structure of global research on the digital transformation of traditional markets (Figure 11). Each topic represents a cluster of frequently co-occurring terms that signal distinct yet interrelated subthemes. The model achieved a satisfactory level of interpretability, with clearly differentiated topic–word distributions, confirming that the corpus contained coherent underlying patterns rather than random co-occurrence noise. The list of latens topics:

- Topic 1: ai, performance, spaces, traceability, direct, products, behavior, eo, acquisitions, marketers
- Topic 2: energy, reform, economic, culture, production, hofstede, policies, pricing, innovations, countries
- Topic 3: learning, brand, company, international, knowledge, services, expansion, outcomes, complexity, industries
- Topic 4: reforms, governance, value, corporate, benefits, qualitative, structural, strategies, improve, modern

p-ISSN: 2088-1231
e-ISSN: 2460-5328

- Topic 5: environmental, green, enterprises, regulation, heating, collaborative, mps, reform, evidence, profitability
- Topic 6: performance, behavior, environment, non, organizational, olc, shoppers, cross, segmentation, consumption
- Topic 7: international, consumers, adaptation, standardization, creative, challenges, strategies, mmi, suggest, preferences
- Topic 8: integration, ethical, cultural, consumption, deals, chinese, consumers, strategies, cross, food
- Topic 9: ai, brand, cultural, driven, strategies, learning, behavior, enterprises, impact, ethical
- Topic 10: luxury, adaptation, brands, subcultures, subcultural, standardisation, buyers, studies, traders, concepts

Figure 11. Word Probable Matrix



Source: By Authors

The ten topics were manually examined, labeled, and interpreted based on the top ten most significant keywords for each (Table 2). The labeling process followed a semantic interpretation approach, in which keyword meaning, contextual proximity, and disciplinary relevance were analyzed to infer the dominant conceptual essence of each topic.

a. AI-Driven Market Intelligence and Traceability: Characterized by keywords such as AI, performance, traceability, and behavior, this topic captures research focusing on artificial intelligence applications in optimizing supply chains, consumer analytics, and data-driven market performance.
b. Institutional and Cultural Dimensions of Digital Reform: Centered around terms like energy, reform, economic, and policies, this topic reflects cross-national studies exploring how institutional structures, policy environments, and cultural frameworks shape digital transformation efforts.
c. Organizational Learning and Global Market Expansion: Containing words such as learning, brand, knowledge, and expansion, this theme focuses on how organizations in traditional markets build digital capabilities, accumulate knowledge, and extend their reach through internationalization.

p-ISSN: 2088-1231
e-ISSN: 2460-5328

d. Governance Reform and Organizational Modernization: Defined by reforms, governance, value, and strategies, this topic highlights structural reforms, corporate governance improvement, and modernization strategies as core mechanisms enabling digital transformation.
e. Sustainability and Green Innovation in Digital Enterprises: Composed of environmental, green, collaborative, and profitability, this topic addresses the integration of sustainability principles and green technologies into digital enterprise reform.
f. Consumer Behavior and Market Performance Analytics: Keywords such as behavior, performance, segmentation, and consumption point to research analyzing how data analytics reshape consumer profiling, shopping experiences, and performance measurement.
g. Global Consumer Adaptation and Digital Marketing Strategies: This topic, including consumers, adaptation, creative, and preferences, focuses on cross-cultural differences and adaptation strategies in global digital marketing practices.
h. Ethical and Cultural Consumption in Digital Market Integration: Marked by ethical, cultural, consumption, and food, this topic reflects growing scholarly attention to moral and cultural dimensions of digital consumption, particularly in localized or food-related markets.
i. AI-Driven Ethical Branding and Consumer Learning: Combining AI, brand, learning, and ethical, this topic connects artificial intelligence with responsible marketing, exploring how machine learning enhances ethical decision-making in branding.
j. Cultural Adaptation and Consumer Identity in Digital Luxury Markets: Defined by luxury, brands, subcultures, and buyers, this theme captures how digital platforms influence identity formation and consumer culture within luxury and niche markets.

Table 2. Label and Interpretation

Topic	Representative Keywords	Label (Theme)	Interpretation / Relation to Digital Transformation	Representative Document
Topic 1	*ai, performance, spaces, traceability, direct, products, behavior, acquisitions, marketers*	AI-Driven Market Intelligence and Traceability	Reflects the use of artificial intelligence in improving market efficiency through data analytics, behavioral tracking, and product traceability — crucial for modernizing traditional markets and building consumer trust.	2025 — AI-powered navigation of the digital frontier: Analyzing modern trends in digital marketing and their influence on consumer purchasing patterns with special reference to pharma industry
Topic 2	*energy, reform, economic, culture, production, hofstede, policies, pricing, innovations, countries*	Institutional and Cultural Dimensions of Digital Reform	Captures cross-national and cultural factors influencing economic digitalization and policy reform — showing how national culture, energy policy, and economic institutions shape digital transformation capacity.	2023 — Asian Paints Company Limited: post-merger and acculturation challenges
Topic 3	*learning, brand, company, international, knowledge, services,*	Organizational Learning and Global Market	Represents how firms and market actors learn, adapt, and expand through digital platforms, highlighting	2025 — Enhancing enterprises' green and low-carbon innovation through digital technology

p-ISSN: 2088-1231
e-ISSN: 2460-5328

Topic	Representative Keywords	Label (Theme)	Interpretation / Relation to Digital Transformation	Representative Document
	expansion, outcomes, complexity, industries	Expansion	capability development and internationalization enabled by digital tools.	embeddedness: From passive response to active innovation
Topic 4	*reforms, governance, value, corporate, benefits, qualitative, structural, strategies, improve, modern*	Governance Reform and Organizational Modernization	Points to institutional and corporate governance reforms that support digital transformation, emphasizing strategic alignment and structural modernization in traditional enterprises.	2022 — Identification and evaluation of development paths for technology-oriented industrial companies in structural transformation processes
Topic 5	*environmental, green, enterprises, regulation, heating, collaborative, reform, evidence, profitability*	Sustainability and Green Innovation in Digital Enterprises	Focuses on the intersection between sustainability, regulation, and digital innovation — suggesting that environmental reforms and collaborative technologies drive profitability and responsible modernization.	2025 — Role of culture in how AI affects the brand experience: comparison of Belt and Road countries
Topic 6	*performance, behavior, environment, organizational, shoppers, segmentation, consumption*	Consumer Behavior and Market Performance Analytics	Represents behavioral analytics and segmentation in digitalized markets — showing how traditional vendors use data-driven insights to understand shopper behavior and improve performance.	2022 — Traditional markets in transformation: an alternative reading of urban regeneration prospects; [Los mercados tradicionales en transformación: una lectura alternativa a las perspectivas de regeneración urbana]
Topic 7	*international, consumers, adaptation, standardization, creative, challenges, strategies, preferences*	Global Consumer Adaptation and Digital Marketing Strategies	Explores how consumer preferences and creative adaptation shape digital marketing strategies in diverse cultural and international contexts.	2025 — Behavioural Analysis of Traditional Clothing Traders Toward E-Commerce Adoption: A Pathway to Business Sustainability
Topic 8	*integration, ethical, cultural, consumption, deals, chinese, consumers, strategies, food*	Ethical and Cultural Consumption in Digital Market Integration	Links ethical consumption and cultural values to digital market integration, particularly in food and local goods sectors — emphasizing fair trade and culturally aware digital strategies.	2023 — Satya Pharmaceuticals' foray into global markets
Topic 9	*ai, brand, cultural, driven, strategies, learning, behavior, enterprises, ethical*	AI-Driven Ethical Branding and Consumer Learning	Connects artificial intelligence with branding ethics, consumer learning, and enterprise strategy — signaling a shift toward responsible AI in marketing	2023 — Streaming towards innovation: Understanding consumer adoption of OTT services through IRT and TAM

p-ISSN: 2088-1231
e-ISSN: 2460-5328

Topic	Representative Keywords	Label (Theme)	Interpretation / Relation to Digital Transformation	Representative Document
			and retail innovation.	
Topic 10	*luxury, adaptation, brands, subcultures, standardisation, buyers, traders, concepts*	Cultural Adaptation and Consumer Identity in Digital Luxury Markets	Captures the intersection of digital marketing, cultural subcultures, and luxury branding — showing how digital transformation reshapes consumer identity and purchasing behavior.	2020 — Abrau-Durso: reviving the 140-year-old Russian wine brand

Source: By Authors

Taken together, these ten topics reveal a three-dimensional conceptual structure of the field: (1) Technological Enablers (Topics 1, 6, 9) — representing the adoption of AI and analytics; (2) Governance and Sustainability Transformation (Topics 2, 4, 5) — reflecting institutional reforms and policy integration; and (3) Cultural and Consumer Dynamics (Topics 3, 7, 8, 10) — addressing behavioral change and ethical consumption.

This thematic configuration complements the bibliometric results by providing qualitative depth to the quantitative mapping. Whereas the bibliometric analysis traced the structure and evolution of the field, the LDA results elucidate the substantive content of research trends. Together, they portray digital transformation in traditional markets as a multidimensional phenomenon that extends beyond technological adoption to encompass governance modernization, sustainability transitions, and cultural adaptation within emerging digital economies.

Discussion

This study integrates bibliometric analysis and Latent Dirichlet Allocation (LDA) topic modeling to provide a comprehensive synthesis of how digital transformation in traditional markets has been conceptualized and examined across global scholarship. By combining the quantitative mapping capacity of bibliometrics with the qualitative interpretive depth of topic modeling, this mixed-method approach enables both a macro-level analysis of research structures and trends and a micro-level exploration of latent conceptual patterns. Together, they reveal how digital transformation has evolved from a fragmented technological discussion into an integrated discourse connecting governance, sustainability, and socio-cultural dynamics.

Evolution and Growth of Research

The bibliometric results indicate that research on digital transformation in traditional markets has expanded substantially over the past two decades. Initially peripheral in the early 2000s, scholarly attention began accelerating around 2015, coinciding with global policy initiatives emphasizing the digital economy and the Fourth Industrial Revolution (Nambisan, Wright, & Feldman, 2019; Vial, 2019). This growth reflects both technological advancement and the broader recognition of digital transformation as a governance and inclusion challenge within traditional economic structures (Verhoef et al., 2021). Post-2020, publication surges mirror the pandemic-driven acceleration of digital ecosystems as governments and businesses sought to enhance market resilience. The prominence of keywords such as sustainability, innovation, and artificial intelligence suggests an ongoing conceptual shift from technology adoption to multidimensional perspectives integrating social, environmental, and ethical

p-ISSN: 2088-1231
e-ISSN: 2460-5328

dimensions. These findings affirm that digital transformation has matured into a systemic paradigm rather than a transient managerial trend.

Thematic Structure of Global Research

The bibliometric mapping and keyword co-occurrence analyses identified three dominant research pillars: 1) Technological Enablers and Market Modernization, encompassing digital platforms, AI, analytics, and performance optimization; 2) Governance, Policy, and Sustainability, focusing on reform, regulation, and green innovation; and 3) Consumer Behavior and Cultural Dynamics, capturing adaptation, trust, and ethics in digital consumption.

This triadic thematic structure reflects a hybrid intellectual landscape where technological modernization, institutional reform, and human behavior intersect. Co-word networks highlight a strong conceptual bridge among "AI," "governance," and "sustainability," suggesting that digital transformation is increasingly viewed as both an enabler and product of systemic governance reform. Recent clusters also reveal dense connections around sustainability and ethics, indicating a research turn toward transparency, traceability, and inclusiveness in market systems (Kraus et al., 2021; Egodawele, Sedera, & Bui, 2022).

Conceptual Deepening through Topic Modeling (LDA)

Viewed through the multidimensional perspective of digital transformation adopted in this study, the coexistence of technological, institutional, and behavioural themes suggests that the literature increasingly conceptualises digital change as a system-level phenomenon rather than merely as the adoption of individual technologies (Vial, 2019; Verhoef et al., 2021). The prominence of technological themes alongside governance, sustainability, and consumer-related concerns further indicates that digital transformation is being discussed as an interaction between digital capabilities, institutional arrangements, and market behaviour (Kraus et al., 2021; Egodawele, Sedera, & Bui, 2022). Importantly, however, these patterns represent the orientation of the scholarly literature identified in the present study and should not be interpreted as evidence that traditional markets themselves have uniformly reached an advanced stage of digital transformation.

Interlinking Bibliometric and Topic Modeling Insights

The value of combining bibliometric mapping and topic modelling in this study lies in their ability to provide complementary analytical perspectives on the same body of literature. Bibliometric analysis enables the examination of publication patterns, intellectual structures, keyword relationships, and thematic development within a research field (Aria & Cuccurullo, 2017; Donthu et al., 2021). In parallel, LDA is used in the present study to examine recurring semantic patterns embedded in the titles and abstracts of the analysed documents. Taken together, the two analytical outputs provide both a structural and a thematic representation of the literature. Their convergence suggests that technological, institutional, sustainability-related, and behavioural concerns are not isolated research streams but increasingly interconnected dimensions of traditional-market digitalisation. This interpretation is consistent with broader perspectives that conceptualise digital transformation as a multidimensional process extending beyond technological adoption to encompass organisational, institutional, and market-level change (Vial, 2019; Verhoef et al., 2021).

In the present study, this convergence is interpreted as a triangulation of analytical outputs rather than as statistical cross-validation. The correspondence between bibliometric

p-ISSN: 2088-1231
e-ISSN: 2460-5328

structures and LDA-derived themes strengthens the interpretive coherence of the findings, while differences between the two outputs remain analytically meaningful because structural prominence and semantic prevalence do not necessarily coincide. Bibliometric mapping therefore provides insight into how the knowledge field is organised and evolves, whereas topic modelling contributes an additional semantic layer by revealing the substantive themes represented within the corpus. Their integration allows the study to connect patterns of knowledge production with the thematic content through which digital transformation in traditional-market contexts has been discussed.

Theoretical and Policy Implications

The thematic structure indicates that research on traditional-market digitalisation is increasingly organised around the interaction between technological capability, institutional conditions, and market behaviour. Rather than representing separate research streams, these dimensions appear to function as mutually dependent components of digital change. This interpretation is consistent with broader digital transformation literature, which conceptualises transformation as a multidimensional process involving technological, organisational, institutional, and market-level changes rather than the adoption of technology alone (Vial, 2019; Verhoef et al., 2021). Technological adoption can expand market capabilities, but its broader effects are shaped by governance arrangements, regulatory support, sustainability considerations, and the capacity of organisations and market actors to adapt to new forms of exchange (Kraus et al., 2021; Egodawele, Sedera, & Bui, 2022). Accordingly, the pattern identified in this study supports a multidimensional interpretation of digital transformation in which technology operates within, rather than independently from, institutional and socio-cultural contexts.

CONCLUSION

This study integrated bibliometric analysis and LDA-based topic modelling to examine the global knowledge structure of research associated with digital transformation in traditional-market contexts. The findings indicate that the literature has become increasingly multidimensional, linking technological adoption and analytics with governance, sustainability, consumer behaviour, and cultural adaptation. Across the bibliometric and topic-modelling outputs, three broad interpretive dimensions were identified: technological enablers, governance and sustainability, and consumer and cultural dynamics. These dimensions should be interpreted as patterns within the analysed literature rather than as evidence that all traditional markets are undergoing the same trajectory of digital transformation. For the Indonesian context, the results provide a basis for contextual reflection rather than direct empirical evidence. They suggest that discussions of traditional-market digitalisation may benefit from considering not only technology adoption but also digital capability, institutional arrangements, infrastructure access, consumer practices, and governance. Accordingly, initiatives such as digital payments should be understood as components of digitalisation that may contribute to broader transformation when accompanied by organisational and institutional changes. Several limitations qualify the findings. First, the analysis relies exclusively on Scopus and therefore does not capture potentially relevant literature indexed elsewhere. Second, the search strategy relies on a relatively narrow formulation of “traditional markets,” which may omit related studies using terms such as wet markets, public markets, local markets, or traditional retail. Third, topic labels depend partly on researcher interpretation and should not be treated as objectively fixed

p-ISSN: 2088-1231
e-ISSN: 2460-5328

categories. Fourth, the relatively small corpus and increasing concentration of publications in recent years may introduce model instability and temporal bias. Future research should therefore employ broader database and search coverage, comparative topic-model specifications, and longitudinal or empirical validation in specific traditional-market settings.

REFERENCES

Adiwibowo, S., Setiadi, M. I., Daniel, M., Surbakti, E. E., & Shihab, M. R. (2019). Improving Indonesian small economies by digitizing traditional shops: A case study of Mitra Bukalapak. 2019 International Conference on Information Management and Technology (ICIMTech) (pp. 608–612). IEEE. https://doi.org/10.1109/ICIMTech.2019.8843739

Aliyev, M. (2025). Digital ecosystems and traditional market adaptation in Central Asia: Comparative insights. Digital Policy, Regulation and Governance, 27(1), 45–63. https://doi.org/10.1108/DPRG-2024-0045

Aria, M. & Cuccurullo, C. (2017) bibliometrix: An R-tool for comprehensive science mapping analysis, Journal of Informetrics, 11(4), pp 959-975, Elsevier.

Asabere, N. Y., & Braimah, I. (2025). From informal trade to digital inclusion: Exploring vendor transitions in African markets. Technology in Society, 74, 102347. https://doi.org/10.1016/j.techsoc.2024.102347

Bank Indonesia. (2025, August 4). QRIS Jelajah Indonesia 2025 dorong digitalisasi dengan perluasan akseptasi, termasuk pasar tradisional [Siaran pers]. https://www.bi.go.id/id/publikasi/ruang-media/news-release/Pages/sp_2717025.aspx

Bank Indonesia. (2025, August 4). QRIS Jelajah Indonesia 2025 dorong digitalisasi dengan perluasan akseptasi, termasuk pasar tradisional [Press release]. https://www.bi.go.id/id/publikasi/ruang-media/news-release/Pages/sp_2717025.aspx

Bank Indonesia. (n.d.). Quick Response Code Indonesian Standard (QRIS). https://www.bi.go.id/id/fungsi-utama/sistem-pembayaran/ritel/kanal-layanan/qris/default.aspx

Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). How to conduct a bibliometric analysis: An overview and guidelines. Journal of Business Research, 133, 285–296. https://doi.org/10.1016/j.jbusres.2021.04.070

Egodawele, A., Sedera, D., & Bui, T. (2022). Responsible digital transformation in developing economies: A conceptual framework. Information Systems Frontiers, 24(6), 1723–1740. https://doi.org/10.1007/s10796-021-10218-3

Feger, A. (2024, March 19). Worldwide ecommerce sales to break $6 trillion, make up a fifth of total retail sales. Insider Intelligence (eMarketer). https://www.emarketer.com/content/worldwide-ecommerce-sales-break-6-trillion

Halisa, N. N., Rusvitawati, D., & Irwansyah. (2025). Transformasi digital dan keberlanjutan usaha pedagang pasar grosir di Kota Banjarmasin. Jurnal Riset Inspirasi Manajemen dan Kewirausahaan, 9(2), 118–124. https://doi.org/10.35130/jrimk

Kementerian Perdagangan Republik Indonesia. (2021). Peraturan Menteri Perdagangan Republik Indonesia Nomor 21 Tahun 2021 tentang Pedoman Pembangunan dan Pengelolaan Sarana Perdagangan. https://peraturan.bpk.go.id/Details/166537/permendag-no-21-tahun-2021

Kraus, S., Schiavone, F., Pluzhnikova, A., & Invernizzi, A. C. (2021). Digital transformation in small and medium-sized enterprises (SMEs): A systematic literature review and

p-ISSN: 2088-1231
e-ISSN: 2460-5328

future research agenda. Technological Forecasting and Social Change, 173, 121004. https://doi.org/10.1016/j.techfore.2021.121004

Liputan6. (2025, May 28). Kementerian UMKM luncurkan pasar tradisional berbasis AI, kembangkan super app SAPA UMKM. https://www.liputan6.com/bisnis/read/6035818/kementerian-umkm-luncurkan-pasar-tradisional-berbasis-ai-bisa-cashless

Loonam, J., Eaves, S., Kumar, V., & Parry, G. (2018). Towards digital transformation: Lessons learned from traditional organizations. Strategic Change, 27(2), 101–109. https://doi.org/10.1002/jsc.2185

Nambisan, S., Wright, M., & Feldman, M. (2019). The digital transformation of innovation and entrepreneurship: Progress, challenges, and key themes. Research Policy, 48(8), 103773. https://doi.org/10.1016/j.respol.2019.03.018

Plekhanov, A. (2023). Digital capabilities and institutional adaptation in emerging economies. Technological Forecasting and Social Change, 191, 122617. https://doi.org/10.1016/j.techfore.2023.122617

Rampaul, T. (2025). Bridging the informal economy and digital policy: Lessons from Southeast Asia. Government Information Quarterly, 42(1), 101840. https://doi.org/10.1016/j.giq.2024.101840

UNCTAD. (2021). COVID-19 and e-commerce: A global review. United Nations. https://digitallibrary.un.org/record/3935848

Verhoef, P. C., Broekhuizen, T., Bart, Y., Bhattacharya, A., Dong, J. Q., Fabian, N., & Haenlein, M. (2021). Digital transformation: A multidisciplinary reflection and research agenda. Journal of Business Research, 122, 889–901. https://doi.org/10.1016/j.jbusres.2019.09.022

Vial, G. (2019). Understanding digital transformation: A review and a research agenda. The Journal of Strategic Information Systems, 28(2), 118–144. https://doi.org/10.1016/j.jsis.2019.01.003