

Evolution of E-Business Research: A Bibliometric Study on Innovation and Digital Transformation

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Abstract— This bibliometric study explores the global evolution of e-business research within the context of innovation and digital transformation over the past decade, analyzing 7,981 documents from the Scopus database (2014–2024) using the Biblioshiny tool. The findings reveal a consistent increase in publications, underscoring the strategic role of e-business in driving digital transformation across industries. Key research themes include e-business models, processes, and technologies, along with their effects on organizational performance, customer behavior, and sustainability. Emerging topics like artificial intelligence, big data analytics, and the influence of the COVID-19 pandemic on e-business practices further highlight the field's dynamism. This study provides a comprehensive understanding of e-business research, offering valuable insights for businesses, entrepreneurs, and policymakers to advance digital innovation and foster a robust digital economy.

Keywords— *e-business, digital transformation, innovation, bibliometric analysis, Scopus.*

I. INTRODUCTION

The advancement of digital technologies has transformed e-business, making it an essential element of contemporary commerce in the last ten years. E-business include activities such as online transactions, digital marketing, and customer relationship management, which are crucial for organizations seeking to maintain competitiveness in a globalized market. Research highlights its transformative influence, especially on micro, small, and medium firms (MSMEs), who utilize e-business platforms to improve customer engagement and respond to market demands [1]. Furthermore, researchers have emphasized its impact on customer behavior and operational efficiencies, underscoring its importance [2].

Innovation and digital transformation have concurrently become significant as firms seek to maneuver through a more digital landscape. Digital transformation is the use of new technologies throughout corporate processes, substantially changing value delivery [3]. Innovation is crucial in this context, allowing firms to enhance processes, elevate consumer experiences, and create new business models [4]. The COVID-19 epidemic expedited these initiatives, leading to the extensive use of digital solutions and transforming research on innovation and digital transformation [5].

The connection between e-business and digital transformation is complex and essential. E-business acts as a catalyst for extensive digital transformation efforts, enhancing operational efficiencies and facilitating innovation to meet changing market demands [6]. Businesses that fail to

incorporate e-business strategies jeopardize their relevance in the swiftly changing digital economy, highlighting the need of this integration [7]. Organizations are increasingly acknowledging the strategic importance of e-business, making its alignment with digital transformation crucial for sustainable growth and competitive advantage [8].

Bibliometric analysis offers a robust method for comprehending the progression of e-business research in the context of digital transformation. This approach methodically analyzes extensive literature, discerning trends, patterns, and significant studies [9]. It facilitates the identification of emerging topics, assesses the impact of research, and highlights gaps in the area [10]. These insights are essential for enhancing entrepreneurship research and reinforcing theoretical frameworks [11].

Despite the growth of research on e-business and digital transformation, thorough studies examining their interaction are still scarce [12]. This study aims to fill this vacuum by conducting a bibliometric analysis of worldwide e-business research, emphasizing its significance in digital transformation. This research seeks to enhance comprehension of the role of e-business in facilitating digital transformation across many industries by integrating current studies and detecting developing patterns, while also offering guidance for future investigation [2].

II. RESEARCH METHODS

This study use bibliometric analysis to examine the progression of e-business research in relation to digital transformation during the last ten years. The Scopus database is the principal data source owing to its comprehensive coverage of peer-reviewed literature in fields including business and computer science. Scopus provides a comprehensive platform for analyzing publication trends, citation patterns, and authorship dynamics, guaranteeing that the results accurately reflect the current research landscape [13].

The literature review utilized the terms "e-business" and "digital transformation," together with their synonyms, to guarantee thorough coverage. The precise query employed was: TITLE-ABS-KEY ("e-business" AND "digital transformation") AND PUBYEAR > 2013 AND PUBYEAR < 2025 AND (LIMIT-TO (DOCTYPE, "ar")) AND (LIMIT-TO (SUBJAREA, "COMP")) OR LIMIT-TO (SUBJAREA, "BUSI").

This inquiry concentrated on original research articles published from 2014 to 2024 in the domains of computer science and business. The data retrieval, executed in December 2024, produced 7,981 documents from 127 nations, offering a varied global perspective.

The study utilized the Biblioshiny tool for data analysis, an R-based application recognized for its intuitive interface and robust bibliometric visualization features. Biblioshiny enables the examination of citation networks, co-authorship dynamics, and theme mapping, rendering bibliometric techniques more accessible, even to academics with minimal programming proficiency [14].

A mapping analysis will be performed to discern principal study themes and visually illustrate their interconnections. This method elucidates the intellectual framework of the domain, revealing research clusters and nascent trends in e-business and digital transformation [15]. Thematic mapping seeks to elucidate the intersections and developments within various realms.

Furthermore, trend analysis will assess yearly scientific output and pinpoint prevailing issues in the literature. This study is crucial for comprehending the dynamics of research output and changes in academic interest over time. The study will analyze annual publishing trends to identify emerging themes and monitor the overall growth trajectory of e-business and digital transformation research [16].

III. RESULTS AND DISCUSSION

A. Summary Statistics

The bibliometric analysis of e-business research (2014–2024) reveals significant trends in innovation and digital transformation (Table 1). The dataset comprises 7,981 documents from 1,610 publications, reflecting a substantial yearly growth rate of 36.02%, showing the field's swift development and rising academic interest. The average document age of 2.14 years indicates the field's dynamic and changing character, propelled by technical breakthroughs. The dataset has a moderate to high academic influence and a linked research foundation, with an average of 18.52 citations per document and a total of 403,544 references.

The analysis reveals 14,783 Keywords Plus and 18,406 Author's Keywords, underscoring the heterogeneous and varied nature of e-business research, as well as rising specialist subjects. Authorship data indicates contributions from 18,937 authors, with 998 single-authored publications (12.5% of the total). Each document averages 3.25 co-authors, highlighting the collaborative nature of e-business research. Furthermore, 25.44% of articles feature international co-authorship, indicating robust global knowledge exchange.

The dataset includes exclusively of papers, affirming peer-reviewed journals as the major channel for sharing discoveries. These findings illustrate the swift expansion and current significance of e-business research, the international and cooperative nature of the discipline, and its impact on fostering innovation and tackling the difficulties of digital transformation

TABLE I. SUMMARY STATISTICS

DESCRIPTION	RESULTS
MAIN INFORMATION ABOUT DATA	
Timespan	2014:2024
Sources (Journals, Books, etc)	1610
Documents	7981
Annual Growth Rate %	36.02
Document Average Age	2.14
Average citations per doc	18.52
References	403544
DOCUMENT CONTENTS	
Keywords Plus (ID)	14783
Author's Keywords (DE)	18406
AUTHORS	
Authors	18937
Authors of single-authored docs	924
AUTHORS COLLABORATION	
Single-authored docs	998
Co-Authors per Doc	3.25
International co-authorships %	25.44
DOCUMENT TYPES	
article	7981

B. Annual Scientific Production

The annual scientific output statistics for e-business research from 2014 to 2024 exhibits a distinct and substantial upward trajectory, indicating the increasing significance of this domain in both academia and industry, as shown in Fig.1. In 2014, the field produced a modest total of 104 articles, which experienced minor fluctuations in succeeding years, declining to 99 articles in 2015, followed by an uptick to 141 in 2016 and a tiny decrease to 139 in 2017. Commencing in 2018, the growth trajectory became increasingly evident, with the article count escalating to 214, signifying the onset of a rapid expansion phase.

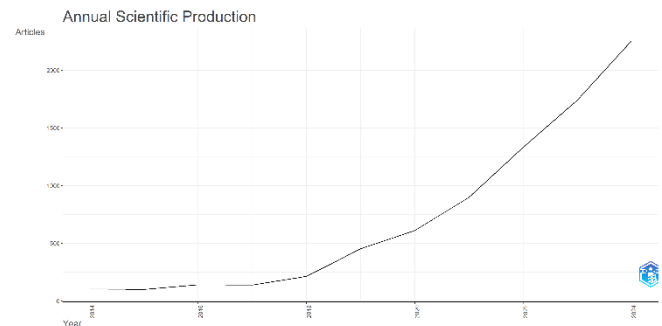


Fig. 1. Annual Scientific Production.

Since 2019, e-business research has undergone exponential expansion. The quantity of publications increased from 214 in 2018 to 452 in 2019, possibly indicating the growing integration of digital technologies and e-business

methodologies across various sectors. The rising trend persisted, with 611 papers produced in 2020 and a significant increase to 897 in 2021. This increase coincided with the global COVID-19 epidemic, which expedited digital transformation and e-business adoption due to extensive lockdowns and the transition to remote work and online transactions.

The years 2022 to 2024 signify an era of unparalleled expansion in e-business research. In 2022, output totaled 1,330 pieces, increasing to 1,740 in 2023, and reaching an astonishing 2,254 in 2024. This significant rise underscores the growing emphasis on e-business innovation and digital transformation as essential elements of contemporary economic and social frameworks. The significant increase in publishing production indicates a vigorous and growing research community, propelled by international collaboration and the imperative to tackle issues and possibilities within the digital economy.

The annual scientific production data highlights the dynamic progression of e-business research during the past decade. The exponential growth in recent years underscores the growing significance of e-business in tackling modern challenges such as digital innovation, technological disruption, and economic transformation. This tendency signifies that e-business research has emerged as a vital field of study, promoting interdisciplinary collaboration and enhancing knowledge in innovation and digital transformation.

C. Trend Topics

The trend analysis of e-business research (2014–2024) indicates shifts in emphasis corresponding to technological and societal transformations, as seen in Fig. 2. During the initial period (2014–2016), fundamental subjects such as e-business processes, hazards, and e-governance were prevalent, highlighting a focus on essential procedures, risk management, and the incorporation of e-business into governmental structures. Technological terminology, including websites, algorithms, and e-business models, has arisen, indicating a focus on the technological and structural dimensions of e-business.

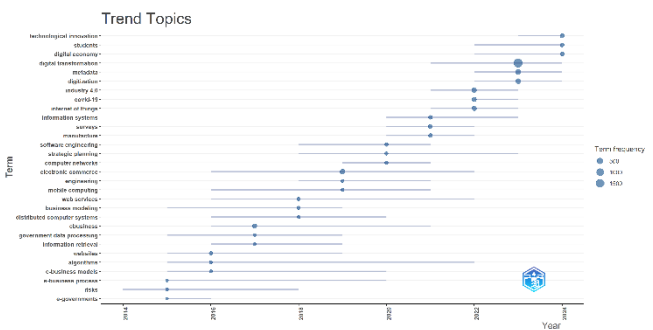


Fig. 2. Trend Topics

Between 2016 and 2019, the emphasis transitioned to practical applications and sophisticated technologies, highlighting subjects such as web services, distributed computing systems, and electronic commerce. This period emphasized endeavors to refine e-business operations and improve information processing. Business modeling and

governmental data processing were examined to enhance strategic planning and decision-making.

The years 2020–2021 signified a substantial transition towards advanced technologies and solutions to global issues. Themes such as software engineering, mobile computing, and computer networks have gained prominence, alongside Industry 4.0 and automation, indicating the use of intelligent technologies in e-business. The emergence of subjects like surveys and manufacturing indicated scholars' investigation into novel approaches and industrial uses.

Beginning in 2021, research shifted focus to global issues and transformational technologies, with digital transformation emerging as the predominant theme by 2023. The swift integration of technologies such as IoT and Industry 4.0 underscored the increasing significance of interconnected devices and sophisticated manufacturing in influencing e-business. The progression of subjects indicates a transition from fundamental themes to strategic planning and digital transformation, underscoring the significance of e-business research in fostering innovation and addressing global disruptions.

D. Three Fields Plot

The Three-Field Plot visually illustrates the interconnections among cited references (CR), authors (AU), and keywords (DE), yielding significant insights into the evolution of e-business research (See Fig. 3). Prominent works, including Vial G.'s 2019 article "Understanding Digital Transformation: A Review and Agenda," are crucial in framing discourse on digital transition. Other notable publications, such as those by Teece et al. on dynamic capacities and Nambisan et al. on digital innovation management, substantially enhance theoretical frameworks in e-business

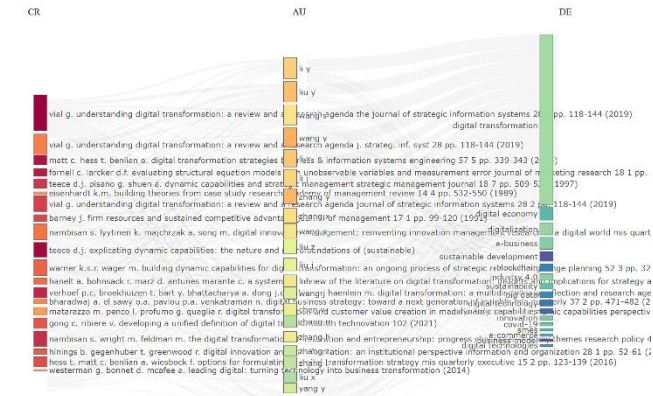


Fig. 3. Three Fields Plot

Notable authors such as Li Y., Liu Y., and Wang J. are crucial to the discipline, underscoring the collaborative essence of e-business research. This interdisciplinary engagement illustrates the extensive scholarly contributions influencing innovation and digital change.

The keyword analysis identifies significant focal points, including "digital transformation," "e-business," "sustainability," "industry 4.0," and "COVID-19." The significance of "digital transformation" underscores its essential function in contemporary e-business, whilst

"industry 4.0" and "COVID-19" highlight current obstacles. Emerging subjects such as "blockchain" and "sustainable development" indicate a growing focus on innovative technologies and sustainable economic frameworks.

The relationships among references, authors, and keywords illustrate how prominent scholars are building upon core theories and tackling contemporary issues such as digital transformation methods and e-business models. The correlation of references with trending keywords highlights the significance of foundational works in tackling developing subjects.

The Three-Field Plot illustrates the dynamic, cooperative essence of e-business research, propelled by significant references, pivotal contributors, and an emphasis on essential themes in innovation and digital transformation. This image depicts the evolving trajectory of the field in reaction to global economic and technological transformations.

E. Thematic Map

The Thematic Map evaluates e-business research themes according to their significance (centrality) and evolution (density), classifying them into four quadrants: Motor Themes, Niche Themes, Emerging or Declining Themes, and Basic Themes (Refer to Fig. 4).

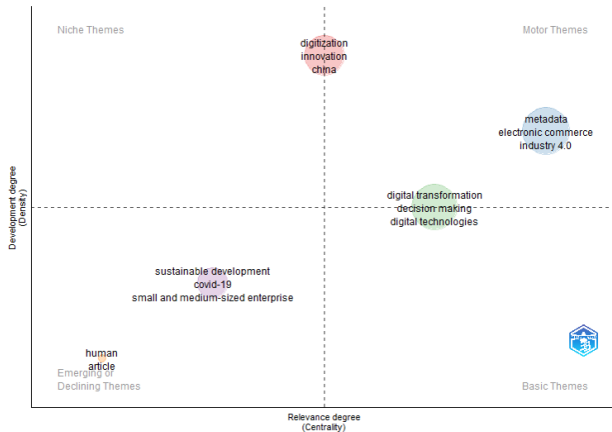


Fig. 4. Thematic Map.

Motor Themes (upper-right quadrant) are thoroughly developed and significantly pertinent subjects, like metadata, electronic commerce, and industry 4.0. These issues are theoretically sophisticated and crucial for the progression of e-business research, influencing the field's trajectory through their substantial density and centrality.

Niche Themes (upper-left quadrant) encompass subjects such as digitization, innovation, and China. These subjects are thoroughly researched yet exhibit constrained links to the wider e-business research landscape. Although specialized or region-specific, they provide essential insights and may impact future research trajectories.

Fundamental Themes (lower-right quadrant), including digital transformation, decision-making, and digital technologies, are essential to the discipline. They demonstrate significant centrality yet reduced density, serving as crucial foundations for nascent research with the potential to transform into pivotal study domains.

The themes that are either emerging or declining (lower-left quadrant) encompass human, article, SMEs, COVID-19, and sustainable development. These issues are inadequately

developed and presently has minimal significance, although may acquire relevance in the future. COVID-19 and sustainable development are current issues that may become central, whilst topics such as human rights and articles may be diminishing or necessitate increased focus.

The Thematic Map delineates the dynamic terrain of e-business research, with Motor Themes propelling the discipline, Basic Themes offering fundamental insights, and Niche and Emerging Themes indicating specialized and underexamined domains for prospective investigation. This report highlights the ongoing adaptation of e-business research to technology improvements and global challenges..

F. Discussion

The growing number of publications in e-business and digital transformation in recent years can be attributed to several key factors.

First, the rapid advancements in digital technologies have reshaped the business world, sparking greater academic interest in understanding the impact of these changes [3], [17]. The integration of information and communication technologies (ICT) into business operations has fundamentally changed how organizations function, compete, and create value, making it essential for researchers to explore the evolving role of e-business in this transformation.

The COVID-19 pandemic has also played a significant role in accelerating the adoption of digital technologies. Businesses had to quickly adjust their operations and customer engagement strategies to accommodate remote work and contactless interactions [5], [18]. This shift has further amplified the academic focus on e-business and its role in long-term digital transformation, as scholars work to understand the lasting effects of this unprecedented disruption [10].

In addition, e-business has gained strategic importance as a driver of organizational agility, innovation, and competitive advantage, fueling research interest in this area [8], [11]. Researchers have been investigating how e-business models, processes, and technologies can be leveraged to enhance digital transformation and improve business performance [19], [20].

The increasing use of bibliometric methods has also contributed to the surge in research. These tools allow researchers to systematically review existing literature, identify emerging trends, and uncover new areas of study, deepening our understanding of e-business and digital transformation [7], [21]. Bibliometric techniques have enabled scholars to map the intellectual landscape of the field, offering clearer insights into its evolution [2], [22].

Finally, the growing focus on sustainability has further driven research in e-business and digital transformation. Researchers are exploring how digital technologies can support sustainable and socially responsible business practices, bridging the gap between sustainability and digital innovation in e-business [12], [23].

The combination of technological advancements, the impact of COVID-19, the strategic importance of e-business, the rise of bibliometric tools, and a focus on sustainability has collectively driven the increase in publications on e-business and digital transformation over the past decade [5], [10], [17].

IV. CONCLUSIONS

From the supplied research details and the analysis performed by bibliometric methodologies, the following conclusions can be derived:

The bibliometric study indicates a notable and consistent upward trend in the publication of research concerning e-business and its convergence with digital transformation over the last ten years. The increase in scholarly output highlights the rising academic interest and acknowledgment of the strategic significance of e-business in fostering innovation and facilitating digital transformation across diverse industries [24].

The mapping analysis and thematic exploration of the literature underscore the complex nature of e-business research, covering diverse topics such as e-business models, processes, technologies, and their effects on organizational performance, customer behavior, and sustainability [25]. The recognition of nascent study subjects, including the influence of artificial intelligence and big data analytics on e-business, underscores the dynamic character of this field and the necessity for ongoing investigation [26].

The trend analysis offers significant insights into the temporal dynamics of e-business research, highlighting the evolving focus and goals within the discipline. The growing significance of digital transformation, Industry 4.0, and the COVID-19 pandemic's effects on e-business practices highlights researchers' adaptability and responsiveness to the swiftly evolving business environment [27], [28]. These findings have significant implications for both the academic community and business practitioners as they traverse the intricacies of the digital economy [29], [30].

V. FUTURE RESEARCH

The bibliometric study of e-business research identifies numerous critical areas for future investigation. A significant area of research is examining the influence of emerging technologies, such as artificial intelligence and big data analytics, on e-business models and their role in facilitating digital transformation ([29], [31]). Researchers can investigate how these technologies streamline processes, improve customer experiences, and drive innovation. An additional focus is on comprehending the distinct obstacles and opportunities encountered by small and medium-sized firms (SMEs), especially in developing nations, in the adoption of e-business strategies and digital transformation [7], [25]. Sustainability is becoming recognised as a critical study focus, with academics investigating the ways in which e-business models might facilitate more sustainable and socially responsible company practices [27], [32]. The amalgamation of e-business strategies with strategic information systems planning (SISP) may facilitate a more efficacious digital transformation [33], [34]. Ultimately, comparative analyses across various locations and industries may elucidate the impact of local and sector-specific factors on the implementation of e-business strategies [35], [36]. Investigating these domains will enhance comprehension of e-business and its significance in fostering innovation, digital transformation, and the advancement of a robust digital economy [20], [26].

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