

# DECENTRALIZED BUSINESS IN THE BLOCKCHAIN ERA: MAPPING RESEARCH TRENDS AND IDENTIFYING FUTURE RESEARCH DIRECTIONS

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## ABSTRACT

The evolution of decentralized business models (DBMs) has fundamentally transformed the global economic landscape, shifting from its initial cryptocurrency-centric origins to a wide array of diverse industrial applications. This study aims to comprehensively map emerging research trends and identify critical knowledge gaps in the field of decentralized business during the current blockchain era. Employing a rigorous Systematic Literature Review (SLR) and bibliometric analysis through the PRISMA framework, a total of 142 eligible documents retrieved from the Scopus database (covering the period 2017–2023) were meticulously analyzed. The findings reveal three distinct evolutionary phases: the initiation phase (2017–2018), stable development (2019–2021), and a recent period of rapid acceleration (2022–2023). Detailed keyword clustering identifies Decentralized Finance (DeFi), Smart Contracts, and Decentralized Autonomous Organizations (DAOs) as the dominant thematic pillars of current academic discourse. Geographically, a "triad" of global leaders consisting of China, the United States, and India dominates the majority of the published research. Despite this rapid growth, significant challenges persist, particularly regarding network scalability, complex regulatory frameworks, and domain-specific security vulnerabilities. This study provides a strategic roadmap for future research, emphasizing the necessary convergence of blockchain technology with the Internet of Things (IoT) and Artificial Intelligence (AI) to foster more automated, transparent, and secure industrial ecosystems for the future global economy.

**Keywords :** Blockchain, Decentralized Business, Business Models, Bibliometric Analysis, DeFi, Smart Contracts.

## INTRODUCTION

The evolution of decentralized business models (DBMs) in the blockchain era represents a fundamental paradigm shift in organizational structures. Initially rooted in the theoretical foundations of cryptocurrencies like Bitcoin and Ethereum, the discourse has matured significantly over the past decade. What began as a security mechanism for peer-to-peer financial transactions has now expanded into a sophisticated digital architecture capable of transforming entire industrial value chains [1]. This transition marks the movement from "Blockchain 1.0" (cryptocurrency) to "Blockchain 3.0," where decentralization is applied to broader organizational governance and complex business ecosystems.

The primary drivers of this digital transformation are multifaceted, blending technological innovation with economic necessity. The convergence of blockchain with emerging technologies such as the Internet of Things (IoT) and Artificial Intelligence (AI) has provided the technical scalability required for real-world deployment [2]. Economically, the shift is driven by the demand for operational efficiency and the elimination of costly intermediaries. By leveraging smart contracts and automated consensus, businesses can achieve unprecedented levels of transparency and trust, which are essential in the modern, globalized economy.

Academic discourse has concurrently shifted from purely technical explorations of

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ledger security to the practical implementation of decentralization in sectors like supply chain and governance. Early research was heavily concentrated on the centralization-decentralization taxonomy within public blockchains [3]. However, contemporary scholars are now focusing on the "value proposition" of blockchain as a disruptive force in digital platforms, exploring how decentralized autonomous organizations (DAOs) can replace traditional corporate hierarchies [4]. This scholarly evolution reflects a growing interest in the socio-technical impacts of blockchain on society and industry.

The current global research landscape is characterized by its interdisciplinary nature, with a strong emphasis on practical frameworks for specific industries. In supply chain management, research highlights how blockchain enhances traceability and decentralized coordination [5]. Similarly, the "Decentralized Finance" (DeFi) movement has become a focal point, illustrating how borderless and permissionless services can democratize financial access. Geographically, the discourse is propelled by a competitive global network of researchers, particularly from the United States, China, and India, who are collectively refining the scalability and security of these decentralized frameworks.

Despite the rapid progress, the decentralized business era still faces significant hurdles, including regulatory uncertainty and integration complexities [6]. This study aims to map these research trends and identify the critical gaps that persist in the current body of knowledge. By

synthesizing the trajectory of decentralized business models, this paper provides a roadmap for both academic inquiry and practical application, ensuring that the transformative potential of blockchain technology is harnessed effectively across diverse global sectors.

## **RESEARCH METHODS**

A Systematic Literature Review (SLR) combined with a bibliometric approach is employed to quantitatively assess the literature, identifying key trends, patterns, and research actors within the discipline of Blockchain and Decentralized Business. By applying established frameworks such as PRISMA (Preferred Reporting Items for Systematic Reviews and Meta Analyses), this methodology ensures a comprehensive and replicable literature assessment, resulting in a clear and transparent overview of the research topic. The PRISMA flow diagram guarantees that the review process is transparent and complete, allowing readers to understand the core procedures used in the review and to examine the reduction (or screening) of irrelevant records [7]. The established inclusion criteria are: (1) articles published up to December 31, 2023, (2) publications in the English language, and (3) a focus on the theme of Blockchain and Decentralized Business Models.

Bibliometric Analysis is a powerful tool for assessing the impact and trends in scientific research. By systematically analyzing large volumes of bibliographic data, this analysis provides valuable insights that can guide the direction of research and

policy making across various academic fields [8][9]. The bibliometric analysis is conducted using software such as VOSViewer to visualize bibliographic data, including citation networks, author collaborations, and keyword co occurrence, thereby uncovering the intellectual structure and dynamics within the field of study. The integration of these two approaches SLR and Bibliometrics offers a holistic understanding of the evolution, historical trajectory, and future directions of the research domain.

The initial stage in this academic study begins with keyword selection, which can be performed through a macro (top down) approach from broad search paths to a narrower focus on more specific studies and topics. Therefore, after considering the limitations of prior research, the main focus is set on using the keywords "Blockchain & Decentralized Business" followed by a more specific refinement using "Blockchain" AND "Decentralised" AND "Business Models" in the article title, abstract, and keywords sections. Subsequently, the Scopus database is utilized by the researchers for conducting extensive literature reviews and monitoring current research trends.

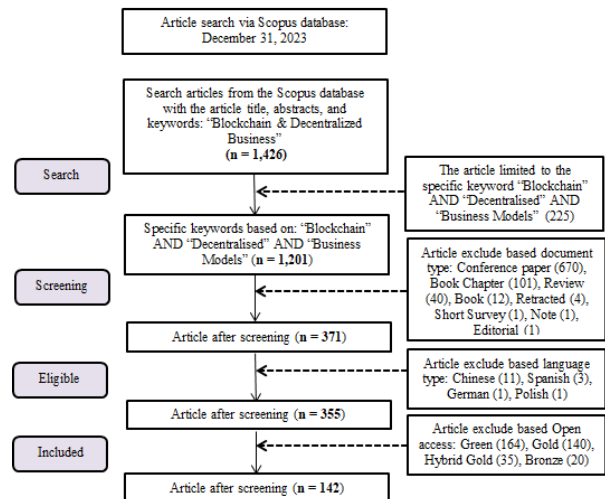


Figure 1. Systematic Literatur Review Information Flow Using PRISMA

Based on the initial search results retrieved from the Scopus database on December 31, 2023, a total of 1,426 documents related to Blockchain & Decentralized Business were identified (See Figure 1). This initial set was compiled using the keyword string applied across the articles' titles, abstracts, and keywords. To narrow the focus, the search was limited to specific keywords: "Blockchain" AND "Decentralised" AND "Business Models", which refined the initial pool to 1,201 documents.

The identified documents subsequently underwent a screening process to categorize and exclude non relevant records based on document type and language. Several document types were excluded at this stage, including Conference Papers (670), Book Chapters (101), Reviews (40), Books (12), Retracted (4), Short Surveys (1), Notes (1), and Editorials (1), which reduced the total number of documents after screening to 371.

A further refinement was performed by excluding articles not written in the English language, specifically excluding Chinese (11), Spanish (3), German (1), and Polish (1), narrowing the set to 355 eligible articles.

The final filtering step involved excluding documents based on specific Open Access categories, including Green (164), Gold (140), Hybrid Gold (35), and Bronze (20), resulting in a final analytical set of 142 documents. These final 142 articles were then subjected to in depth analysis within this study to address the relevant research questions concerning the intellectual structure and emerging trends in Blockchain based business models.

These final 142 articles were then subjected to in depth analysis within this study to provide a comprehensive landscape of the field and to address the following Research Questions (RQs):

**RQ1:** What are the primary intellectual structures and thematic trends within the literature on decentralized business in the current blockchain era?

**RQ2:** Who are the key research actors including influential authors, institutions, and countries contributing to the development of decentralized business research, and what does their collaboration network look like?

**RQ3:** What research gaps and future directions can be synthesized from the current body of knowledge to guide both academic inquiry and practical application in the blockchain era?

## RESEARCH RESULTS

### **RQ1: What are the primary intellectual structures and thematic trends within the literature on decentralized business in the current blockchain era**

This study's findings are based on the 142 articles identified from the Scopus database that specifically address Decentralized Business in the Blockchain Era. The data derived from these articles were meticulously analyzed by examining the total number of publications, annual publication trends, and the key journal sources. Furthermore, the study highlights the most influential elements within the literature on this topic, including the contributing authors, their institutional affiliations, and the countries involved in the research collaboration networks.

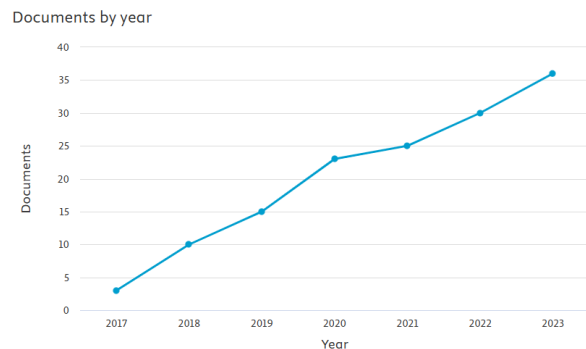


Figure 2. Number of Decentralized Business In The Blockchain Era Publication  
(Source: Scopus database)

Based on the bibliometric data, the evolution of literature concerning decentralized business demonstrates a consistent positive growth trend, which can be categorized into three distinct phases:

1. **Initiation Phase (2017–2018):** In 2017, research in this field was in its infancy with only 3 documents. However, a

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significant surge occurred in 2018, reaching 10 documents (an increase of over 200%).

2. Stable Development Phase (2019–2021): During this period, the number of publications grew organically from 15 documents (2019) to 25 documents (2021).
3. Acceleration and Maturity Phase (2022–2023): The peak of this growth is evident in the last two years, where publications reached 30 documents in 2022 and hit an all-time high of 36 documents in 2023.

Analysis of keyword clusters reveals three primary thematic areas:

1. Core Concepts of Decentralization: Focused on Distributed Ledger Technology (DLT) and Decentralized Autonomous Organizations (DAOs).
2. Innovations and Practical Applications: Dominated by Decentralized Finance (DeFi), Smart Contracts, and Peer-to-Peer (P2P) systems.
3. Strategic Challenges and Oversight: Highlighting Governance, security, and scalability.

**RQ2: Who are the key research actors including influential authors, institutions, and countries contributing to the development of decentralized business research, and what does their collaboration network look like?**

The analysis of the research landscape in decentralized business reveals several key metrics regarding the primary actors involved:

1. Author Contribution

Based on the bibliometric data, the top contributing authors including Al-Turjman, F., Bellavitis, C., Chen, Y., Da

Xu, L., and Kumar, N. each have a consistent output of 2 articles. Authors like Bi, Z. and Li, M. are also noted for their contributions to the field.

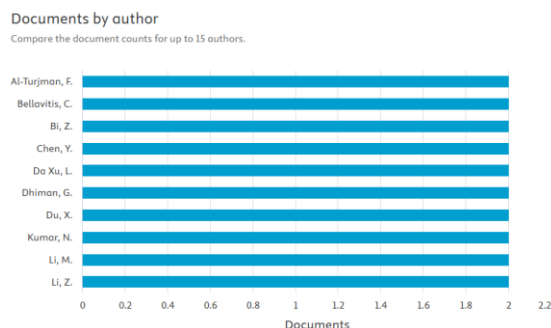


Figure 2. Number of Decentralized Business In The Blockchain Era by Author (Top 10)

(Source: Scopus database)

2. Institutional Affiliation

Leading the global contribution are Thapar Institute of Engineering & Technology, Old Dominion University, and the Chinese Academy of Sciences, each with 4 core publications. A secondary group including Shaanxi Normal University, King Abdulaziz University, The University of Hong Kong, and UNSW Sydney each contributes 3 articles.

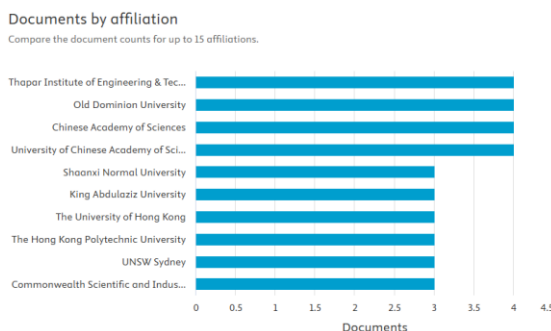


Figure 3. Number of Decentralized Business In The Blockchain Era by Affiliation (Top 10)

(Source: Scopus database)

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3. Geographical Distribution

China, the United States, and India emerge as the most prolific contributors, with 32, 31, and 30 documents respectively. This is followed by a secondary cluster comprising Germany (9), Australia (8), and Canada (8).

Documents by country or territory  
Compare the document counts for up to 15 countries/territories.

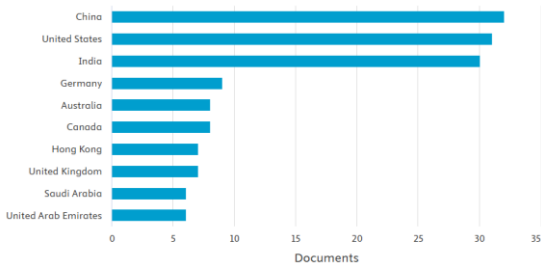


Figure 4. Number of Decentralized Business In The Blockchain Era by Country (Top 10)

(Source: Scopus database)

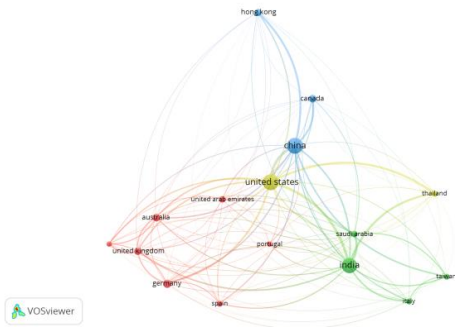


Figure 5. Visualization of countries in the network

(Source: VOSviewer software output)

Table 1. Top Countries/Territories in Decentralized Business Research

Country	Documents	Citations	Total link strength
United States	31	2556	2195
India	30	1677	1953
China	32	1899	1897

United Kingdom	7	697	758
Saudia Arabia	6	612	717
Thailand	5	68	681
Australia	8	1351	601
Germany	9	609	594
France	4	277	472
Taiwan	5	217	461

Source: VOSviewer software output

**RQ3: What research gaps and future directions can be synthesized from the current body of knowledge to guide both academic inquiry and practical application in the blockchain era?**

The bibliometric analysis of keyword co-occurrence identifies the following data patterns regarding research foci and emerging trends:

1. Keyword Co-occurrence Analysis

The study identifies Blockchain (140 occurrences) and Smart Contracts (29 occurrences) as the primary pillars of the existing literature. However, emerging nodes such as Information Management (15), Internet of Things (IoT) (16), and Digital Storage (12) indicate a broadening scope.

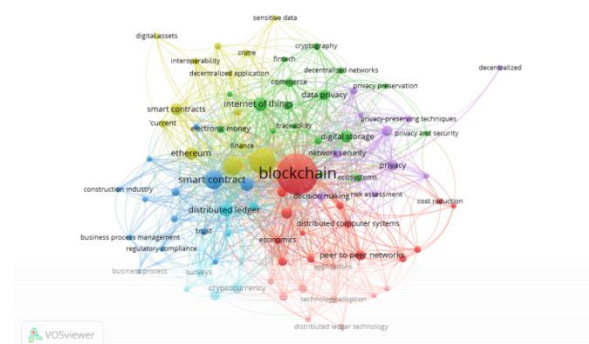


Figure 7. Co-occurrence framework and representation of key terms.

(Source: VOSviewer software output)

2. Key Terms Frequency and Link Strength

The following table summarizes the quantitative data of terms that define the research landscape:

Table 1. Key Terms and Research Foci in Decentralized Business

Keywords	Occurrences	Total Link Strength
Blockchain	140	533
Block-chain	57	323
Decentralised	32	176
Smart Contract	29	160
Distributed Ledger	13	91
Information Management	15	90
Internet of Things	16	88
Digital Storage	12	69
Ethereum	13	63
Security	10	63

**DISCUSSION**

**RQ1: What are the primary intellectual structures and thematic trends within the literature on decentralized business in the current blockchain era?**

The consistent growth in publication volume, reaching its peak in 2023, signifies that decentralized business has transitioned into a "mature research subject." This evolution indicates that academic interest has shifted from basic conceptual introductions toward deeper explorations of complex ecosystems.

The literature highlights that the utilization of DLT serves as the foundation for transparent authority and data distribution without reliance on central entities [10]. This shift has enabled DAOs to operate autonomously through consensus

mechanisms and digital code [11]. The dominance of DeFi and Smart Contracts in the second cluster shows a practical movement toward eliminating intermediaries in the financial sector [12] and automating business agreements [13]. Furthermore, the application of P2P systems in supply chain and renewable energy sectors demonstrates the technology's ability to enhance trust and transparency [14][15].

However, the discourse is not without its hurdles. A significant portion of the literature is dedicated to the technical and regulatory challenges hindering widespread adoption, specifically regarding scalability bottlenecks, smart contract vulnerabilities, and legal uncertainties [20][21]. Researchers emphasize that Governance remains critical, especially in hybrid business models where decentralized and centralized systems intersect [16].

Looking forward, emerging themes highlight a technological convergence. The integration of blockchain with AI and IoT is expected to create smarter coordination systems, while the focus on green technologies suggests a shift toward sustainable business models, such as decentralized carbon credit trading [22][23]. This trajectory signifies a major transformation toward a more autonomous, transparent, and efficient global business ecosystem.

**RQ2: Who are the key research actors including influential authors, institutions, and countries contributing to the development of decentralized business**

**research, and what does their collaboration network look like?**

The authorship analysis reveals a highly balanced and emerging intellectual landscape where no single researcher dominates. This uniform distribution suggests that the field is currently shaped by a diverse collective of experts specializing in different niches, ranging from financial disruption to technical blockchain integration. The collaboration networks indicate an interdisciplinary approach bridging computer science, economics, and strategic management, creating an intellectual structure that is fragmented yet burgeoning.

The institutional concentration within prominent technical universities, particularly the cluster involving the Chinese Academy of Sciences, underscores the critical role of engineering-heavy institutions in driving digital business transformation. The involvement of high-ranking universities from Australia, Hong Kong, and Saudi Arabia demonstrates that interest in the "Blockchain Era" has transcended regional boundaries and gained widespread global traction.

Geographically, the "triad" of China, the United States, and India serves as the primary hub for innovation. The narrow margin between these nations indicates intense academic competition and a shared strategic interest in mastering decentralized technologies. Notably, the United States leads in citations (2556) and link strength (2195), suggesting its research holds high influential weight in the global network.

The inclusion of major financial hubs like the UAE and Hong Kong in the secondary cluster highlights a global shift toward integrating blockchain into international trade. This interconnectedness across diverse economic hubs reflects a collective drive to address technical bottlenecks and regulatory frameworks, ensuring that decentralized business models can eventually be scaled effectively across global markets.

**RQ3: What research gaps and future directions can be synthesized from the current body of knowledge to guide both academic inquiry and practical application in the blockchain era?**

Based on the keyword co-occurrence analysis and the synthesis of literature up to 2023, the discussion regarding research gaps and future trajectories in decentralized business models is categorized into three primary pillars:

1. Technological Paradigm Shift: From Finance to Integrated Digital Ecosystems

While core technologies such as Blockchain (140 occurrences) and Smart Contracts (29 occurrences) are firmly established, the data indicates a significant shift toward broader digital ecosystem integration. These findings suggest that future research directions are no longer confined to pure financial applications (DeFi), but are moving toward a convergence with the Internet of Things (IoT) and Information Management. This synergy aims to create automated industrial data systems and secure Digital Storage solutions. Furthermore, the

relatively low frequency of specific platforms like Ethereum (13 occurrences) compared to general terms highlights a substantial gap in comparative studies between different decentralized infrastructures to test their specific efficiencies across various business sectors.

## 2. Technical Scalability and Performance Hurdles

A primary gap identified in the existing literature is the issue of scalability, low performance in large-scale applications, and high energy consumption. While blockchain offers unprecedented transparency, its operational efficiency for real-time industrial applications remains significantly hindered [24][25]. Consequently, future research must prioritize the development of lightweight algorithms and hybrid models that integrate on-chain and off-chain solutions. This hybrid approach is expected to enhance transaction speeds without compromising data privacy, which is essential for mass adoption across industrial sectors [26].

## 3. Regulatory Frameworks, Governance, and Security

The absence of robust regulatory frameworks and standardized protocols continues to be a major barrier to blockchain adoption in sensitive sectors such as accounting, auditing, and healthcare [27][28]. Additionally, the relatively low frequency of the keyword Security (10 occurrences) suggests that

smart contract vulnerabilities require much deeper exploration. Future focus should be directed toward:

- a. Resilient Governance: Designing governance frameworks that facilitate the seamless integration of blockchain into governmental and high-stakes financial ecosystems.
- b. Formal Verification: Developing formal verification tools and advanced risk assessment frameworks to mitigate code exploitation within smart contracts [25].
- c. Domain-Specific Implementation: Closing the gap between theoretical models and practical application, particularly in the architectural design of decentralized medical data exchange and digital credentialing in the education sector [28][29].

Overall, bridging technical gaps with organizational strategy will provide a more robust framework for the widespread adoption of decentralized business models. The most significant research opportunity lies in exploring the synergy between Blockchain-AI and IoT to support automated decision-making. By aligning technical capabilities with legal compliance, future academic inquiry can accelerate the transition toward an autonomous and transparent post-digital transformation business landscape.

Table 3. Summary of Key Gaps and Future Research Directions

Research Area	Future Focus & Directions	Authors	Reference
Scalability	Development of	Kumar	[24][26]

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& Performance	hybrid models and lightweight protocols for real-time efficiency.	et al.; Huang et al.	]
Regulatory & Governance	Design of robust legal frameworks and standardized compliance protocols.	Zhao et al.	[27]
Domain-Specific Gaps	Tailored architectural designs for healthcare and digital credentialing in education.	Zhang et al.; Srivastava et al.	[28][29]
Security Vulnerabilities	Advanced risk assessment frameworks and formal verification for smart contracts.	Samanta & Chaki	[25]
Emerging Tech Synergy	Exploration of Blockchain-AI and IoT integration for automated decision-making.	Kumar et al.	[24]

**CONCLUSION**

This study concludes that decentralized business research has transitioned from a theoretical niche into a mature academic subject characterized by rapid annual growth and global collaborative efforts. The primary intellectual structure of the field is anchored in Decentralized Finance (DeFi) and Decentralized Autonomous Organizations (DAOs), driven by technological innovations such as smart contracts and IoT integration. While China, the United States, and India lead in publication volume, the United States maintains the highest scholarly impact through extensive citation networks.

However, the "Blockchain Era" still faces substantial hurdles that prevent total industrial adoption. The synthesis of existing knowledge reveals critical gaps in technical

scalability, the absence of standardized global regulatory frameworks, and security vulnerabilities in automated code execution. Future research must bridge these gaps by shifting focus toward interdisciplinary inquiries that combine technical robustness with legal compliance and organizational strategy. Ultimately, the future of decentralized business lies in creating smarter, energy-efficient, and highly integrated systems that can operate seamlessly across international borders.

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