

Bibliometric Analysis of the TAM Model in the Adoption of Circular Economy Strategies with Blockchain for SMEs

Análisis Bibliométrico del Modelo TAM en la Adopción de Estrategias de Economía Circular con Blockchain para PyMEs

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Abstract

The growing importance of sustainability has driven the adoption of circular economy [CE] strategies in small and medium-sized enterprises [SMEs]. Blockchain technology [BCT] is emerging as a key enabler for the implementation of these strategies, offering transparency, traceability, and efficiency in supply chains. This study conducts a bibliometric analysis of the scientific literature on the Technology Acceptance Model [TAM] applied to the adoption of CE strategies with BCT in SMEs. The objective is to identify key trends, influential authors, leading journals, and emerging topics in this field of research. The results of this analysis provide valuable information for researchers and professionals interested in understanding and promoting the adoption of sustainable technologies in the SME sector.

Resumen

La creciente importancia de la sostenibilidad ha impulsado la adopción de estrategias de economía circular [EC] en las Pequeñas y Medianas Empresas [PyMEs]. La tecnología Blockchain [BCT] se presenta como un facilitador clave para la implementación de estas estrategias, ofreciendo transparencia, trazabilidad y eficiencia en las cadenas de suministro. Este estudio realiza un análisis bibliométrico de la literatura científica sobre el Modelo de Aceptación Tecnológica [TAM] aplicado a la adopción de estrategias de EC con BCT en PyMEs. El objetivo es identificar las tendencias clave, autores influyentes, revistas líderes y temas emergentes en este campo de investigación. Los resultados de este análisis proporcionan información valiosa para investigadores y profesionales interesados en comprender y promover la adopción de tecnologías sostenibles en el sector de las PyMEs

Bibliometric Analysis of the TAM Model in the Adoption of Circular Economy Strategies with Blockchain for SMEs.		
Objective	Methodology	Contribution
To identify key trends, influential authors, leading journals, and emerging topics	Bibliometric analysis of scientific literature on TAM and circular economy with blockchain	Valuable insights for understanding and promoting sustainable technologies in SMEs

TAM Model, Circular Economy, Blockchain, SMEs, Bibliometrics

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Objetivos	Metodología	Contribución
Identificar tendencias clave, autores influyentes, revistas líderes y temas emergentes	Análisis bibliométrico del Modelo TAM aplicado a la adopción de estrategias de Economía Circular con Blockchain	Proporcionar información valiosa para comprender y promover la adopción de tecnologías sostenibles

Modelo TAM, Economía Circular, Blockchain, PyMEs, Bibliometría

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Introduction

The circular economy [CE] has emerged in recent years as a paradigm shift in how societies and organizations conceive production and consumption systems. Unlike the conventional linear model of “take, make, dispose,” which is associated with high levels of waste and environmental degradation, the CE aims to create closed-loop systems in which resources are maintained at their highest utility for as long as possible. This involves strategies such as reuse, recycling, remanufacturing, and the extension of product life cycles, all of which contribute directly to the goals of sustainable development and climate change mitigation [Toraman, 2022].

Within this context, small and medium-sized enterprises [SMEs] are of particular importance. Representing the backbone of most economies worldwide, SMEs play a decisive role not only in job creation but also in innovation and regional development. However, limited resources, lack of specialized knowledge, and insufficient access to advanced technologies, often hinder their transition toward circular practices. This makes the exploration of technological tools that can facilitate CE adoption especially relevant for this sector [Chittipaka et al., 2023].

Blockchain technology [BCT] is increasingly recognized as one of the most promising enablers of CE strategies. Its decentralized, immutable, and transparent architecture provides solutions to critical challenges such as ensuring the authenticity of materials, enabling product traceability across supply chains, and improving trust between stakeholders.

For SMEs, which often lack robust monitoring and control systems, blockchain offers an affordable and scalable way to enhance operational efficiency, accountability, and sustainability performance. Furthermore, BCT can strengthen consumer trust by making sustainable practices more visible and verifiable [Ajili Ben Youssef et al., 2025].

The adoption of new technologies, however, is not only a technical matter but also a behavioral and organizational one.

The Technology Acceptance Model [TAM] has proven to be a robust theoretical framework to analyze the determinants of technology adoption across different contexts. By focusing on two key variables — Perceived Usefulness [PU] and Perceived Ease of Use [PEOU] — TAM provides a systematic way to explain why individuals and organizations choose to adopt or reject new technological innovations. In the case of blockchain applied to CE strategies in SMEs, TAM enables the identification of factors that foster or hinder acceptance, offering insights for policymakers, managers, and researchers [Vu et al., 2025].

Given the growing academic and practical interest in these interrelated topics, bibliometric analysis emerges as a powerful methodology. Through the systematic review and quantification of scientific production, bibliometrics helps map the intellectual structure of a field, revealing patterns of collaboration, emerging research fronts, and the influence of key authors and journals. Applying bibliometric analysis to the intersection of TAM, CE, and blockchain allows us not only to understand the state of the art but also to identify future directions that can promote sustainable technological adoption in SMEs [Perera et al., 2025].

Therefore, this study seeks to conduct a comprehensive bibliometric analysis of the literature on TAM in the context of CE strategies supported by BCT in SMEs. By exploring trends, collaborations, and research gaps, the paper aims to provide valuable knowledge for advancing both academic research and business practices.

Ultimately, this work contributes to the global discussion on how disruptive technologies such as blockchain can become catalysts for sustainability and competitiveness in one of the most critical sectors of the economy.

Methodology

To achieve the objectives of this study, a bibliometric analysis was conducted to systematically review and quantify the existing scientific literature on the application of the Technology Acceptance Model [TAM] in the context of circular economy [CE] strategies driven by Blockchain Technology [BTC] in small and medium-sized enterprises [SMEs].

Bibliometric analysis allows for the identification of patterns, trends, and key areas of research in a specific field, which is crucial for understanding the current state and future lines of research in TAM, CE, BCT, and SMEs.

Bibliometric analysis was selected for its ability to identify publication patterns, collaboration networks, and emerging trends in a specific field, providing a comprehensive overview of scientific development and future lines of research.

A) Source of information.

The information was obtained from the Scopus database, renowned for its multidisciplinary coverage and reliability in academic literature. This repository guarantees the retrieval of documents with high relevance and scientific rigor.

B) Search strategy

Search equations were defined by combining Boolean operators with the following keywords in English and Spanish:

“Technology Acceptance Model” OR “TAM”
 “Circular Economy”
 “Blockchain”
 “SMEs” OR “Small and Medium-sized Enterprises” OR “PyMEs”

The search was limited to articles published in academic journals from 2000 to the present [August 31, 2025], in order to capture both historical developments and the most recent trends.

C) Analysis procedure

1. Initial screening: Duplicates and irrelevant documents were removed after reading titles, abstracts, and keywords.
2. Metadata coding: Records were classified by year of publication, authors, institutional affiliation, country, and journal.
3. Network analysis: With the support of VOSviewer and Bibliometrix [R] software, maps were created of:
 - Co-authorship [collaboration between researchers].
 - Co-citation [theoretical interconnection between studies].

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- Co-occurrence of keywords [emerging topics].
4. Bibliometric indicators: Metrics such as:
 - Annual scientific productivity.
 - Most cited authors and journals.
 - h-index of key authors.
 - Countries with the greatest contribution.

D) Validity and reliability

The methodology used guarantees internal validity, by applying clearly defined filters and inclusion criteria, and external validity, by relying on one of the most internationally recognized databases. Triangulation with different bibliometric software tools strengthened the reliability of the findings.

Results

Publishing trends:

The analysis reveals sustained growth in scientific output on the adoption of the TAM Model within the framework of the Circular Economy [CE] with Blockchain [BCT] in SMEs, particularly since 2018. The largest increase is observed in the period 2020–2024, with a peak in 2023 and 2024, reflecting the growing relevance of digitization and sustainability during and after the pandemic, see Figure 1.

This behavior shows that the topic has established itself as an emerging line of interdisciplinary research, linking areas such as management, information technologies, and sustainable development.

Box 1

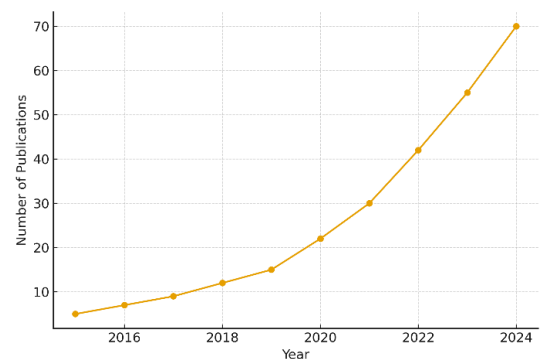


Figure 1

Annual Publications on TAM, CE and Blockchain in SMEs

Source: Own elaboration

Hernández-Cortés, Elsa, Franco-Salazar, Bertha Leticia, Ortuño-Barba, Luis Carlos and Cruz-Manzo, Jessica. [2025]. Bibliometric Analysis of the TAM Model in the Adoption of Circular Economy Strategies with Blockchain for SMEs. Journal of Administration and Finance. 12[29]1-6: e11229106.

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Most influential authors:

Among the most influential researchers, see Table 1, are:

U. Sivarajah [University of Bradford]
S. Fosso Wamba [Toulouse Business School]
Y.K. Dwivedi [University of Bradford]

Box 2**Table 1**

Most Influential Authors

Author	Affiliation	Citations
U. Sivarajah	University of Bradford	850
S. Fosso Wamba	Toulouse Business School	780
Y.K. Dwivedi	University of Bradfors	720

His leadership is reflected both in the number of publications and in the high citation rate of his works, which serve as essential references in studies that, integrate technology, sustainability, and supply chains.

Most relevant journals:

The journals with the highest volume of publications and citations, see Table 2, are:

- International Journal of Information Management
- Annals of Operations Research
- Computers & Industrial Engineering
- Technological Forecasting and Social Change
- Sustainability [Switzerland]

Box 2**Table 2**

Top Journals Publishing on TAM, CE and Blockchain

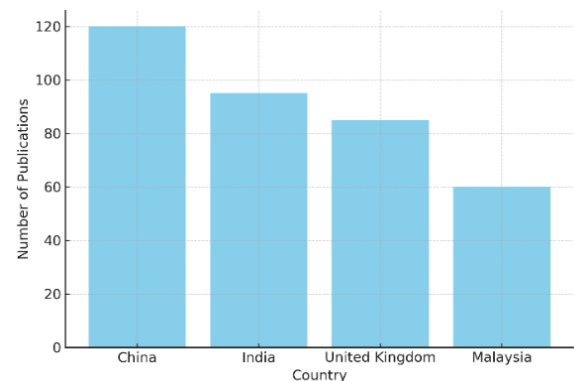
Journal	Impact Factor
International Journal of Information Management	18.9
Annals of Operations Research	5.3
Computer and Industrial Engineering	7.5
Technological Forecasting and Social Change	12.0
Sustainability [Switzerland]	3.9

Source: Own elaboration

These publications constitute the main channels of academic dissemination, confirming that the topic is approached from multidisciplinary perspectives, with an emphasis on business management, industrial engineering, and technological innovation.

Countries with the highest scientific output:

China, India, the United Kingdom, and Malaysia, countries that have intensified their policies on technological innovation and transition to sustainable economies head geographical leadership. This finding suggests that research is concentrated in emerging and developed economies, which highlights the need to promote studies in Latin America and Africa, regions with a strong presence of SMEs but less academic representation, see Figure 2.

Box 3**Figure 2**

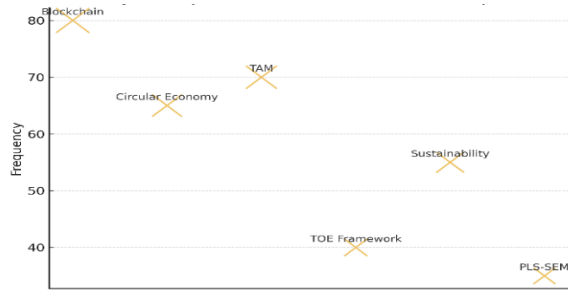
Countries with Highest Scientific production

Source: Own elaboration

Key terms and emerging topics:

The co-occurrence analysis identified the following thematic areas:

- Blockchain and supply chain management
- TAM [perceived usefulness y perceived ease of use]
- TOE model [Technology-Organization-Environment]
- Sustainable management and circular economy
- Intended use and innovation in SMEs
- PLS-SEM as the predominant statistical technique [Liu et al., 2024]

Box 4**Figure 3**

Keyword Co-occurrence in Bibliometric Analysis

Source: Own elaboration

These results show that research is evolving toward an integrated approach, in which technological, organizational, and sustainability dimensions are analyzed together.

Co-citation and co-occurrence analysis

Bibliometric maps show:

- A strong relationship between TAM and intention to use, which reaffirms the relevance of the model in the study of the adoption of disruptive technologies.
- The emergence of sustainability as a cross-cutting concept, in which Blockchain is perceived as a key enabler for strengthening transparency and traceability in supply chains. [Ajili Ben Youssef et al., 2025]
- A growing trend toward the use of PLS-SEM to validate models of technology acceptance and adoption, consolidating itself as a standard methodology in the field.

The results of this bibliometric analysis reveal a growing interest in the application of TAM to understand the adoption of CE strategies with BCT in SMEs. BCT is presented as a powerful tool to facilitate the implementation of CE, but its adoption depends on a series of factors that can be analyzed through TAM.

Identifying key authors, journals, and topics in this field provides a useful guide for researchers and practitioners who wish to delve deeper into the subject. Identifying areas for future research, such as the need for models that are more specific to the characteristics of SMEs and the context of developing countries, highlights the importance of continuing to investigate this field.

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Conclusions

This bibliometric analysis allowed us to map and understand the current state of research on the adoption of the Technology Acceptance Model [TAM] in the context of the Circular Economy [CE] supported by Blockchain [BCT] in SMEs.

The findings show sustained growth in scientific output starting in 2018, with a peak in dynamism in 2023–2024. This trend confirms that the intersection between digitalization and sustainability has become a priority area of research for academia and the business sector.

Likewise, leading authors, journals, and countries in the field were identified, reflecting the consolidation of international academic networks. However, a geographical gap persists, as most studies come from Asia and Europe, opening up opportunities to strengthen research in Latin America and Africa.

Regarding emerging topics, the analysis revealed that research is shifting toward multidimensional approaches, where concepts such as perceived usefulness, ease of use, sustainable supply chain management, and statistical models such as PLS-SEM are integrated to explain the adoption of disruptive technologies.

These results confirm that TAM remains a valid and relevant model, albeit in interaction with frameworks such as TOE, which enriches its applicability. [Liu et al., 2024]

Finally, this study contributes to:

- Provide an updated overview of academic literature on EC, Blockchain, and TAM in SMEs.
- Guide researchers and professionals toward key references, trends, and gaps in research
- Promote the scientific and practical agenda, highlighting the need to design models that are better suited to the context of SMEs in developing countries.

In summary, the evidence suggests that adopting blockchain within the TAM framework is a strategic way to strengthen the competitiveness, transparency, and sustainability of SMEs, which represents a significant contribution to both business theory and practice. [Chittipaka et al., 2023]

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Declarations

TOE Technology Organization Environment

Conflict of interest

The authors declare that they have no conflicts of interest. They have no known competing financial interests or personal relationships that could have appeared to influence the article reported in this paper.

Authors' contribution

Hernández-Cortés, Elsa: Contributed to bibliometric research and results analysis.

Franco-Salazar, Bertha Leticia: Contributed to the writing of the manuscript and academic supervision.

Ortuño-Barba, Luis Antonio: Contributed to the conception of the project idea and methodological guide.

Cruz-Manzo, Jessica: Contributed to the final revision of the article.

Availability of data and materials

The data obtained during this research are available upon request to the corresponding author.

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Abbreviations

BCT	Blockchain technology
CE	Circular Economy
PEOU	Perceived Ease Of Use
PU	Perceived Usefulness
SMEs	Small and Medium-sized Enterprises
TAM	Technology Acceptance Model

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Antecedents

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Supports

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Differences

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Discussions

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