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Investigación
Tecnología e Innovación

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A Bibliometric Analysis of Informática y Sistemas: A University-Based Computer Science Journal

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ABSTRACT

Context: Evaluating scientific output and visibility in regional journals is often difficult due to limited and inconsistent metadata, especially in those managed through Open Journal Systems (OJS). **Objective:** This study aims to analyze the scientific production, collaboration patterns, and citation trends of the journal Informática y Sistemas, published by Universidad Técnica de Manabí (UTM). **Method:** The methodology combines traditional bibliometric analysis with Natural Language Processing (NLP) to classify thematic areas more accurately. Data was collected from the OJS platform and citation information from Dimensions.ai **Results:** Between 2017 and 2025, the journal published 109 articles, with an average of 3.16 authors per paper and a Collaboration Index of 2.84. Despite these numbers, the journal still faces challenges in reaching international visibility, as shown by an average of only 0.16 citations per article. **Conclusions:** These insights can help the editorial team make better strategic decisions to improve the journal's impact and use digital tools more effectively for research management.

Keywords: Bibliometric analysis, OJS, Scientific visibility, Citation metrics, Computer science publishing.

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INTRODUCTION

Bibliometric analysis has become a fundamental tool for evaluating scientific output, identifying citation patterns, collaboration networks, and thematic evolution within academic journals (Cascon Katchadourian et al., 2020). This approach is especially relevant in peripheral academic contexts, where local scientific publications encounter persistent challenges in achieving international visibility. These include limited indexing in global databases, geographical and linguistic biases, and a lack of standardization in editorial metadata (García Villar and GarcíaSantos, 2021).

Scientific journals published at Universidad Técnica de Manabí (UTM), as is common across Latin America, are managed through the Open Journal Systems (OJS) platforman open-access publishing system widely adopted in the region. However, technical and usability limitations have been reported in OJS implementations that hinder efficient extraction and analysis of bibliometric data. Among the main challenges are inconsistencies and incompleteness in metadata, particularly in journals from Latin America, which affect indexing processes and complicate comprehensive analysis (Nogueras Iso et al., 2021; Flores Chávez, 2023). Although previous bibliometric studies have examined scientific production and collaboration patterns across regional contexts (Polanco and Mayorga, 2025; Ravelo Contreras et al., 2020), many rely on traditional data sources and overlook the impact of metadata quality on the reliability of findings. These conditions highlight the need for context-sensitive approaches capable of accurately classifying content, even when working with limited or inconsistent data.

To respond to this need, this study conducts a bibliometric analysis of the journal Informática y Sistemas, edited at UTM. Because of the metadata limitations present in OJS-managed repositories, the analysis incorporates Natural Language Processing (NLP) techniques to support thematic classification, using article

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metadata from OJS and citation data from Dimensions AI. This approach aims to extract meaningful insights from limited and imperfect metadata.

This article aims to characterise scientific production, collaboration patterns, and citation behaviour in the journal Informática y Sistemas, using structured metadata extracted from OJS and citation data from Dimensions. Specifically, the study seeks to answer the following research questions:

(RQ1) What are the publication volume and author participation trends in the journal? (RQ2) How has the thematic focus of the journal evolved over time? (RQ3) What are the main patterns of collaboration among authors? (RQ4) What is the citation impact of the published articles?

This study proposes a structured analytical approach that uses data processing tools to address common metadata issues found in OJS-managed journals. Improving thematic classification and bibliometric analysis helps make better use of available information.

Although focused on the case of UTM, this approach can be adapted by other Latin American institutions interested in improving the evaluation and visibility of their scientific journals.

The remainder of this paper is organized as follows: The materials and procedures are described in Section 2, along with the NLP-based preprocessing and theme classification processes, as well as the data collecting from OJS and Dimensions. The findings and discussion are presented in Section 3, which addresses the study questions about citation impact, collaborative networks, theme evolution, and publication trends. The study's limitations are described in Section 4, along with recommendations for further investigation. The paper's main conclusions and their implications for regional journal management are summarized in Section 5.

MATERIALS AND METHODS

The main analytical and visualization procedures were carried out in the R environment. Data manipulation and restructuring were performed using dplyr (1.2.1) and tidyr (1.3.2), while graphical outputs were generated with ggplot2 (4.0.2). The annual publication plot, the thematic evolution heatmap, and the Sankey diagram representing citation flows by publication year and thematic category were produced within this analytical environment. In the case of the Sankey diagram, networkD3 (0.4.1) was used, with export support through htmlwidgets (1.6.4) and webshot2 (0.1.2) for high-quality output. For science mapping, co-authorship relationships were visualized using VOSviewer (1.6.20), which was used to construct and display the collaboration network reported in the Results section.

Data collection

This stage focused on collecting bibliographic and citation data. The journal *Informática y Sistemas*, managed by UTM, was selected due to its regular publication. Metadata was exported from the institutional OJS system in *.xml* format, while citation and VOSviewer input data was obtained from Dimensions AI in *.csv* format, as OJS does not include citation metrics. Table 1 summarises the variables, descriptions, and data sources used.

The unit of analysis in this study was the individual research article published in the journal *Informática y Sistemas* between 2017 and 2025. A manual verification of the OJS records for the study period showed that the journal corpus consisted exclusively of research articles, with no editorials, brief notes, reviews, or errata identified. Therefore, no document-type exclusion process was required, and the analytical corpus comprised the full set of 109 research articles published during the period examined.

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Table 1. Overview of collected metadata variables and their sources

Variable	*Description*	*Source*
title	Article title.	OJS
abstract	Article abstract.	OJS
keywords	Author-provided keywords.	OJS
publication.date	Date of article publication.	OJS
autor.names	Names of authors.	Dimensions AI
doi	Digital Object Identifier.	OJS
times.cited	Total citations received.	Dimensions AI

Source: Authors

Data preprocessing

Cleaning operations

The field's title, abstract, and keywords were converted to lowercase, cleaned of special characters, tokenised, and stripped of common stopwords to retain relevant terms

Transformation operations

Text fields were standardised in encoding and structure. Author strings were split into lists using delimiters and whitespace trimmed. For co-authorship analysis, author names were normalized to a consistent format (first name plus last two surname parts, if applicable) to ensure accurate identification across publications. The publication.date was parsed to a standard date format, extracting the publication year and computing the year since publication (set to a minimum of 1). Citation counts (times.cited) were converted to numeric, with missing values excluded during later aggregation steps.

Enrichment operations

This stage focused on assigning thematic categories to each article through an ad hoc classification procedure based on Natural Language Processing (NLP) techniques. The procedure analyzed the title and abstract of each article in order to associate the document with thematically related areas derived from the IEEE taxonomy 2025 version. Figure 1 presents the general workflow of this classification process.

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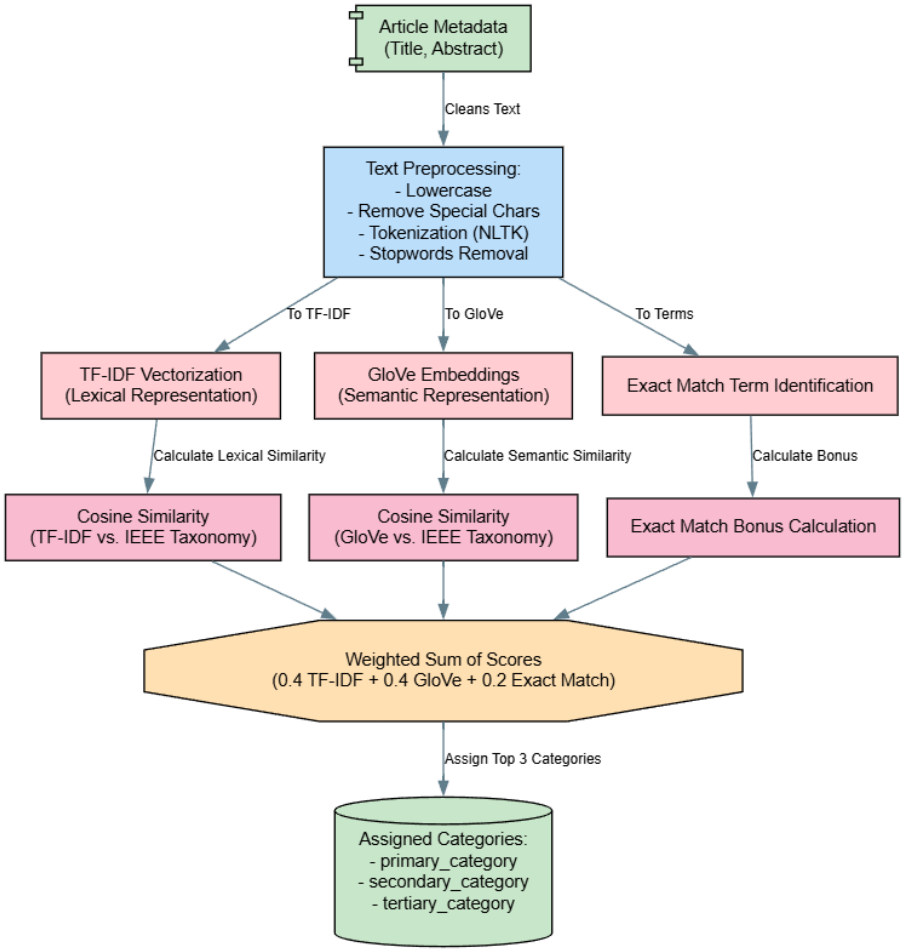

Figure 1. Workflow of the thematic classification process**.**

As illustrated in Figure 1, the cleaned text was processed through three complementary components: (i) lexical representation using TF-IDF vectorization, (ii) semantic representation using pretrained GloVe embeddings, and (iii) exact keyword matching. Lexical and semantic similarities between article content and thematic descriptors were estimated using cosine similarity, while the keyword-matching component assigned an additional score when explicit term overlaps were identified.

The final thematic score was obtained through a weighted combination of these three components. The weighting scheme was defined heuristically in order to balance lexical similarity, semantic proximity, and direct term coincidence within the classification procedure. Based on the resulting scores, the three most relevant thematic labels were assigned to each article as primary, secondary, and tertiary categories. These labels were used as analytical support for the study of thematic patterns in the journal.

Data analysis

The enriched dataset served as the basis for analyzing publication patterns, collaboration dynamics, and thematic trends, following the bibliometric framework proposed by Donthu et al (2021). The techniques applied were organized into two main categories — output analysis and science mapping — and were aligned with the research questions RQ1 to RQ4, as detailed in Table 2.

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Table 2. Overview of Bibliometric Analysis Metrics and Research Questions Addressed

Category	*Metric*	*RQ*
Output Analysis	Total Publications (TP)	1,2
	Number of Unique Authors (NCA)	1,3
	Collaboration Index (CI)	1,4
	Total Citations (TC)	1,3
	Number of Cited Publications (NCP)	1,4
	Proportion of Cited Articles (PCP)	1,4
	Citations per Publication (CCP)	1,4
	Average Years to Impact (AYI)	1,4
	Adjusted Citations (AC)	1
Science Mapping	Co-authorship Network Modeling (CNM)	1,3
	Thematic Evolution Modeling (TEM)	1,2
	Citation Impact Trends Modeling (CITM)	1, 2, 4

Source: Authors

Output analysis

This section quantifies research output and impact (Laengle et al., 2021). *TP* and *NCA* reflect the overall production volume and author participation. The Collaboration Index (CI) was calculated as the ratio between the number of unique authors and the total number of publications included in the corpus. *CI* and the average number of authors per paper were used to characterize co-authorship intensity. *TC*, *NCP*, *PCP*, and *CCP* indicate visibility and citation impact. *AYI* shows the average time between publication and citation, while *AC* metric was used to normalize the citation count based on the age of the publication, providing a more equitable measure of its relative influence throughout the study period.

Science mapping

Science mapping analyses structural relationships in the dataset (Khare and Jain, 2022). *CNM* analyses collaboration by constructing graphs where nodes represent authors and weighted edges indicate co-authorship frequency. *TEM* visualizes changes in research focus over time through a heatmap that cross-tabulates publication years with primary thematic categories. *CITM* analyses annual patterns in publication count, total citations, and average citations per article to describe changes in scholarly influence over time.

Consistency and coherence checks

Basic consistency checks were performed to support the interpretation of thematic trends. In particular, Fisher's Exact Test was applied to the contingency table of publication year and primary thematic category in order to assess whether the observed variation in topic distribution over time was statistically significant.

RESULTS AND DISCUSSION

General production metrics

The journal published a total of 109 articles be-tween 2017 and 2025 (until Vol. 9, Num. 1). TP and NCA show a fluctuating pattern over this period, reflecting variations in research output and author participation. CI reached 2.84, while the average number of authors per paper was 3.16, indicating a moderate level of collaboration (RQ3). Regarding citation performance, the articles accumulated 17 total citations, with PCP equal to 0.10 (10% of articles cited), and a CCP of 0.16. AYI was calculated at 4.82, suggesting a relatively long time to impact. The annual distribution of articles, shown in Figure 2, reveals a fluctuating yet generally

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increasing trend between 2017 and 2025. Peaks occurred in 2018 and 2022, with a notable drop in 2021, likely linked to broader disruptions in research output.

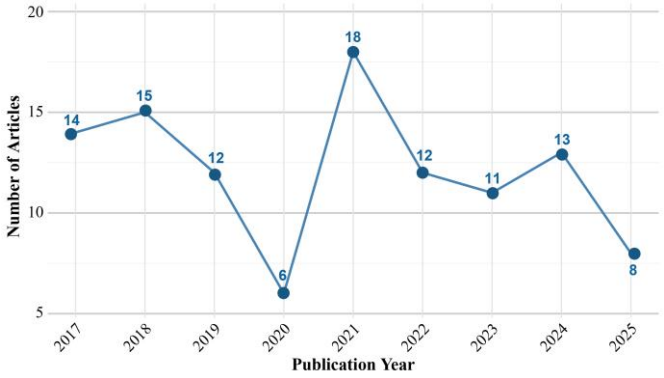

Figure 2. Annual Article Production of the journal**.**

Thematic evolution and Trends

Thematic Evolution Map (TEM) results (Figure 3) show the progression of research themes from 2017 to 2025. Core areas like blockchain and social network analysis remained consistent, while e-learning peaked in 2021. Artificial intelligence showed variability, peaking in 2018 and resurging in 2025. Newer themes such as augmented reality (from 2024) and ethical aspects (2025) have recently emerged. Other topics—including data analytics, DevOps, health informatics, edge computing, and information systems—appeared intermittently. In contrast, themes like biomedical computing, digital twin, smart cities, and cyber-physical systems showed short-lived or declining activity. This thematic shift highlights the journal's responsiveness to emerging trends in computer science.

To assess whether the observed thematic variation across years was statistically non-random, Fisher's Exact Test was applied to the contingency table relating publication year and primary thematic category. The test supported the existence of a significant association between both variables ($p < 0.001$), reinforcing the interpretation of a changing thematic distribution over time.

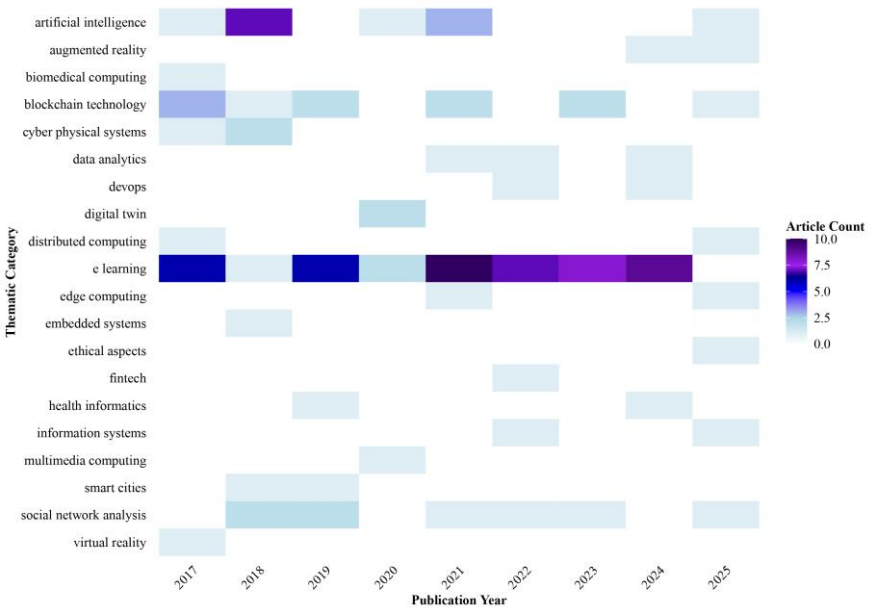

Figure 3. Thematic Evolution Heatmap. Colour intensity indicates article counts by theme and year**.**

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Collaboration networks

CNM analysis identified (Figure 4) a total of 301 authors (nodes) and 430 co-authorship links (edges), resulting in a network density of 0.0095, indicating a relatively sparse network. The connected subnetwork of authors, comprising only 26 out of the 301 total contributors, is organized into four main clusters (Figure 5). This structure reveals a highly fragmented pattern of collaboration, with authors forming isolated pockets of co-authorship rather than a cohesive, interconnected community. The lack of links between these clusters, coupled with the fact that the vast majority of authors are not part of any collaborative network, significantly hinders the broader dissemination of research and contributes to the low visibility and reduced impact of the journal.

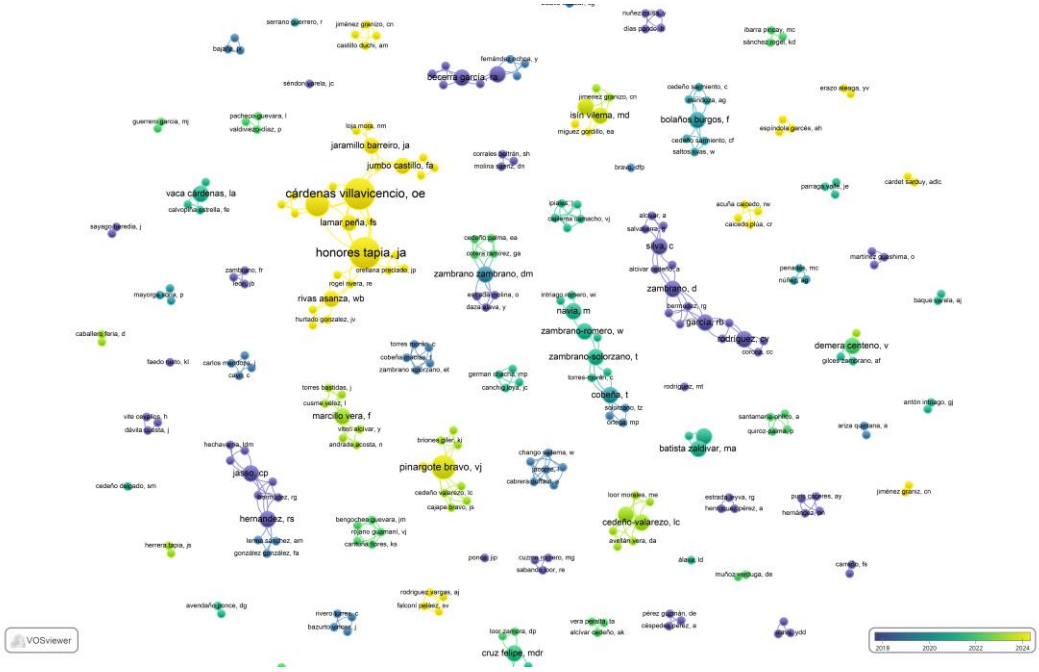

Figure 4. Co-authorship Network with VOSviewer**.**

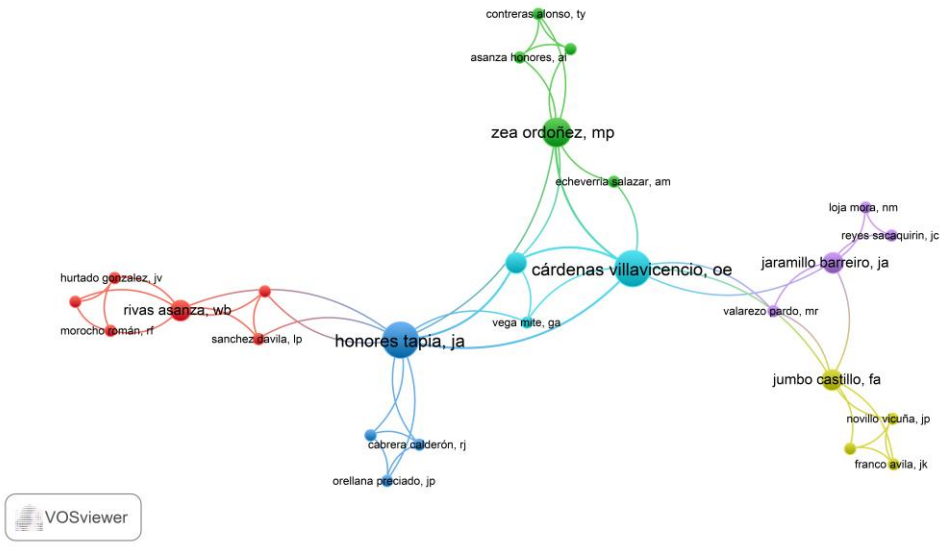

Figure 5. Largest set of Co-Authorship Network with VOSviewer**.**

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Table 3 summarizes the top 10 most prolific and connected authors based on publication count and degree centrality in the co-authorship network.

Table 3. Most Prolific and Structurally Connected Authors

ID	*Publications*	*Degree*
A01	4	12
A02	4	11
A03	2	7
A04	2	7
A05	2	7
A06	2	7
A07	2	6
A08	2	6
A09	2	6
A10	2	6

Source: Authors

In Table 3, Author A01 stands out with four publications and the highest degree centrality (12), suggesting both high productivity and a central role in connecting other researchers. Author A02 follows closely with four publications and 11 co-author connections, indicating strong collaborative influence. The remaining authors (A03-A10) contributed two publications each but maintain relatively high degrees (6–7), highlighting their embeddedness in active research clusters.

Citation Impact

CITM was used to analyze citation distribution across years and themes. Figure 6 shows a Sankey diagram linking publication years (2017–2023) to thematic categories. Flow widths represent citation volume per year-category pair. *E-learning* stands out with five citations and sustained presence across years. Recent citations to *digital twin*, *fintech*, and *devops* suggest emerging high-impact topics. The citation peak in 2018 may reflect particularly visible or influential publications from that year.

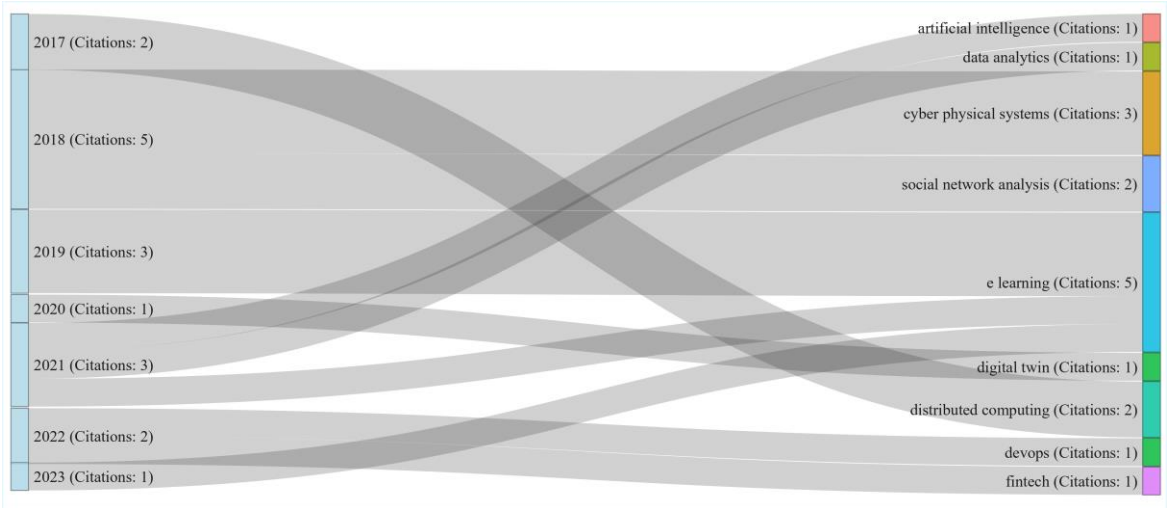

Figure 6. Sankey diagram showing the distribution of citations by publication year and thematic category

Table 4 shows the five most cited articles based on Dimensions data. Despite low citation counts, the results highlight interest in applied topics like assistive technology and precision agriculture, each with three citations, mainly under *e-learning* and *cyber-physical systems*.

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Table 4. *Five most cited articles identified in Dimensions and their primary thematic categories*

Article Title	*Primary Category*	*Citations*
Tecnología asistiva para la comunicación y movilidad de personas con discapacidad motriz	e-learning	3
Raspberry Pi y Arduino: semilleros en innovación tecnológica para la agricultura de precisión	cyber physical systems	3
Análisis explorativo de la seguridad en las redes sociales de los estudiantes de grado medio en la región de El Mante, México	social network análisis	2
Ethical hacking, a methodology to discover security flaws in computer systems using the KALI-LINUX tool	distributed computing	2
Cross-platform application of predictive computational model	e-learning	1

Source: Authors

DISCUSSION

RQ1

The journal published 109 articles during the study period, with a Collaboration Index (CI) of 2.84 and an average of 3.16 authors per publication. These values reflect a trend toward team-based research in computer science (Paphawasit and Wudhikarn, 2022; Delgado-Garcia et al., 2014). This average is consistent with global benchmarks, where studies report co-authorship rates around 2.78--3.0 (Wang et al., 2021; Thelwall and Maflahi, 2022; Wu et al., 2025). A recent analysis on ChatGPT literature (2023--2024) revealed 12,680 authors and 5.6 citations per article, with 26.77% of works involving international co-authorship (Koo, 2025).

Although the journal demonstrates continued editorial activity (Figure 2), its annual output is inconsistent and frequently falls below thresholds considered by primary indexing services. Databases such as Scopus, SciELO, and Web of Science typically favour journals with sustained publication volume—often exceeding 16 articles per year—and stable editorial patterns.

RQ2

The thematic heatmap (Figure 3) shows that topics such as “e-learning," “artificial intelligence," and “cyber-physical systems" remained consistently active. Emerging themes like “digital twin," “ethical aspects," and “fintech" reflect alignment with global trends (Ramirez-Correa et al., 2025; Zhang et al., 2021). “E-learning" peaked in 2021, in line with a 31.28% annual growth in AI applications for education (Putra et al., 2025), while AI-driven video generation diversified from 2020 (Xie et al., 2025). In contrast, themes like “virtual reality" and “embedded systems" showed lower persistence. The significant association between themes and time ($p<0.001$) confirms this evolution.

RQ3

The co-authorship network (Figure 4) included 301 authors and 430 collaborations, with a density of 0.0095---typical of regional academic networks (Nishavathi and Jeyshankar, 2020). This sparsity offers opportunities to diversify partnerships but may also signal fragmented knowledge exchange. Central figures like A01 act as key hubs (Staff, 2022; Gonzalez-Alcaide et al., 2020), vital for information flow but also representing points of dependency. CI and the average number of authors per paper are in line with global norms (Thelwall et al., 2023), but international collaboration remains unmeasured. This is significant given its positive correlation with citation impact (Solis-Pino et al., 2024; Koo, 2025).

RQ4

Figure 6 shows a citation peak in 2018. While recent low counts may reflect citation delay (Herrera-Franco et al., 2021), the overall CCP of 0.16 and PCP of 0.10 indicate limited visibility, a common challenge in regional journals (Taskın et al., 2021). The extremely low number of citations per article makes a year-over-year analysis of the CCP evolution unfeasible. Instead, the analysis reveals that the journal's impact, though minimal overall, is not uniform; rather, it is concentrated within a small number of key articles focused on high-impact topics such as “e-learning", “cyber-physical systems", and “fintech". Focusing on these key themes, reviews, and wider collaboration could enhance citation impact (Ramirez-Correa et al., 2025; Chen et al., 2021).

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Limitations and future research directions

Citation analysis should go beyond Dimensions, as relying on a single source may underestimate actual journal impact. This study combines NLP for thematic classification with traditional bibliometrics, helping to overcome metadata limitations typical of OJS platforms. Despite these efforts, the overall low citation rate (CCP = 0.16) reflects broader issues of limited indexing in major international databases and a consequent lack of international reach. This observation highlights the main challenge facing this and other regional journals.

A notable limitation is the lack of distinction between national and international collaborations, which significantly affect citation outcomes (Garcia-Villar and Garcia-Santos, 2021). Future work should include affiliation analysis to examine hub authors and knowledge diffusion. Moreover, alternative metrics (Bar-Ilan and Halevi, 2020) can capture broader dimensions of visibility and influence, complementing citation-based evaluation and enriching the understanding of research dynamics.

An additional limitation concerns the thematic classification procedure. Although the NLP-based approach was useful for organizing article content under a common thematic structure, the classifier was designed as an ad hoc analytical support tool and was not formally validated against a manually annotated gold-standard dataset. Therefore, the thematic categories reported in this study should be interpreted as analytical approximations intended to support descriptive pattern identification rather than as definitive supervised classifications.

CONCLUSION

This study analyzed the scientific production, collaboration patterns, thematic evolution, and citation performance of the journal Informática y Sistemas between 2017 and 2025 through a combined bibliometric and thematic analysis approach. The results show that the journal has maintained continuous editorial activity during the study period, publishing 109 articles and involving 301 authors. However, this continuity has not yet translated into broad scholarly visibility, as reflected in the low number of citations identified in the analyzed dataset.

The findings indicate a moderate level of collaboration, with an average of 3.16 authors per paper and a Collaboration Index of 2.84, although the co-authorship network remains fragmented and weakly connected. From a thematic perspective, the journal has sustained activity in areas such as artificial intelligence, e-learning, blockchain, and social network analysis, while more recent topics such as augmented reality, ethical aspects, and fintech have appeared only in recent years. This suggests that the journal has been responsive to emerging topics in computer science, although thematic continuity remains uneven across time.

In terms of citation impact, the results point to limited visibility within the citation source considered in this study. With 17 total citations, a proportion of cited publications of 0.10, and an average of 0.16 citations per article, the journal's impact appears to be concentrated in a small subset of papers rather than distributed across its full output. This finding highlights the importance of strengthening editorial visibility, improving indexing coverage, and promoting publication strategies that increase the international reach of the journal.

Methodologically, the study shows that the combined use of bibliometric indicators, thematic classification, and visual mapping can support the analysis of journals affected by incomplete or heterogeneous metadata. In practical terms, the results may help the editorial team identify thematic strengths, recognize structural weaknesses in collaboration, and prioritize actions aimed at improving visibility and citation performance. Future research could expand the analysis by incorporating additional citation sources, refining thematic classification procedures, and distinguishing between national and international collaboration patterns.

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

The authors used Google Gemini and GPT-4 only for minor language edits and took full responsibility for the final content after careful review.

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