

# Exploration of E-Commerce Research: A Bibliometric Analysis

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## ABSTRACT

Electronic commerce is one of the technological tools that emerge as a response to the globalization phenomenon and society's high demand for more competitive companies. Many studies have addressed e-commerce from multiple perspectives and approaches. This study examines the field of electronic commerce knowledge through a bibliometric analysis, mainly embracing technology diffusion, adoption, and acceptance of a Scopus database comprising 226 articles from 2000 to 2020. To analyze the data, we used quality indicators, scientific impact, and structural elements. The results show that, although there is progress in research on electronic commerce, many of the issues addressed and methodologies used are still the objects of study in different countries.

**Keywords:** e-commerce; adoption; diffusion; acceptance; bibliometric analysis

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## 1. INTRODUCTION

The rapid growth of internet access worldwide has given rise to new business models and the emergence of commercialization of products and services through technology; which, according to Al-Qirim [1], can be defined as the science through which useful tools are generated for problem solution, concerning characteristics and abilities of a system, for both software and hardware. In this sense, electronic commerce has become a worldwide phenomenon; however, the reality experienced by developing countries is far behind due to the many factors and obstacles that are keeping it from flourishing. As a technology, electronic commerce covers all aspects of the system, information, procedures, and security, which allow it to differentiate from traditional commerce, and can be defined, according to Turban et al. [2], as the process of buying, selling,

transferring or exchanging products, services or information through computational networks, such as the Internet.

For most companies, electronic commerce is a well-known tool that facilitates their transactions with customers. E-commerce may be considered a widely studied topic. However, it remains relevant within the context of an increasingly heterogeneous business, i.e., developing countries, where the studies on the adoption and acceptance of this type of technology have received less attention [3] and the majority are descriptive, which hinders real theoretical contributions due to their disregard of the local sociocultural framework [4].

According to Ngai and Wat [5], the research works on e-commerce focus on central topics related to technological aspects, applications, support, and implementation. Table (1) shows the different topics covered by research on the subject.

**Table 1.** Classification of e-commerce topics

<b>Technological Aspects</b>	<b>Applications</b>	<b>Support and implementation</b>
<b>Security</b>	Interorganizational systems	Public policy (taxes, legal components, privacy, fraud, trust)
<b>Technological component</b>	Electronic payment systems	Corporate strategy
<b>Network technology</b>	Financial services	
<b>Support systems</b>	Retailing	
<b>Methodologies and algorithms</b>	Publications	
	Auctions	
	Intra-organizational e-commerce	
	Education and training	
	Marketing and publicity	

Source: Compiled by the author based on Ngai and Wat [5].

The research work by Kabanda and Brown [4] identifies multiple e-commerce practices carried out by other companies; these are related to marketing activities focused on image creation through websites, mobile transactions, and problem-solving by the management of business associations.

Such practices might be extrapolated onto any organization. Nonetheless, there are significant barriers for e-commerce acceptance in small and medium enterprises (SMEs); these comprise technical aspects and economic, political, legal, or social hurdles, in addition to regulatory and organizational aspects that are grouped and known as cultural barriers; where economic and organizational barriers are the most relevant [6-7]. Regarding the expansion of e-commerce use, factors such as budgetary restrictions and the conditions of the region like internet access or underqualified IT training and insufficient knowledge, make greater use of technology not possible [8]. In this sense, and to foster the companies' technological expansion, those factors affecting adoption related to technology absorptive capacity by companies must be differentiated [3], as well as the traditional negotiation systems in each region, where the use of cash transactions still prevails [4].

Furthermore, another existing barrier to the implementation of e-commerce in developing countries lies in the logistic models associated with operational status due to internet access and high shipping costs [9]. This situation is resolved when companies invest in their distribution systems. In this scenario, adoption of e-commerce serves as a sales channel through which companies can increase their customer database, and, in the case of SMEs, this process largely depends on the owners' willingness to innovate [10-11].

Among the salient advantages of e-commerce use are eliminating physical and infrastructure barriers in creating a world presence and improving the distribution channels and customer relations [9]. Additionally, this supposes transformations in the purchasing process, such as reducing processing times and the error costs generated by sellers and buyers [12]. In this regard, when designing these types of platforms, recommendations are to account for variables such as visitor's experience, after-sales processes, and user-friendly interfaces that give customers streamlined processes when making their transactions [13].

Currently, e-commerce use has several applications, corresponding to its use by consumers as an extension of credit services is one example Jia, Xue, Fu and Xu [14], research allowed identifying factors that promote enjoying online purchases, from a hedonic point of view, with the premise of later payments and a more experiential vision on consumption. As a result, this study determined the existence of three factors that attract consumers: offering coupons that allow consumers to access discounts or non-monetary rewards using a credit service; raising the credit limits offered by the suppliers to their users; and enriching scenarios by increasing the offers to place payments through e-commerce.

Moreover, in the study of e-commerce for social purposes supported by platforms such as Facebook, a trend is found when detecting that the system's perceived utility is an essential variable for its acceptance by consumers [15].

According to the literature review, clear research lines on e-commerce are identified, mainly focused on its adoption by companies and consumer acceptance. For this, several adoptions and acceptance models have been used to determine those factors that promote the diffusion of e-commerce as transactional means that offer differentiation and, in some cases, competitive advantages for the organizations. Muslim and Sandhyaduhita [16], conclude that by combining the theory of Technology-Organization-Environment (TOE) and the unified theory of acceptance and use of technology (UTAUT), the main factors supporting electronic commerce acceptance are: perceived easiness of use, technological infrastructure, communication, and culture. Likewise, authors conclude that factors inhibiting adoption are related to the perceived benefits, technological infrastructure availability, and commercial compatibility. Besides these factors, it is crucial to consider the cost of adoption, the support from company managers and the government, and the competitive pressure [17-18].

Considering the above research works, the companies' conditions when carrying out e-commerce adoption must also be considered [19]. In this sense, factors such as level of adoption, adoption's length or life-cycle in the company, number of people dedicated to activities related to the technology, and scope of e-commerce use must be evaluated [20].

Despite the existing barriers regarding e-commerce adoption by companies or its acceptance by consumers, research results on the subject are currently used to develop better technologies allowing greater scalability, flexibility, and profitability on these

types of tools. One of the technologies identified in this literature review is cloud computing; Sohaib and Naderpour [21], applying the TOE frame, demonstrated the existence of optimal software for e-commerce implementation in firms employing a multi-criteria decision-making analysis.

## **2. METHODOLOGY**

The work aims to determine the current state of publications on e-commerce through a bibliometric analysis. The scientific study of academic publications serves as a referent for researchers interested in a particular field of knowledge since it can reveal trends in research topics and identify the authors or networks with the most significant influence [22]. Hence, the bibliometric analysis allows quantifying the bibliographic material produced within different disciplines and contributes to the classification of information according to different variables [23].

In line with the above, the work describes the bibliometric analysis results based on the scientific importance of indicators, taking into account amount, scientific impact, and structure gauges.

The source used for conducting the bibliometric analysis to obtain the documents published on e-commerce was the Scopus Database. Applying a structured search equation limited the findings to articles related to acceptance, diffusion, and adoption of this technology; it revealed 388 publications from 2000 to 2018. It is critical to mention that Scopus is a database that indexes citations of scientific publications, which offers broader and more flexible coverage of the results in the study field, and is recognized as one of the search engines with the most efficacy [24].

## **3. RESULTS**

The statistics related to e-commerce publications are presented below, focusing on its acceptance by users and its adoption and diffusion by organizations. The data presented correspond to indicators on the importance and the scientific impact, useful for determining thematic and methodological trends, and proposing improvements in the research study field [25].

### **3.1 Indicators of Scientific Importance**

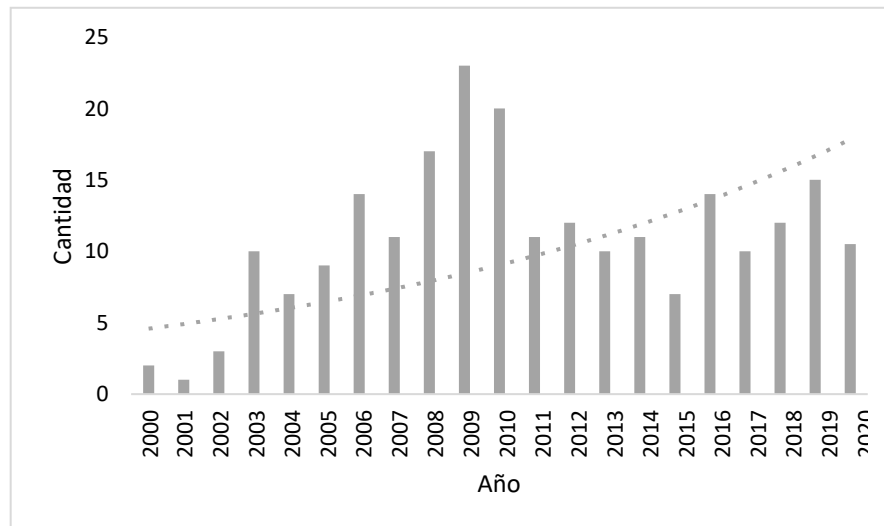
#### **3.1.1 Amount Indicators**

Amount indicators allow determining the productivity of institutions, journals, authors, or research groups in a specific field of knowledge. The number of publications generated at a given period is considered for its calculation [26].

##### **3.1.1.1 Volume of Publications**

The volume of publications in the field of adoption, acceptance, and diffusion of e-commerce shows incremental behavior since 2003, reaching an average of 13 articles between 2006 and 2019. By 2019 a total of 15 publications were added. It must be highlighted that the years with a higher sum of publications are 2006, 2009, and 2010, as shown in Figure 1. In 2006, for example, addressed topics revolved around consumers' recognition of the Internet as a distribution channel. Among these works, Cheng, Sheen, and Lou [27] presented the most remarkable study, with 51 citations: a review of the critical factors influencing the consumers' attitude for accepting the

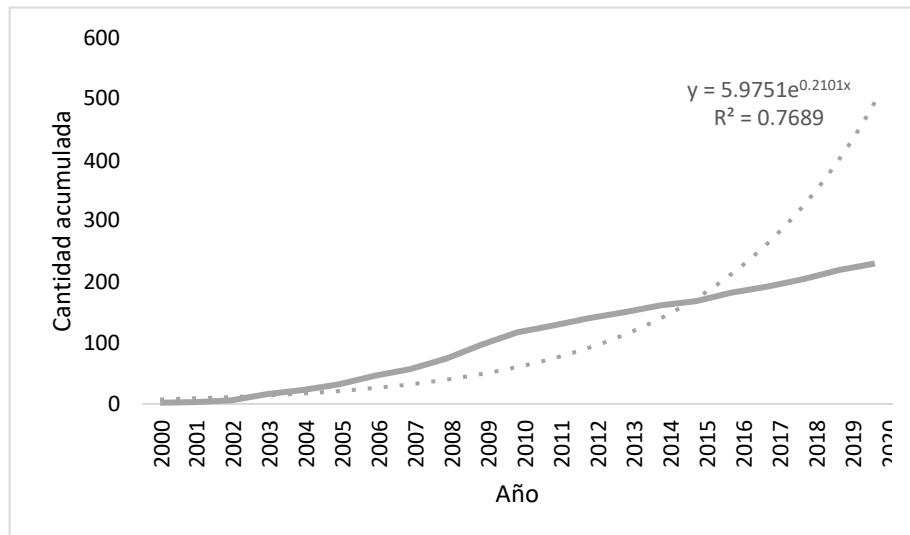
channels' online features that aimed to facilitate e-commerce development, which showed that companies should help their customers recognize the value in such hallmarks (i.e., usefulness) and make them userfriendly. However, for the same year, Zhu, Xu, Kraemer, & Dedrick, [28], contribution to global convergence and local divergence in e-commerce showed that this kind of business was a slow-growing global force urging for managers and legislators who would study the issue.



**Figure 1.** Volume of publications per year. Source: In-house elaboration from the bibliometric analysis

In 2009, research was based on the acceptance and trust of e-commerce; the study by H. bumm Kim, Kim, & Shin, [29], provided valuable information on direct-to-consumer business management in the formulation of internet marketing strategies for airlines. For the year 2010, research on the perspective of e-commerce is presented; it should be noted that the publication with the highest number of citations this year corresponds to the study on social commerce from an electronic commerce perspective, where social commerce is examined through the lens of electronic commerce, i.e., the delivery of electronic commerce activities in social networks and through social software tools [30].

Finally, for the year 2016, the research topics spun around the adoption of e-commerce in small and medium-sized companies, as well as the factors that influence companies and the adoption models of mobile applications [31-33].



**Figure 2.** Accumulated publications per year. Source: In-house elaboration from the bibliometric analysis

According to Figures 1 and 2, it can be claimed that there is a constant trend in the growth of publications on e-commerce, of which 54% corresponds to journal papers, 39% to conference papers, 4% to book chapters, 2% to literature reviews, and the remaining 1% to books and errata. It can also be stated that there is a greater preference of the authors for paper publications and participation in academic events with scientific papers on their research.

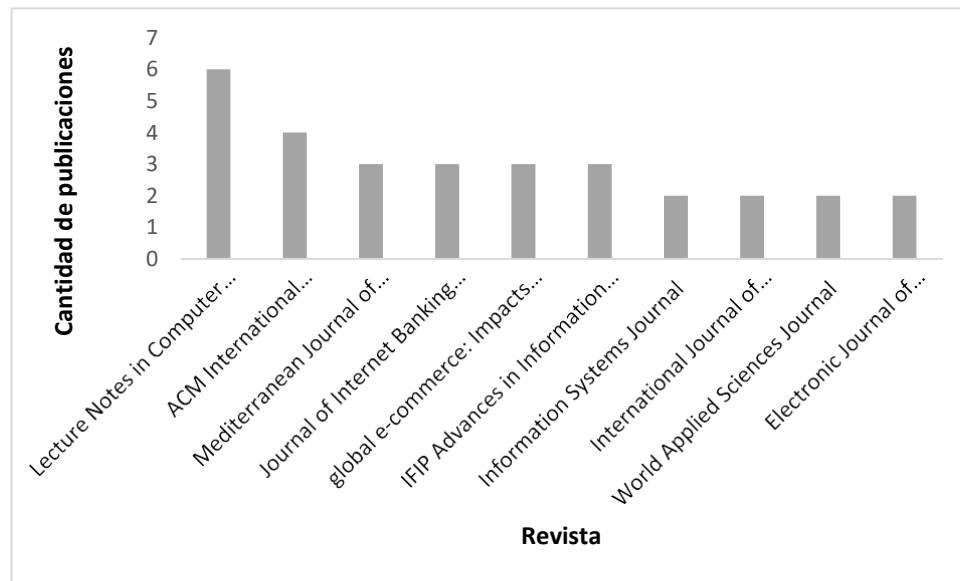
### 3.1.1.2 Publications in journals

Concerning the journals with the highest number of publications, as shown in figure 3, there is "Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)" with a total of 6 publications and designed to provide information on topics about new developments in computer science and information technology research and teaching. Among the many research published by the journal, the study with the highest impact of citations was the work by Pedrinaci, Cardoso, & Leidig, [34], on commerce services at a web-scale, which provided a complete vocabulary to capture and share enriched description services as well as to support e-commerce services in an open, scalable, and highly automated manner. Equally remarkable was Dani & Radha Krishna, [35], work, which presented the E-Check architecture and a trust model for safeguarding transactions to support the Online Electronic Payment System and discussed its implementation protocols.

Besides, the "ACM International Conference Proceeding Series" is the world's largest computer society, brings together educators, researchers, and computer professionals to inspire dialogue, share resources, and address the field's challenges. Among the research presented, topics related to strategies for adopting e-commerce, social commerce, distribution, and logistics stand out.

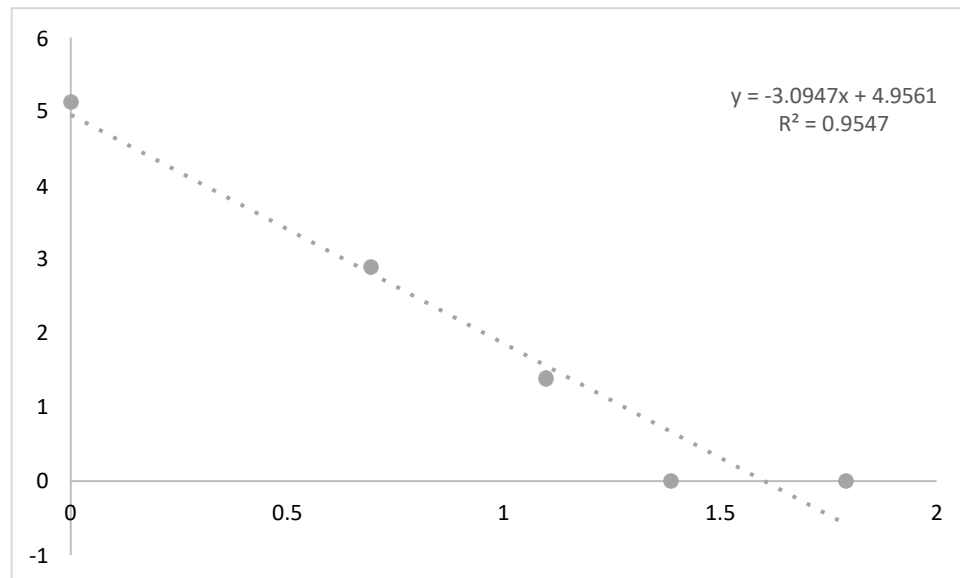
Finally, the magazine Mediterranean Journal of Social Sciences' particular focus is to understand how social sciences are integrated into the new millennium and how they can help society solve the new global problems. The journal's most cited research relates to incorporating technological tools in small companies and creating competitive advantages through them, allowing and promoting prosperity within a global economic environment. Dani & Radha Krishna, [35], study the experiences of women

entrepreneurs in Kenya applying technology and digital marketing platforms to know their impact on the enterprises' growth and development. Figure2: Volume of publications per journal.



**Figure 3.** Volume of publications per journal. Source: In-house elaboration from the bibliometric analysis

By analyzing Pareto's law, it is found that the publications are scattered across a high amount of journals, in which 65% of the sources publish 80% of the documents. To better understand the findings, the journals' percentage was separated by quartiles, obtaining that 11% of the journals publish 25% of the research works, 35% of them publish 50%, and 60% publish 75%. With this information, it can be concluded that there is no prevalence of publications per journals as per the exported database.



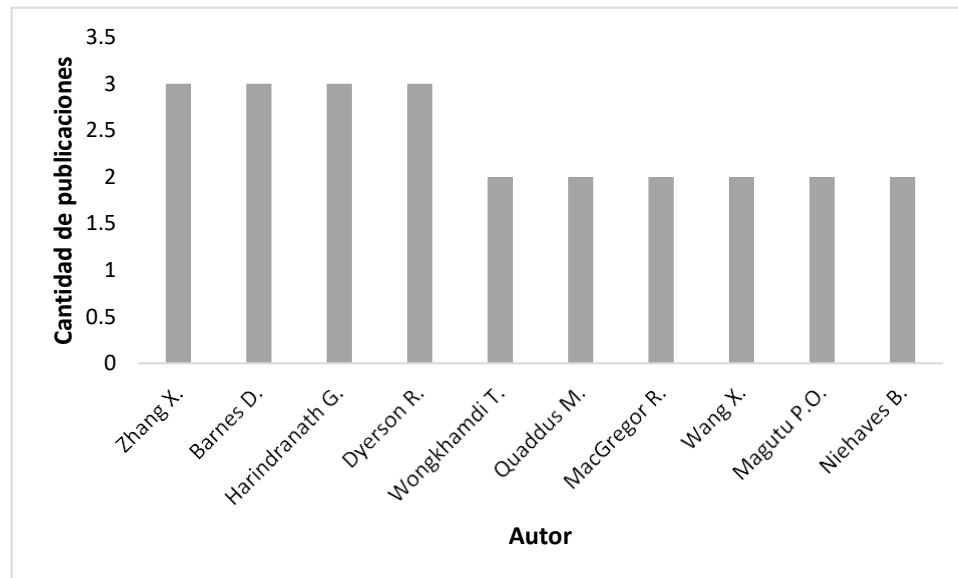
**Figure 4.** Law of journal productivity. Source: In-house elaboration from the bibliometric analysis

Furthermore, following the productivity law in Figure 4, it can be verified that the publications are not concentrated, indicating that the number of journals decreases as the number of works increases. The determination coefficient is 0.9547, which

reinforces the conclusion about specialization in research on e-commerce in terms of adoption, acceptance, and diffusion.

### 3.1.1.3 Publications per author

For the analysis of scientific production per author, the top 10 places are drawn from the number of publications in the study field. It can be observed that there is a maximum of 3 publications, followed by authors with 8, 6, 5, and 4 publications, respectively.



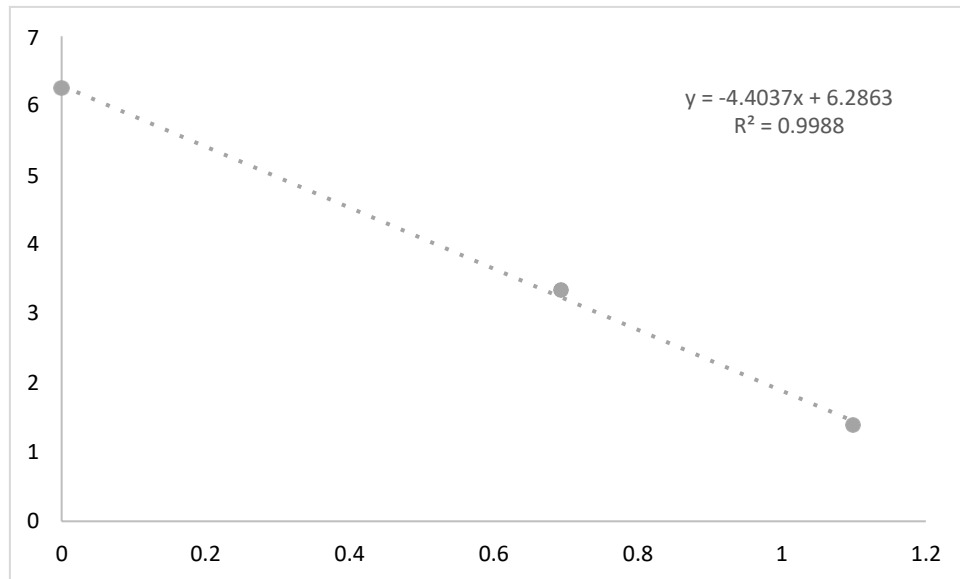
**Figure 5.** Volume of publications per author. Source: In-house elaboration from the bibliometric analysis.

About the four authors with the highest number of publications, there is evidence of a work co-authored by Barnes D, Harindranath G, and Dyerson R in the research carried out, some of them in collaboration with other authors. Author Zhang X submitted a solo post and others in co-authorship. The topics addressed in his research focus on different aspects related to the adoption of electronic commerce by small and medium-sized companies.

A verification of Pareto's Law was applied to strengthen the analysis; results showed that 74% of the authors published 80% of the works. Next, we proceed to subdivide by quartiles to offer a more structured analysis, obtaining that 19% of the authors published 25% of the works, 44% published 50%, and 69% published 75%. According to these results, no author predominance in the field of knowledge is identified.

Furthermore, according to the law of author productivity (Figure 6), it is verified that the publications are not concentrated. The determination coefficient is 0.9988, which reinforces the conclusion on author specialization in the research field of electronic commerce in terms of its adoption, acceptance, and diffusion.



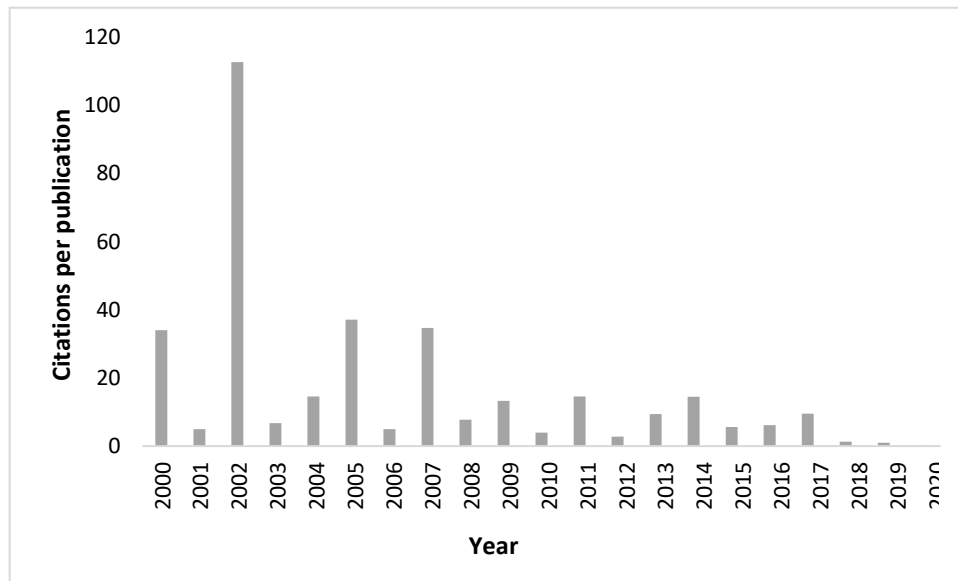


**Figure 6.** Power-law for authors. Source: In-house elaboration from the bibliometric analysis.

### 3.1.2 Scientific impact indicators

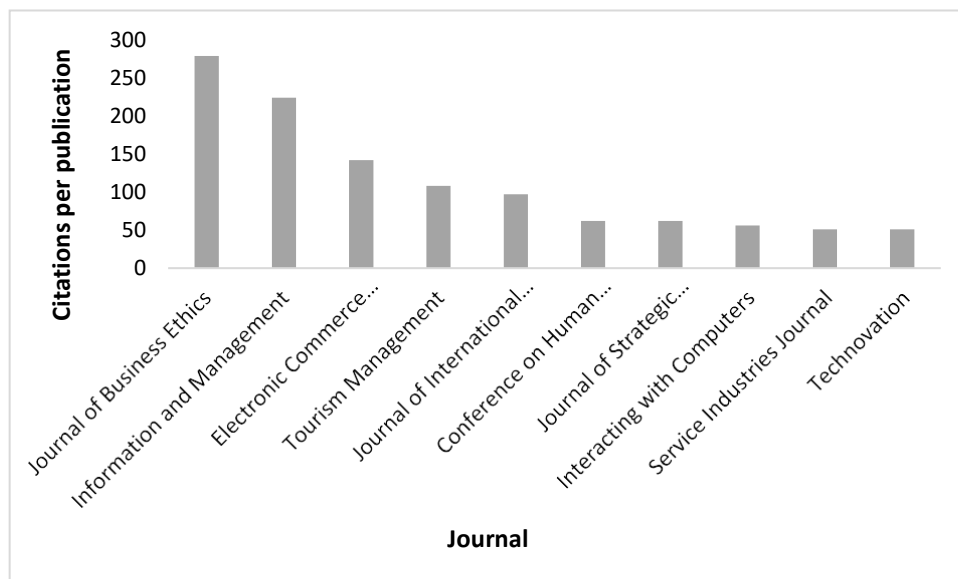
Analyzing citations permits identifying those documents that have been more frequently used in other research works and constitutes an approximation to research impact in this field of knowledge. In this sense, citation analysis allows us to recognize the primary authors and scientific progress [36]. The figures below present citations by year of publication and journal.

The number of citations for the period 2000-2020 is divided by the number of publications made to determine the citation index. In this way, it can be observed, in Figure 7, that the year 2000 generated a total of 312 citations, corresponding to the research work of Egger, [37], which corresponds to the trust of e-commerce services where a model is made. The year with the highest citation corresponds to 2002 with 113, which also gives the illusion to trust and the role played by social media; in this, Grabner-Kraeuter, [38], discussed the different types and trusted sources of trust literature and their importance for trust-related decisions and behaviors in online social media.



**Figure 7.** Citations per year. Source: In-house elaboration from the bibliometric analysis.

When examining the database extracted from Scopus, it can also be determined that the years with the highest impact by the volume of publications are 2005, 2004, 2007, 2009, 2011, and 2014. It must be noted that, although the citations index is calculated on the citations and publications generated during these periods, there are high-impact scientific publications during the mentioned years. Thus, citations per journal are considered, as shown in Figure 8, which allowed us to identify not only the journals with the highest impact but the most influential research works in the field of knowledge.



**Figure 8.** Volume of citations per journal. Source: In-house elaboration from the bibliometric analysis.

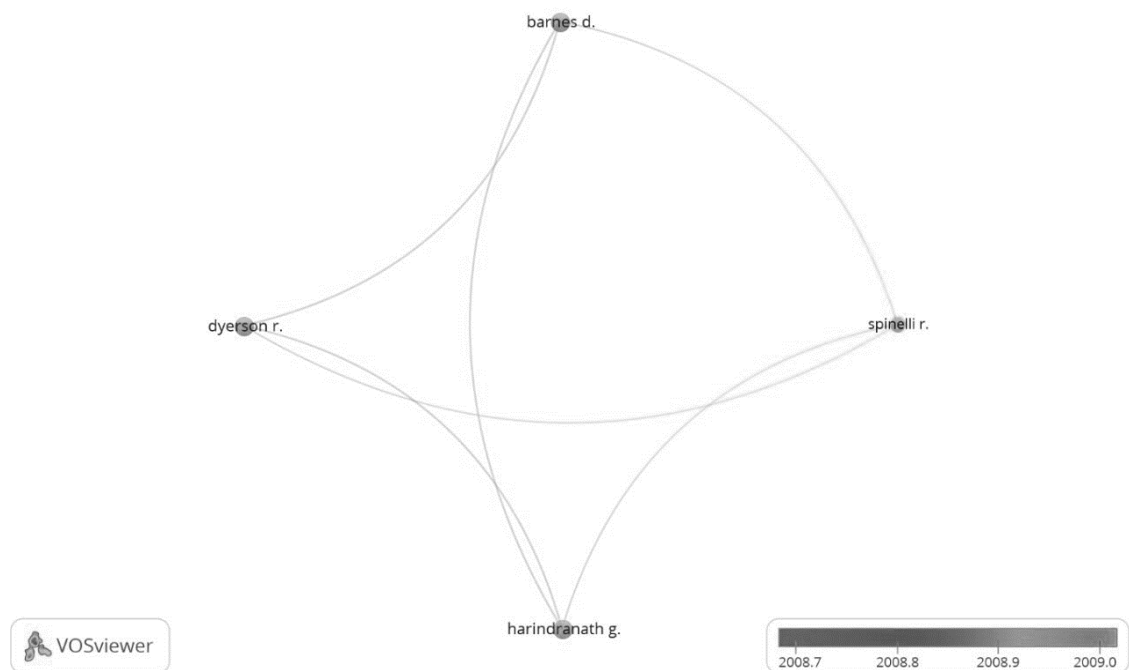
Figure 8 shows the top 10 journals with the highest number of citations directly related to the research works published. In this regard, the journal with the highest impact is "Journal of Business Ethics" which publishes research papers related to ethical business issues seeking to improve the human condition. The magazine "Information and

Management" has a citation index of 224, corresponding to research papers on the adoption of e-commerce in developing countries [39] and business-to-business in China [40]. The journals' publications with the highest number of citations contain research works mainly related to the role of consumer trust in online shopping [38]; it should be noted that this same study was the most cited in 2002.

Comparing Figure 3, which corresponds to the number of publications per journal, and Figure 8, which shows the number of citations per journal, it can be observed that none of the journals with the highest number of publications presents a high citation impact index. Such is coherent with the literature review since the journals with the most publications are not necessarily those whose research works are represented in the study field.

### 3.1.3 Structure indicators

The connection between publications, authors, and knowledge areas is measured through the bibliometric indicators for structure. This analysis serves to determine the associations within social knowledge networks' construction through the nodes and links that make up the networks. The nodes represent the authors and the links the co-authorship [41].



**Figure 9.** Timeline, relationships established in the co-occurrence of authors.

Source: In-house elaboration from VOSviewer

A total of 32 authors were selected from the field of study according to the number of nodes presenting co-authorship relationships. As per the network diameter, it can be seen that co-authored publications include up to 2 authors. Additionally, the connection intensity among the network's authors is low, so it can be stated that dispersion in the production is significant. According to the above, the results indicate that there is a large number of authors publishing on topics related to electronic commerce. The relationships established in the co-occurrence of authors correspond to the study by Dyerson, Harindranath, Barnes, & Spinelli, [42] on the use of information and communication technologies (ICTs) in small and medium-sized companies. When

considering the number of isolated components, it can also be claimed that there is a high number of researchers that publish isolatedly, thus making it difficult for consolidation of research on the topic and advance in the topics already addressed by other researchers.

## **4. CONCLUSIONS**

The field of e-commerce research is a topic of current interest for those organizations that seek to respond to the demands of a globalized world. However, there are different types of barriers, especially for small businesses, which hinder its adoption and diffusion and factors related to user acceptance regarding this type of technology. The research with the most significant impact, in terms of citations, addresses e-commerce adoption and the use of different models such as the technology framework and the role of consumer trust in online purchases. These models identify six components grouped into three categories (pre-purchase knowledge, interface properties, and informational content) and inform the human-computer interaction (HCI) design of e-commerce systems in the sense that their components can be taken as specific high-level user trust requirements [37]. Other widely-used models in the study of electronic commerce acceptance and adoption are the Technology Acceptance Model (TAM) [32-33] and the Theory of Innovation Diffusion [43].

In their analysis, Hong and Zhu [45], demonstrated that the presence of diverse factors such as technology integration, web functionalities, and spending, and use of e-commerce by firms, are relevant predictors of diffusion and positioning of the firms in the market.

From the user's perspective, research works often focused on specific geographic areas, have coincided in establishing factors such as culture, perceived usefulness, usefulness, trust, and intention to use as determinants of e-commerce acceptance, mediated by other variables such as culture and gender [45]. These variables, such as consumer trust in electronic channels, are key factors for determining intention to use [46].

Despite the impact of the studies and advances in the research field, it can be noted through this investigation that both recent and current studies continue approaching the same type of issues, oriented to determining the variables that must be considered in the process of e-commerce adoption and diffusion by firms, or the acceptance models to determine consumers' intention to use. Hence, although there is an advance on the topic, it can be concluded that an impossibility to advance further exists when practical issues, or even the use of research results, are addressed by organizations.

The above argument is also drawn from the results obtained from the structure indicators that showed consolidated research networks in the field but without contact or relationship with other equally consolidated networks, generating a dispersion of the research areas or redundancy about researching the same topics in different countries. In this regard, it is crucial to consider that future research lines on e-commerce should deal with practical e-commerce's implementation's practical issues in organizations and their effects on consumers. Although big firms may have this issue resolved due to their technology investment capacity, implementation strategies for small businesses must be addressed, such as using free software and advisory on its implementation from technology regulatory entities in each country.

## 5. ACKNOWLEDGMENTS

This work has been funded by the Instituto Tecnológico Metropolitano [Metropolitan Technological Institute] (reference: 3302) and the Fundación Universitaria CEIPA [CEIPA University Foundation] (reference: 2727).

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