Article

Research in Electronic and Mobile Payment Systems: A Bibliometric Analysis

Oussama Tounekti *[ID], Antonio Ruiz-Martínez [ID] and Antonio F. Skarmeta Gomez [ID]

Department of Information and Communications Engineering, University of Murcia, 30100 Murcia, Spain; arm@um.es (A.R.-M.); skarmeta@um.es (A.F.S.G.)
* Correspondence: oussama.tounekti@um.es

Abstract: Electronic (mobile) payment systems are an important aspect of e-commerce. However, few reviews highlight the most significant findings and challenges. In this article, we have prepared a bibliometric analysis to provide a statistical overview of previously published research papers on electronic (mobile) payment systems and user preferences, with a particular emphasis on their diverse techniques and analyses, as well as comprehensive and reliable directions to reveal evolutionary nuances and highlighting emerging areas in this specific research. This study reviewed 177 scientific papers published between 2001 and November 2021 in the Web of Science (WoS) database on the subjects of electronic payment systems (EPS) and mobile payment systems (MPS), payment interface (PI), technology acceptance model (TAM), payment frameworks (PF), and user preferences (UP). The amount of studies using the abovementioned topics (EPS, MPS, TAM, PF, and UP) increases annually. Spain, China, and Malaysia are the three main countries that actively participate, and their international academic partnership is relatively close. We have compiled a list of the most relevant publications, prolific authors, institutions, and leading research topics. The articles were used to evaluate bibliometric indicators, analyze research activity, investigate the subject's evolution, and identify the most interconnected themes. The findings provide a comprehensive overview of existing thematic studies, with a notable rising trend showing the potential for future research in the field. The study provides a guideline for further research.

Keywords: bibliometric analysis; literature review; electronic payment systems; mobile payment systems; payment interface; network analysis

1. Introduction

Globally, online electronic (mobile) payments for e-commerce transactions and payments for products and services are increasing [1,2]. Electronic (mobile) payment methods enable faster, cheaper, and more convenient processing. At the same time, they have evolved to improve security and privacy issues [3–5]. Over the past period and during the lockdown caused by the COVID-19 crisis, electronic (mobile) payment services around the world have become increasingly important [6]. The COVID-19 crisis has led to the increased usage of digital payments and accelerated development, notably in e-commerce [7] and mobile payments, which have become appealing in developing areas [8,9].

But, even before COVID-19, we were assisting in the evolution of EPS and MPS and in how they are used. This has derived from intensive research in the field of EPS and MPS. Indeed, several publications can be identified in the academic literature related to different issues regarding EPS and MPS [2–4,10–23]. Namely, some research works have focused on specific issues such as PI [20], TAM [18], PF [15,18,19], and user preferences and acceptance [2,24–26].

Due to the extensive research conducted in this field, we suppose there is a need to synthesize the research conducted in the field and identify study subjects and major concerns. To address this need, a bibliometric analysis was used, one that examines the

overall number of papers, attempts to highlight the basic developments of the topic, and suggests potential research directions in this still-emerging area of knowledge [27].

We decided to use bibliometric analysis because it is a method that allows the analysis of massive amounts of data published on bibliographic databases. Thus, it allows us to cover different research issues, such as assessing and analysing researchers' production, as well as how researchers and institutions collaborate [27]. In our case, its choice is based on the fact that it is capable of providing a statistical evaluation of previous studies [24,28], which joined m-payment and e-payment as well as consumer preferences and acceptance, to identify the related keywords subsumed under these words (i.e., m-payment, consumer preferences, acceptance). It also allows building different networks based on countries, authors, and keywords. Moreover, it exhibits the co-occurrence of keywords and highlights their evolution with other related words. Thus, we have performed a detailed quantitative and network analysis on the aforementioned issues associated with m-payment and e-payment.

In addition, and due to the features, we decided to perform a bibliometric mapping approach to view the state of a research area, as well as what options are available to the researcher to expand their research fields and take new directions in a research field [28, 29]. This research will specifically shed light on the importance of electronic and mobile payment, as well as explore new approaches or relevant timely issues. This paper aims to accomplish two goals: (i) identify relevant papers and authors who have recognized the electronic (mobile) payment system as an important research subject; and (ii) determine the intellectual structure of the domain using a co-citation analysis.

To the best of our knowledge, no previous publication has used this methodology to analyze electronic and mobile payment system studies. With regard to EPS and MPS, we have only found a work that is focused on mobile payment adoption [30]. But it has started to be used in other fields such as the Internet of Things [31] and blockchain [32,33]. Bibliometrics has been used to determine the adoption of mobile payments. Furthermore, as bibliometric studies are suitable for assessing prior keyword-based research and offering relevant themes for future study, we selected it as a time-saving method because of its ability to expose and identify electronic (mobile) payment sources.

In addition, this paper provides an initial overview of electronic and mobile payment articles to visualize the evolution of the research. It attempts to link research in both areas. The originality of the study focuses on the link between keywords and related terms, establishing clusters that draw on the major focus of research and so highlighting areas that are evolving and require more investigation. Furthermore, this paper reviews the primary outline of electronic and mobile installment articles to visualize the investigated advancement. It endeavors to connect and investigate these two areas. The study emphasizes the association between keywords and related words, defining clusters that attract the main research focus, and thereby distinguishing areas that are developing and need further investigation.

The remainder of this article was separated into sections. Comparable studies and the investigation's context are discussed in Section 2. The third section discusses the materials and methods utilized in this analysis, as well as the methodology applied to reach the findings. Then, in Section 4, we disclose our investigation's results. In Section 5, we evaluated the findings, and in Section 6, we discussed the conclusion, implications, and limits of the research.

2. Related Studies and Background

As electronic (mobile) payments become increasingly prevalent, new payment systems are being developed globally to facilitate online payment transactions and support several payment systems [2]. Prior research [1,2,14–17] reveals that the present amount of m/e-commerce research is growing everyday. In addition, on the topic of consumer perceived security and intention to use mobile payment, Jiaxin Zhang et al. (2019) [34] concluded that the use of mobile payment services is responsible for the growth of m-commerce, and they emphasized the importance of perceived security factors from the perspectives

of customization design and consumer acceptance for long-term use. In contrast, this study establishes the groundwork for future research on the influence of perceived security on users' behavioral intentions and suggests that researchers examine the influence of perceived security on further post-adoption behaviors.

Economic systems depend mainly on m-payments technology, which has become one of the driving factors of m/e-commerce development [35]. Due to the expansion of mobile commerce and the establishment of government policy [36], consumers argue that the government provides sufficient policy support for the adoption of online payment. This issue makes its usage more susceptible to government control than the e-payments studied in earlier research [37].

On the other hand, established research has primarily examined m-payments acceptance [38,39], from a broad perspective, along with the technology acceptance model (TAM) [40,41], and the unified theory of acceptance and use of technology (UTAUT).

In particular, there have been bibliometric research studies on the area of MPS as an important topic [30,42]. However, our research is valuable in that it combines the fields of EPS, MPS, PI, TAM, PF, and UP, while previous research has mostly concentrated on a single, limited subject. This study is largely driven by the fact that consumers face new and diverse challenges in digital environments, which affect all facets of society, including personal finances [43].

Our study acquired research papers from a range of sources and conducted a consultation exercise with relevant parties to confirm the findings and provide a better understanding of the field of EPS, MPS, PI, TAM, PF, and UP. Based on the findings, further avenues were suggested.

Abdullah and Mohammed Naved Khan [29] conducted a systematic literature search and bibliometric analysis to better comprehend the field of m-payment, which included a sample of 56 papers published in 44 refereed international journals. They discovered that the number of publications in the field of m-payment has increased since 2014, with the majority of authors hailing from the United States. Also, and based on the findings, it is evident that m-payment research has gained steam, which will result in rapid acceptance and major contributions, particularly in light of the coronavirus crisis. This trend indicates a growing global concentration of research in the Asia-Pacific area, which mostly contains large developing countries such as India and China and a lack of interaction between practicing countries and researchers.

Moreover, on the topic of mobile payment research, research investigation found that Francisco Liébana-Cabanillas, Francisco Muoz-Leiva, and Juan Sánchez-Fernández, all of whom are based in Spain, are the most eminent authors with the most scientific contributions. This review, on the other hand, was compiled using 177 publications from the scientific area of EPS and MPS, PI, TAM, PF, and user preferences and acceptance. Therefore, more research is necessary to identify the research gaps inherent to the area of study and to provide researchers with the means to investigate the previously undiscovered research issue.

In this study, the following research questions (RQs) are addressed:

- RQ (1) Who are the most influential researchers in this field?
- RQ (2) Which countries substantially contribute to scientific research?
- RQ (3) Which keywords, co-occurrence network, and clusters are the most frequently?
- RQ (4) What are the most significant links across countries, authors, author keywords, and sources in this research?
- RQ (5) What are some of the most prevalent research topics in this area of study?

3. Materials and Methods

The main objective of this study is to identify the growth of EPS and MPS literature published between 2001 and 2021 according to the WoS database and to perform a qualitative and quantitative evaluation by analyzing various characteristics of research performance such as publication distribution over years, main authors and network vi-

sualization, citations, source pattern, co-citation network, principal countries, growth of publications, keyword co-occurrence, high-impact journals, degree of collaboration, etc.

3.1. Materials

As part of this study, data were gathered from the Web of Science (WoS) database consulted on the 15 November 2021. Clarivate Web of Science is the main database for collecting citations and scientific information. It is used as an advantage for investigations involving large amounts of data. Furthermore, it serves as a research method delivering a broad variety of scientific assignments across several knowledge disciplines [43,44]. Previous studies have thoroughly validated WoS as a repository of scientific literature [45]. However, it exceeds the first three acknowledged citations and is widely referenced [46].

The WoS is known as the largest indexing database and only one summary has ever been built to be used to monitor and display the search and the literature (Figure 1). The purpose is to deliver scientific research with effective and efficient oversight. To achieve our aims, we have deployed the Bibliometrix package. We have chosen it since, among the different tools to perfom this kind of anlysis, this software (with its user interface Bibliosiny) stands out [27]. Bibliometrix is an open-source R software package for comprehensive scientific mapping analysis (SMA) [47]. We used the free bibliometrix R package (version 4.1.2), R Core Team, Vienna, Austria, to conduct the bibliometric study [47].
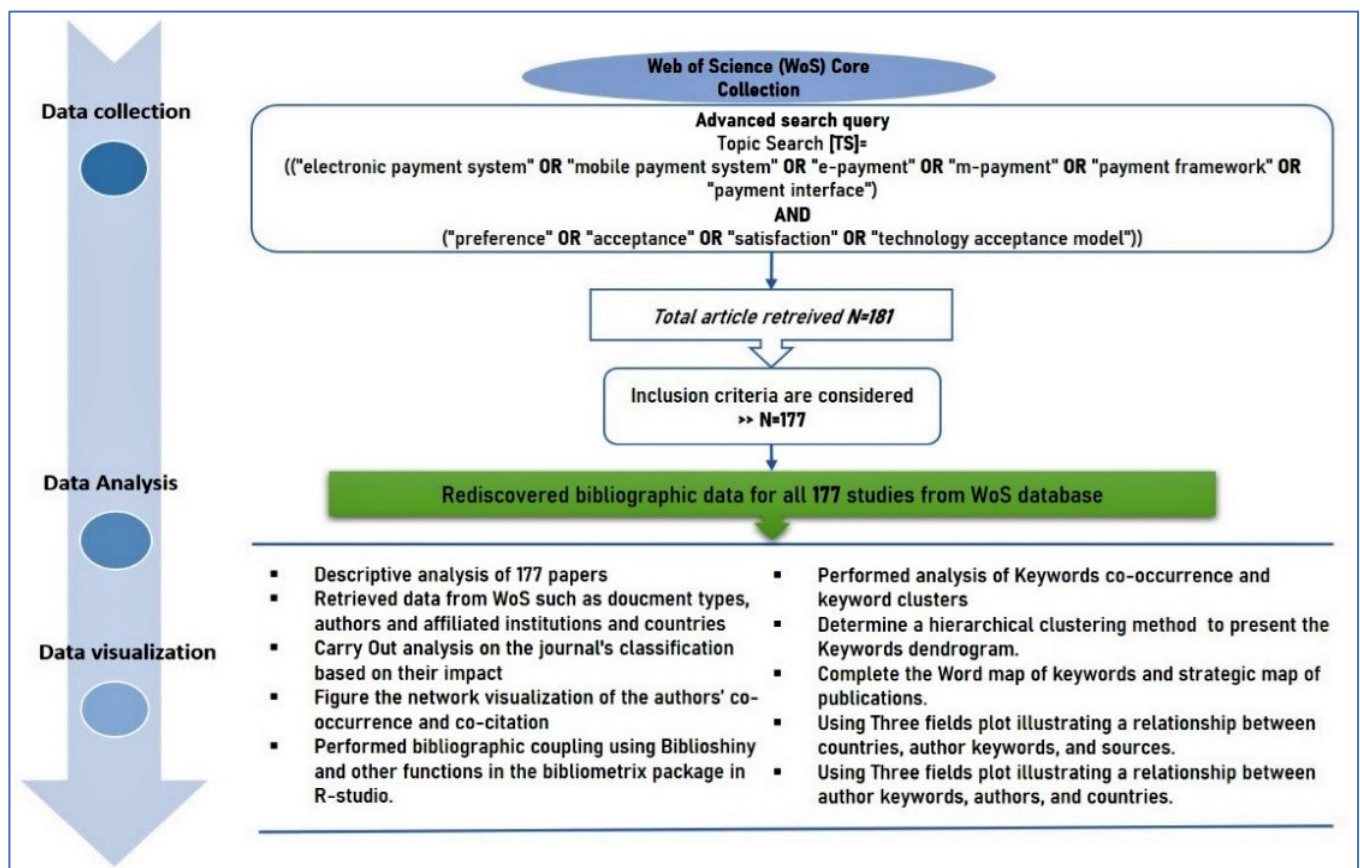

Figure 1. The conceptual model of research.

The package contains methods for bibliometric analysis of published datasets [48]. It is applicable for co-citation, linking, cooperation, co-word, and network analytics [49]. Moreover, biblioshiny which is a dynamic library has been used, because of its capability in performing extensive bibliometric and relevant research analysis. It is a web-based graphical interface driven by bibliometrix [47]. It can read data extracted from many bibliographic sources, such as WoS and Scopus. Furthermore, it facilitates the generation of

several forms of graphs (e.g., annual scientific production, scientific production by country, co-author network, author-affiliate country network, co-citation of cited authors, co-citation model cited sources, thematic evolution, and the collaboration network of the most cited journals by country) that represent the relationships between various components (scholars, affiliations, countries, etc.), a characteristic not found in other repositories [48].

3.2. Methods

Bibliometrics are broadly used in scientific research across a range of disciplines [50,51]. In this study, bibliometric measures are generally performed to (i) explore quantitative literature research [52] and to (ii) analyze and estimate growth patterns for a specific subject using objective evaluation indicators [53]. The conceptual model of our study is shown in Figure 1. Evidently, it starts with the selection of the database employed for this study. WoS [54] was chosen because it has the world's most comprehensive collection of academic journals, books, and conferences in the sciences, social sciences, and arts and humanities, as well as the ability to search throughout the whole citation network [55,56]. Next, the advanced search query is carried out in two parts: first, selecting specific keywords to cover the general and specific topics of our study and, second, carrying out the general and specific subject of our research. Between 2001 to November 2021, there were a total of 181 articles retrieved. We used the following syntax to collect our data:

Topic search [TS] = (("electronic payment system" OR "mobile payment system" OR "e-payment" OR "m-payment" OR "payment framework" OR "payment interface") AND ("preference" OR "acceptance" OR "satisfaction" OR "technology acceptance model")).

We used a set of inclusion criteria to determine which papers would be examined based on the findings. The exact search steps are depicted in Figure 1.

We applied the following criteria for inclusion:

- The article must be written in the English language.
- Between 2001 and November 2021, all WoS-registered sources of scientific article are examined (i.e., Journals, books, and Conferences).
- User acceptance and preferences for electronic (mobile) payment systems, payment frameworks, and payment interfaces should be the focus of the articles' research.

181 articles were recovered, 177 retrieved data from WoS, including information on document type, authors, affiliated institutions, and countries, after applying inclusion criteria. To examine the journal classification, author co-occurrence and co-citation, keywords co-occurrence and clusters, and to determine a variation of leveled clustering strategies to display the valuable directional subjects where they are reflected in this study, biblioshiny and other functions from the bibliometrix package were implemented in R-studio.

4. Results and Analysis

The data collected were analyzed to identify the source type, document type, year, subject area, keywords, author count, and citations. For quantitative analysis, data were presented as frequencies and percentages.

### 4.1. Bibliometric Analysis_General Characteristics

Based on our keyword study, Table 1 summarizes the relevant facts about the studied papers. First, we can see general information about papers. Then, information about document types is found, followed by information about document keywords. In this part, Keywords Plus data are terms that appear often in the headings of an article's references, but not in the article title itself. After that, we show information about authors and, finally, information about a collaboration among authors. From these data, we can point out that the WoS database search result was 177 publications from 2001 to 15 November 2021, covering various topics such as EPS, MPS, PI, consumer acceptance, PF, etc.; the studies were published in 137 reputable peer-reviewed sources. These articles were compiled by 467 authors, and 457 authors of multi-authored papers.

Table 1. Key information about data obtained from the WOS.

Main Information about Data	
Timespan	2001–2021
Sources (Journals, Books, etc.)	137
Documents	177
Average years from publication	5.18
Average citations per document	20
Average citations per year per doc	3.29
References	6964
Document Types	
Article	112
Article; book chapter	4
Article; early access	6
Article; proceedings paper	2
Article; retracted publication	1
Proceedings paper	52
Document Keywords	
Keywords Plus (ID)	315
Author's Keywords (DE)	584
Authors	
Authors	467
Author Appearances	515
Authors of single-authored documents	10
Authors of multi-authored documents	457
Authors Collaboration	
Single-authored documents	10
Documents per Author	0.37
Authors per Document	2.64
Co-Authors per Documents	2.91
Collaboration Index	2.74

10 research papers out of a total of 177 are authored by a single author. The collaboration index of the authors is 2.74. The value of a document per author is 0.37, but the value of an author per document is 2.64. Table 1 provides a summary of the descriptive analysis.

The number of publications on EPS and MPS distribution through time is shown in Figure 2. Since 2001, the number of articles has increased with slight changes. It illustrates the subject's increasing significance. At the beginning of the 21st century, the number of publications was very limited; it does not exceed 1 publication from 2002 to 2005. From 2006 till 2013 there was an obvious increase with fluctuation of the research papers when the highest number was registered in 2010 with 7 papers. From 2013 to 2021, the number of publications rose, reaching a single-year peak of 26 publications in 2020. In 2021, the number is not higher than in 2020, but we should take into account that the query was made in November 2020 and, moreover, that bibliographic databases take some time in reflecting all of the research contained in them [57]. In an increasing trend, the overall number of publications grew. It might be divided into three phases depending on the rate of expansion. The first era, which spanned from 2001 to 2005, has a flattened shape, suggesting that no new publications appeared during that time. The second phase extends from 2006 to 2014, and the moderate slope of the curve illustrates the development of this scientific field via published articles. The last phase is marked by a steeper slope where the quantity of scientific research papers has increased, validating the significance of this study topic (Figure 2). Table 2 indicates that just 5.4% of the total researchers (25 authors) have produced two publications, and that 7.0% of the total researchers (33 authors) have published two or more articles. Additionally, 1.5% of all researchers (7 authors) contributed three publications, whereas 0.2% of all authors (1 author) contributed ten papers.
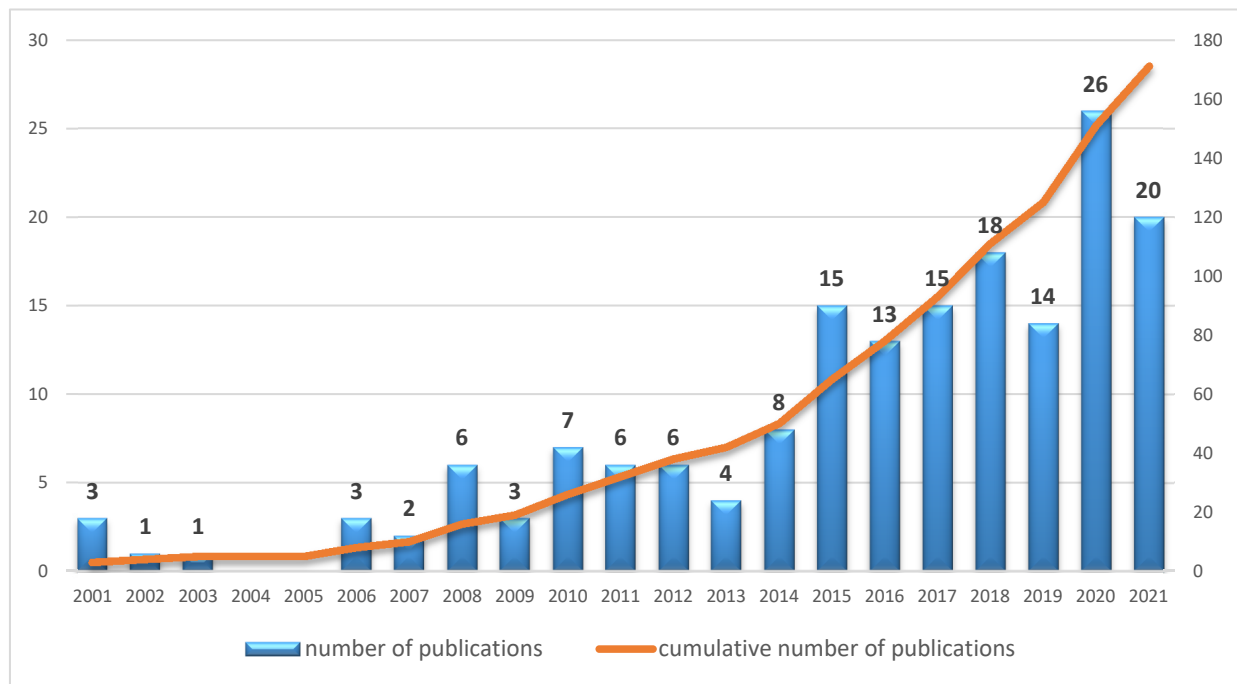
Figure 2. Distribution and cumulative publication over the years.

Table 2. Published articles by corresponding authors.

Number of Articles	Number of Authors	Frequency
1	434	0.929
2	25	0.054
3	7	0.015
10	1	0.002

4.2. Source Patterns

There were a total of 177 papers published in 137 journals between 2001 and 2021. The classification of journals is shown in Table 3, and Figure 3 shows the ten most relevant and highly ranked sources. The first source is the *International Journal of E-Business Research*, which has the highest number of articles (6 publications), followed by several journals with 4 publications each: *Computers in Human Behavior*, *Industrial Management & Data Systems*, the *International Journal of Bank Marketing*, the *International Journal of Mobile Communications*, and the *Sustainability Journal*. The h index is a unique indicator that takes both the efficiency and the impact of total journal citations into consideration. As demonstrated in Table 3, the Journal of Computers in Human Behavior has the greatest h index and total citations, with the first citation occurring in 2010. This table's start year indicates when the first article in this journal was published. *Industrial Management & Data Systems* has 367 citations since its inception in 2014, followed by the international publication *Journal of Mobile Communications* with 290 citations.

4.3. Main Authors and Network Visualization

467 authors in total have been identified. To evaluate the author's dominance, we used the dominance factor (DF), which calculates the proportion of articles in which the author appears first within a group of several authors. According to Table 4, Liebana-Cabanillas, F., from Spain, holds the top spot with a dominance coefficient of 1; he is the primary author of 80% of his published publications (12 papers first-authored over 15 papers total articles). Ladkoom, K, and Pei Y are the second authors, and their dominance factor is 1.

Table 3. Classification of journals based on their impact.

Journal	h_Index	Total Citation	Start Year
Computers in human behavior	4	695	2010
Industrial management and data systems	4	367	2014
International journal of mobile communications	4	290	2008
International journal of information management	2	182	2014
Journal of retailing and consumer services	2	149	2016
Technological forecasting and social change	2	97	2018
Information systems research	1	296	2001
Communications of the association for information systems	1	152	2010
Journal of product innovation management	1	94	2001
Information systems frontiers	1	91	2017

Figure 3. Journals classification based on their publication number.

Table 4. Authors dominance.

Author	Dominance Factor	Total Articles	Multi-Authored	First-Authored	Rank by Articles	Rank by DF
Liebana-Cabanillas F	1.00	15	15	12	1	1
Ladkoom K	1.00	2	2	2	4	1
Pei Y	1.00	2	2	2	4	1
Kalinic Z	0.66	2	3	2	2	4
Khan An	0.66	2	3	2	2	4
Andreev P	0.50	2	2	1	4	6
Chaiyasoonthorn W	0.50	2	2	1	4	6
Kelana B	0.50	2	2	1	4	6
Keramati A	0.50	2	2	1	4	6
Liu Y	0.50	2	2	1	4	6

Figure 4 illustrates the author's production over time. The size of the circles indicates the number of articles, a larger size means more publications. The color of the circles represents the total number of citations per year; a darker color signifies more citations.
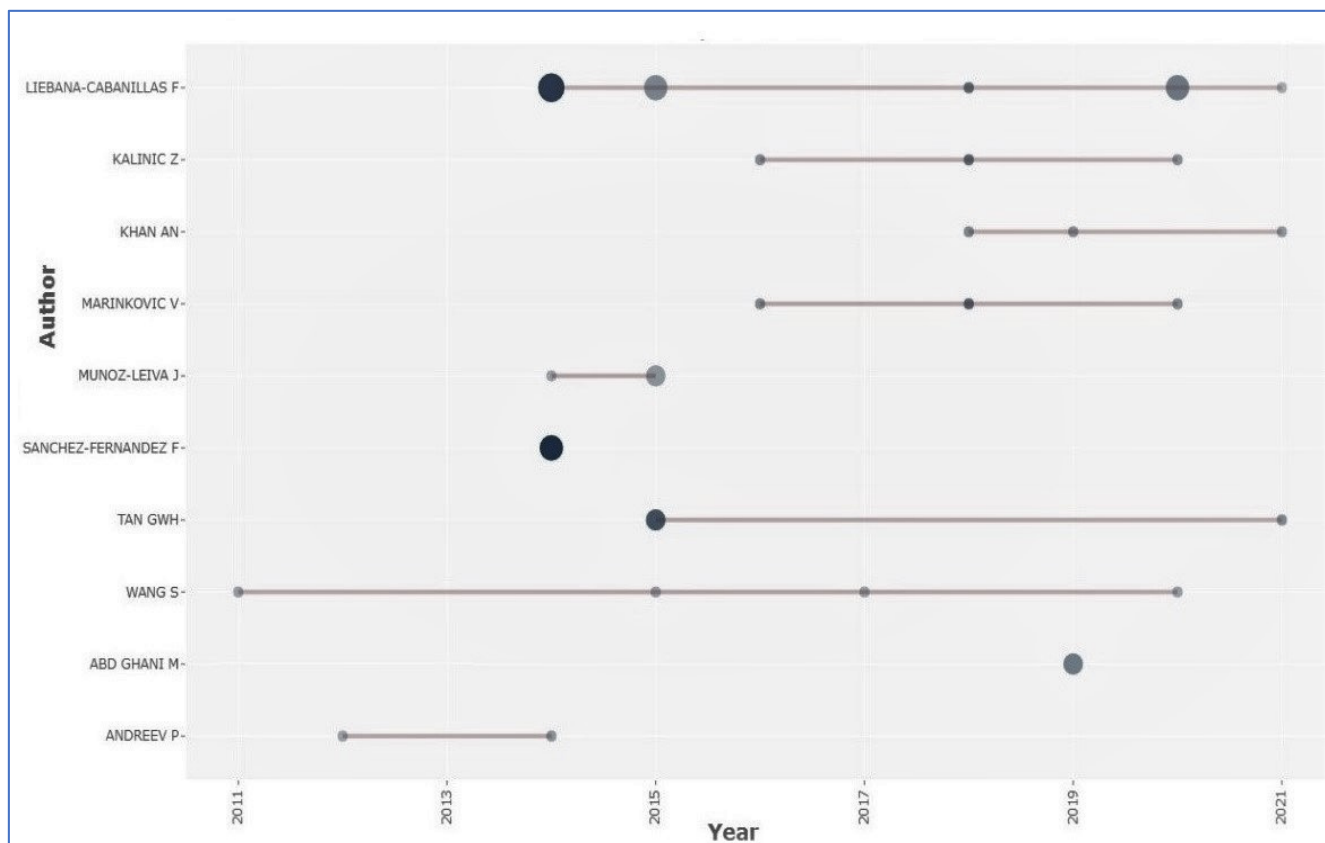

Figure 4. Authors' production over time.

Moreover, Table 5 presents the productivity classification of the authors by total h_index. An analysis of the most prolific and influential authors led to a better understanding of the contribution of each author and their influence in the field of research. Prolific authors are the ones who have created volumes of work and contribute to advancing an area of research [58]. According to Hirsch (2005) [50], the h-index evaluates and characterizes the scientific production of researchers based on citations within a given corpus [59]. Then, the g-index [60] is a variant of the h-index, and it is calculated based on the distribution of citations of a given researcher's publications. It corresponds to the index that favors researchers who have received a very high number of citations for some of their articles.

Table 5. Top 10 authors' productivity classification by total h_index.

Author	h_Index	G_Index	TC	NP	PY_Start
Liebana-Cabanillas F	7	9	468	9	2014
Sanchez-Fernandez F	3	3	363	3	2014
Tan Gwh	3	3	198	3	2015
Kalinic Z	3	3	146	3	2016
Marinkovic V	3	3	146	3	2016
Khan An	3	3	58	3	2018
Lin B	2	2	94	2	2013
Fong Mwl	2	2	49	2	2016
Andreev P	2	2	47	2	2012
Abd Ghani M	2	2	42	2	2019

TC: Total citation, NP: Number of publications, PY_Start: First Year of publication.

Interestingly, Liébana-Cabanillas, F., Sánchez-Fernandez., of Spain, appeared as the most prolific and influential author. Liebana-Cabanillas, F. has the highest h_index (7), with nine publications referred to 468 times. Sanchez-Fernandez, F., comes second with multiple publications (3 articles) cited 363 times with an h_index of three (Table 5). Table 6 presents the most cited articles and journals; the order of the research document is determined according to the number of publications. The ground-breaking paper by Kim et al. (2010) [40] makes a substantial contribution to the intention to use mobile payment research. The publication of their article "An empirical examination of factors influencing the intention to use mobile payment" in the journal *Computer in Human Behavior* has set the basis for empirical research in compensation. The second cited article, published in the *Journal of Retailing and Consumer Services*, was provided by De kerviler et al. (2016) [61]. Their work examined the effect of the perceived risk and convenience on the adoption of in-store mobile payment users using m-payment service characteristics.

Table 6. Most cited research papers and journals.

	Authors	Source	Title	TC	TC/Year
1	Kim et al. (2010) [40]	Computers in human behavior	An empirical examination of factors influencing the intention to use mobile payment	424	32.6
2	De kerviler et al. (2016) [61]	Journal of retailing and consumer services	Adoption of in-store mobile payment: are perceived risk and convenience the only drivers?	140	20
3	Liébana-Cabanillas et al. (2014) [62]	Computers in human behavior	Antecedents of the adoption of the new mobile payment systems: the moderating effect of age	172	19.1
4	Liébana-Cabanillas et al. (2018) [63]	Technological forecasting and social change	Predicting the determinants of mobile payment acceptance: a hybrid sem-neural network approach,	89	17.8
5	Teo et al. (2015) [64]	Industrial management & data systems	The effects of convenience and speed in m-payment	141	17.6
6	Johnson et al. (2018) [26]	Computers in human behavior	Limitations to the rapid adoption of m-payment services: understanding the impact of privacy risk on m-payment services	88	17.6
7	Karjaluoto et al. (2019) [65]	International journal of information management	How perceived value drives the use of mobile financial services apps	64	16
8	Yang et al. (2015) [66]	Industrial management & data systems	Understanding perceived risks in mobile payment acceptance	123	15.3
9	Gao and Waechter, (2017) [67]	Information systems frontiers	Examining the role of initial trust in user adoption of mobile payment services: an empirical investigation	91	15.1
10	Chen L., (2008) [68]	International journal of mobile communications	A model of consumer acceptance of mobile payment	221	14.7
11	Liébana-Cabanillas et al. (2014) [69]	Industrial management & data systems	Role of gender on acceptance of mobile payment	73	8.11
12	Khan and Ali (2018) [70]	Wireless personal communications	Factors affecting retailer's adoption of mobile payment systems: a sem-neural network modeling approach	33	6.6
13	Liébana-Cabanillas et al. (2015) [71]	Technology analysis & strategic management	User behaviour in QR mobile payment system: the QR payment acceptance model	49	6.12
14	Chuan Teo et al. (2015) [72]	International journal of mobile communications	Why consumers adopt mobile payment? a partial least squares structural equation modelling (pls-sem) approach	48	6
15	Kalinic and Marinkovic (2016) [73]	Information systems and e-business management	Determinants of users' intention to adopt m-commerce: an empirical analysis	41	5.85
16	Duane et al. (2014) [74]	Behaviour & information technology	Realising m-payments: modelling consumers' willingness to m-pay using smart phones	36	4

TC: Total citation, TC/Year: Total citation per Year.

In addition, the next two highly cited articles are contributed by Liébana-Cabanillas et al. (2014) [62] and Liébana-Cabanillas et al. (2018) [63], respectively: "Antecedents of the adoption of the new mobile payment systems: the moderating effect of age" and "Predicting the determinants of mobile payment acceptance: a hybrid sem-neural network approach". These articles contribute to the advancement of the mobile payment research area. Furthermore, Figure 5 depicts the co-citation network of all publications included in this analysis. Each circle in the graphic indicates each author's name; in certain situations, the author's name is anonymous, suggesting that authors may choose to publish anonymously. In our instance, there is a circle with the name of an anonymous author, Anonymous, J Strategic inform S, V16, P413. The diameter of the circle is proportional to the number of articles each author has produced on the subject. In addition, Figure 6 presents the Overlay visualization for the article Co-citation network. The closer authors are to the center of the representation, the stronger their bibliographic connections are. The authors' networked visualization shows three color groupings (blue, red, and green).
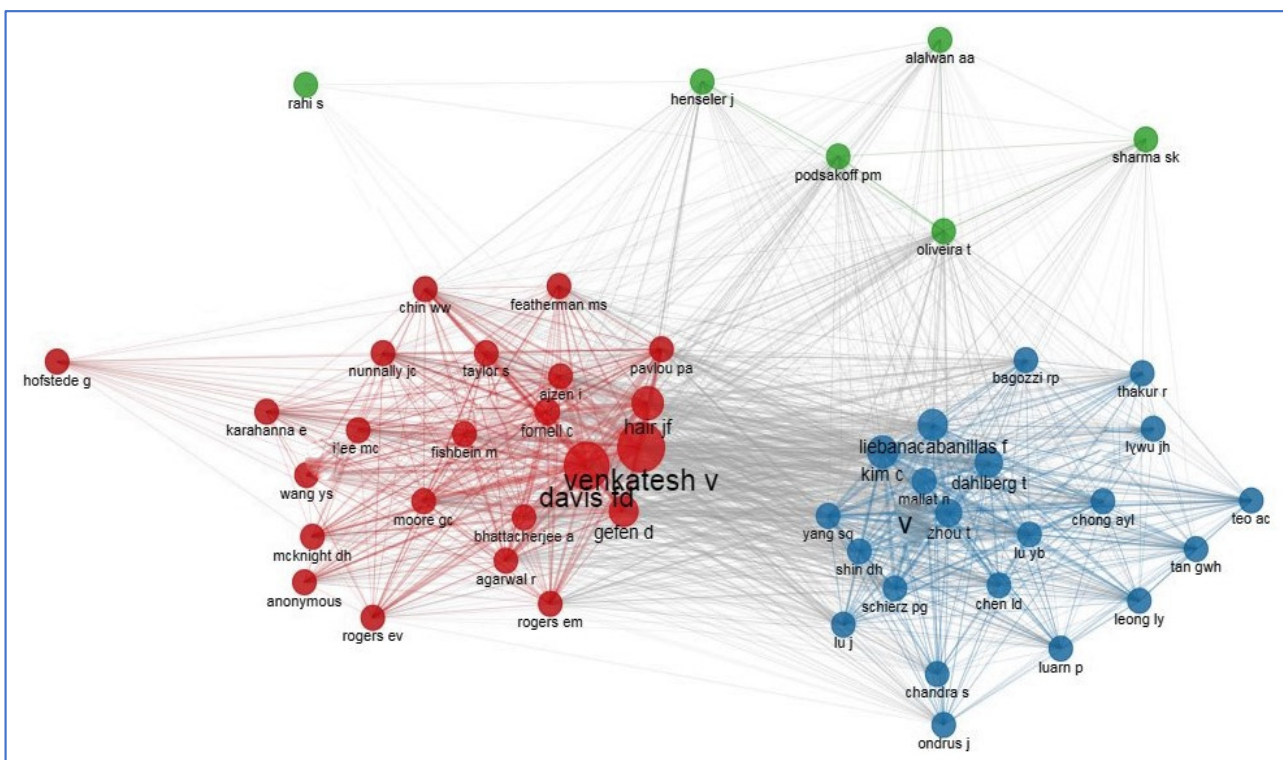
Figure 5. Network of co-authors and the strongest collaborations.

4.4. Principal Countries and Affiliations Authors

Many countries are recognized within the selected articles; Table 7 describes the classification of the top ten countries that have the largest volume of publications listed. The Single Country Publications (SCP) list the authors who collaborate inside the same country, whereas the Multiple Country Publications (MCP) include the authors who collaborate in many countries. The total number of papers (MCP + SCP) is the total number of papers produced with authors from the same country and multi-national authors. The number of articles in SCP exceeds the number of publications in several countries (MCP). China tops the list with 29 national publications, accounting for about 85% of total published articles (national and international), followed by Malaysia with 10 local papers, which represent 77% of all publications. Spain and India are tied with SCP = 8, and the United States has SCP = 6.
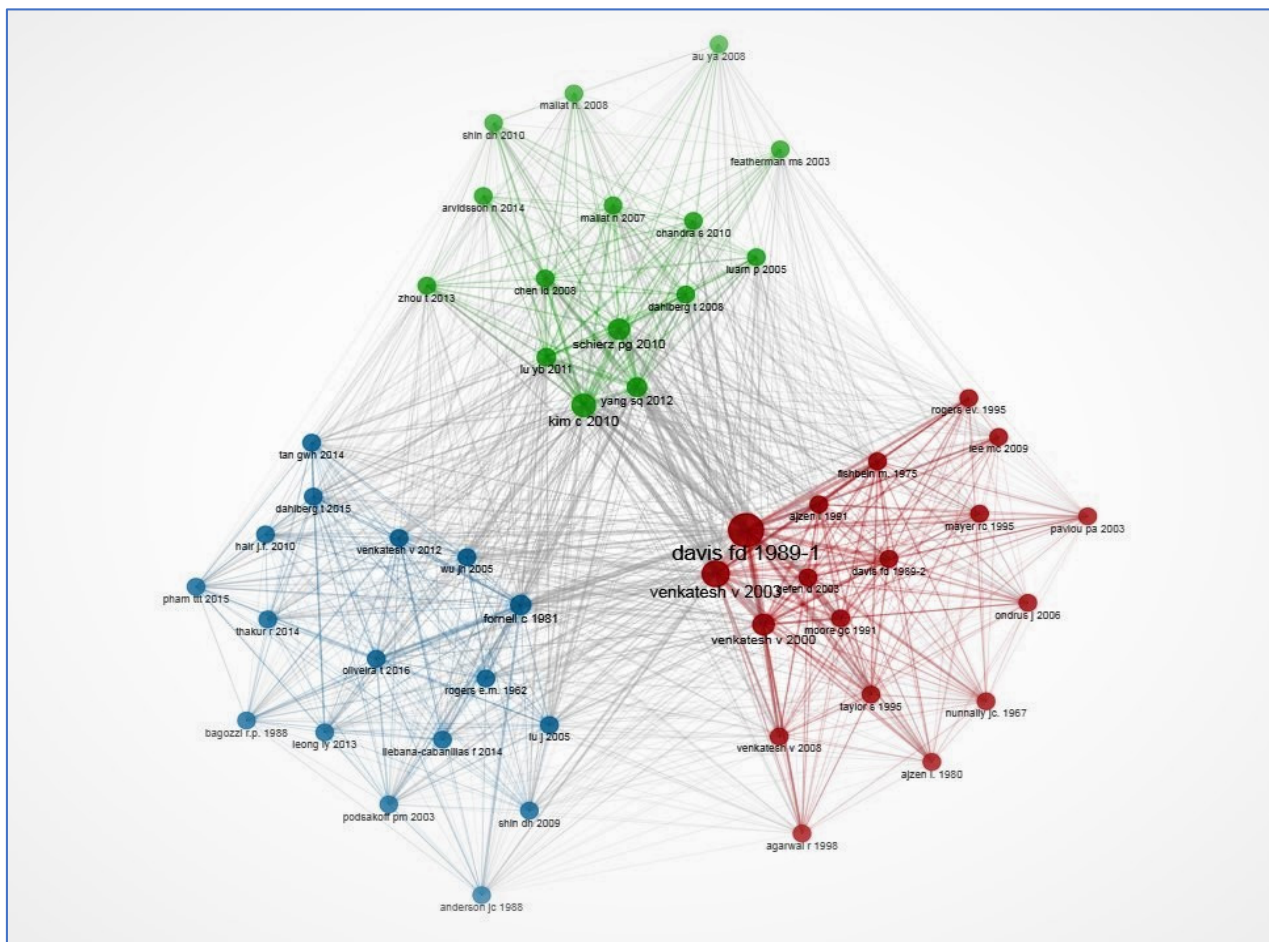
Figure 6. Co-citation network of papers and collaborations.

Table 7. Corresponding author's country and Scientific production.

Countries	MCP Frequency	Total Articles (SCP + MCP)	Single Country Publication (SCP)	Multiple Country Publication (MCP)	MCP Ratio
CHINA	0.196	34	29	5	0.14
MALAYSIA	0.075	13	10	3	0.23
USA	0.069	12	6	6	0.5
SPAIN	0.063	11	8	3	0.27
INDIA	0.052	9	8	1	0.11
THAILAND	0.052	9	6	3	0.33
INDONESIA	0.034	6	6	0	0
IRAN	0.034	6	5	1	0.16
PAKISTAN	0.034	6	3	3	0.5
CANADA	0.028	5	3	2	0.4

Single Country Publications (SCP), Multiple Country Publications (MCP).

In addition, Table 8 lists the 15 institutions with the most publications. The Spanish University of Granada leads the list of institutions with 23 papers, followed by King Mongkut's Institute of Technology Ladkrabang in Thailand. The University of Kragujevac from Serbia has earned third place. The University of Jordan is the fourth-ranked institution in the world. Iran's University of Tehran is ranked fifth in the world. Malaysia ranks sixth with three universities (i.e., Tunku Abdul Rahman University, Multimedia University, and UCSI University). China occupies seventh position and is offered by four universities (i.e.,

Beijing Foreign Studies University, Renmin University China, Tongji University, and Jiaxing University). The eighth position on the list is held by an American institution (Louisiana State University), while the ninth is held by Taiwan with two affiliations (i.e., National Chung Hsing University and National Taipei University Technology).

Table 8. Most relevant affiliations authors ranked by countries and published volume.

Country	Affiliations	Articles/Country	Articles
Spain	University of Granada	23	23
Thailand	King Mongkut's Institute of Technology Ladkrabang	9	9
Serbia	University of Kragujevac	8	8
Jordan	University of Jordan	7	7
Iran	University of Tehran	7	7
Malaysia	Tunku Abdul Rahman University	18	7
	Multimedia University		6
	UCSI University		5
China	Beijing Foreign Studies University	16	4
	Renmin University China		4
	Tongji University		4
	Jiaxing University		4
USA	Louisiana State University	4	4
Taiwan	National Chung Hsing University	8	4
	National Taipei University Technology		4

According to Table 8, the University of Granada (Spain) published the greatest number of publications (23) in our area of research. An analysis of the number of papers per country shows that European and Asian countries have more research on electronic and mobile payment systems. Combined with the analysis of the most influential institutions, Spain is a well-deserved leader, contributing about 23 papers of the research literature; Malaysia is in second with 18 papers, and China ranks in the third place with 16 papers. These three countries work in close cooperation with most of the countries or scientific research institutes of the cooperation network.

4.5. Keywords Co-Occurrence and Dendrogram Analysis

To study the keywords co-occurrence network related to our research area, we present the keyword clusters according to their number of associations and the grade of the intensity of their relationships (Figure 7). The color denotes the cluster, and the distance between the circles indicates the strength level of the correlation between these keywords; a shorter distance indicates a stronger connection.

To characterize the prevalent topic flow of information among scholars, an author keyword analysis was performed. Therefore, we used biblioshiny to construct a network of keyword co-occurrences, as illustrated in Figure 7, showing commonly used author keywords. The map demonstrates that "mobile payment" is the most researched topic, followed by "Trust" and "E-payment." With 63 occurrences, mobile payment emerged as the most popular author keyword, followed by e-payment and trust with 19 occurrences respectively. The study resulted in a total of 27 keywords organized into 3 groups, with each cluster represented by a distinct color. Author keyword analysis provides valuable knowledge. First, it demonstrates that conventional theoretical adoption models, such as TAM, UTAUT, and diffusion of innovation theory, are widely used to construct theoretical

models by researchers. Researchers have used these models to evaluate the adoption intention and behavioral intention to use mobile payment. Second, it demonstrates the significance of consumer trust in m-payments in avoiding perceived risk, indicating that trust is substantially correlated with perceived risk when selecting m-payments. Third, it demonstrates that researchers used Partial least square-Structural equation modelling (PLS-SEM) [75] and neural networks as their preferred statistical methodology to evaluate their suggested model and hypothesis.
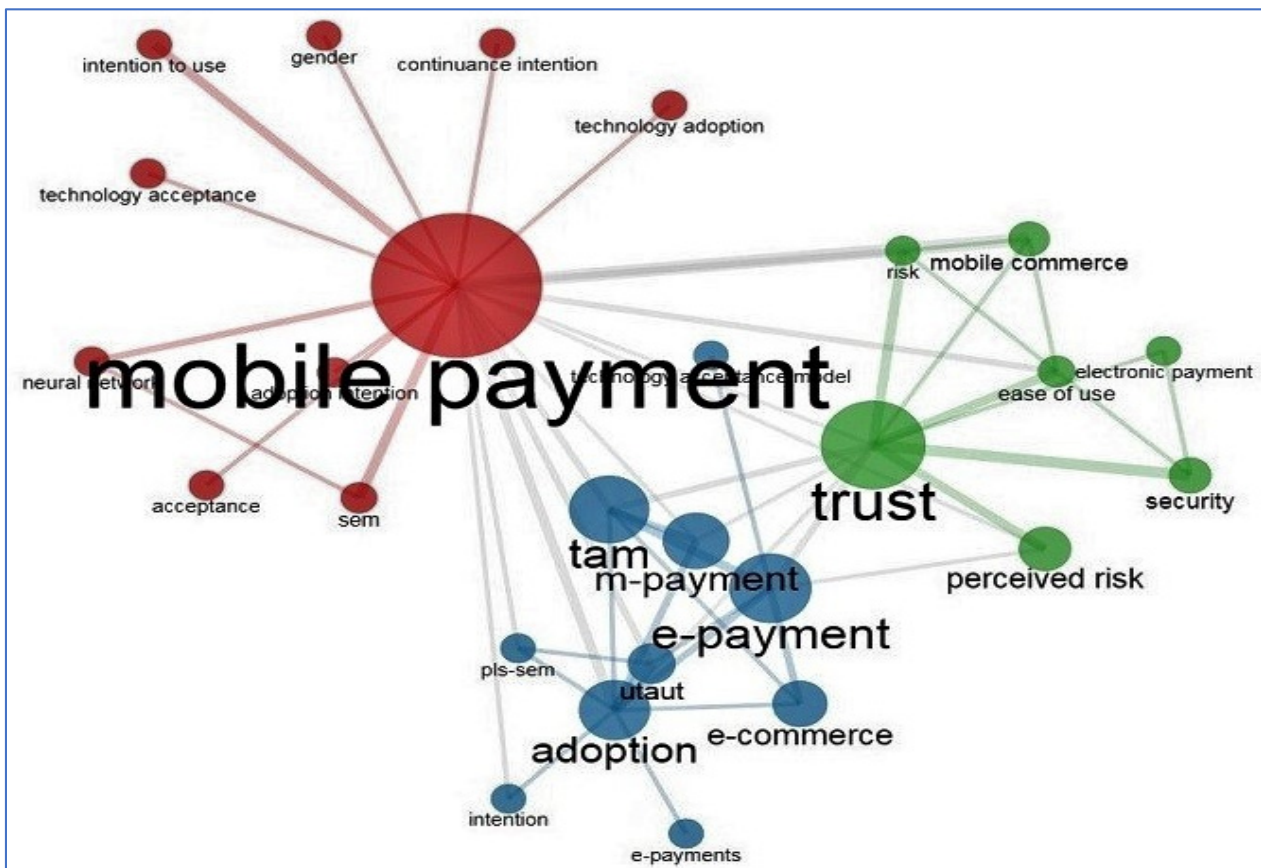
Figure 7. Keywords co-occurrence analysis and keyword clusters.

Mobile payment fills the red cluster, trust is the green cluster, and e-payment occupies the blue clusters, as seen by the largest circle on the network map in Figure 7. The shorter distance between Intention to use, Gender, Continuance intention, Technology adoption, Technology acceptance, and Acceptance indicates a stronger link with mobile payment.

Furthermore, the keyword e-payment has a shorter distance from m-payment, reflecting the closeness between them. Moreover, we can mention the closeness between electronic payment, mobile payment and trust, ease of use, security, and perceived risk. The research's main focus was placed on electronic payment (e-payment), mobile payment (m-payment), technology acceptance model (TAM), Unified theory of acceptance and use of technology (UTAUT), intention to use, technology adoption, ease of use, security, trust, perceived risk, e-commerce, and user acceptance.

Additionally, Table 9 ranks the top keywords based on their co-occurrence. Mobile payment (m-payment) ranks first with 63 co-occurrences, followed by the E-payment and Trust with 19 co-occurrences. TAM has 17 co-occurrences. The keyword Perceived risk is one of the first ten words, arranged according to their appearance, with 11 co-occurrences. Based on these results, Mobile payment (m-payment), Electronic payment (e-payment), Trust, Adoption, Perceived Risk, and TAM are the emerging keywords (Table 9) in this research field. This points to the importance of exploring the relationship between those

authorship keywords. Furthermore, Figure 8 shows a dendrogram that indicates the hierarchical rank and relationship between the classified keyword groups. The hierarchical clustering displayed by the dendrogram depicts the degree of similarity between words. It illustrates the relationships between several subjects. Based on the data presented in Figure 8, we can conclude that "technology acceptance" and "intention to use" have a high degree of similarity, indicating that the coexistence of these two keywords may contribute to the growth of this study issue. There is a strong correlation between "Technology Acceptance" and "Intention to Use" in papers. The dendrogram is effective in illustrating emerging patterns in this study subject.

Table 9. Top ten author keywords.

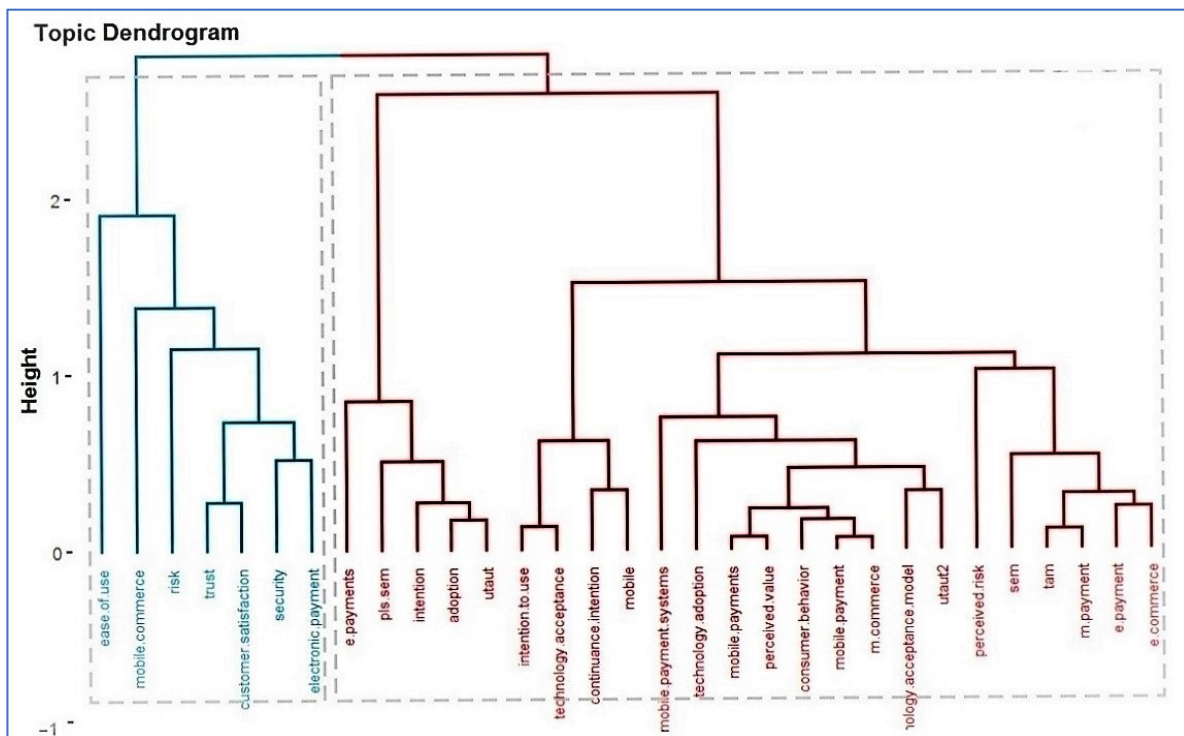| Coupling Keywords	Co-Occurrences
Mobile payment (M-payment)	63
E-payment	19
Trust	19
TAM	17
Adoption	13
E-commerce	13
Perceived risk	11
UTAUT	9
Mobile commerce	8

Figure 8. Keywords dendrogram using a hierarchical clustering method.

Multiple Correspondence Analysis (MCA) was used to interpret the different clusters identified and transform the variables into small structural clusters of similar keywords. In the present case, two thematic clusters are organized. About the blue group, electronic payment is linked to trust, security, ease of use, and customer satisfaction. For the red group, mobile payment (m-payment) is related to intention to use, e-payment, TAM, UTAUT, perceived risk, consumer behavior, and continuance intention.

4.6. Keyword Analysis

As seen in Figure 9, the field of mobile payment has expanded tremendously over the years. This signifies that it has attracted the attention of many researchers. The keyword trust is related to the keywords e-payment and m-payment, which are both on the rise. In our instance, this indicates that the actual usage of electronic payment and research on mobile payments has followed an exponential movement, in addition to boosting the choice rate of users to use a payment framework. The keyword map demonstrates that user acceptance is a complicated issue involving several domains, including MPS, EPS, security, trust, perceived risk, intent to use, adoption, and information technology.
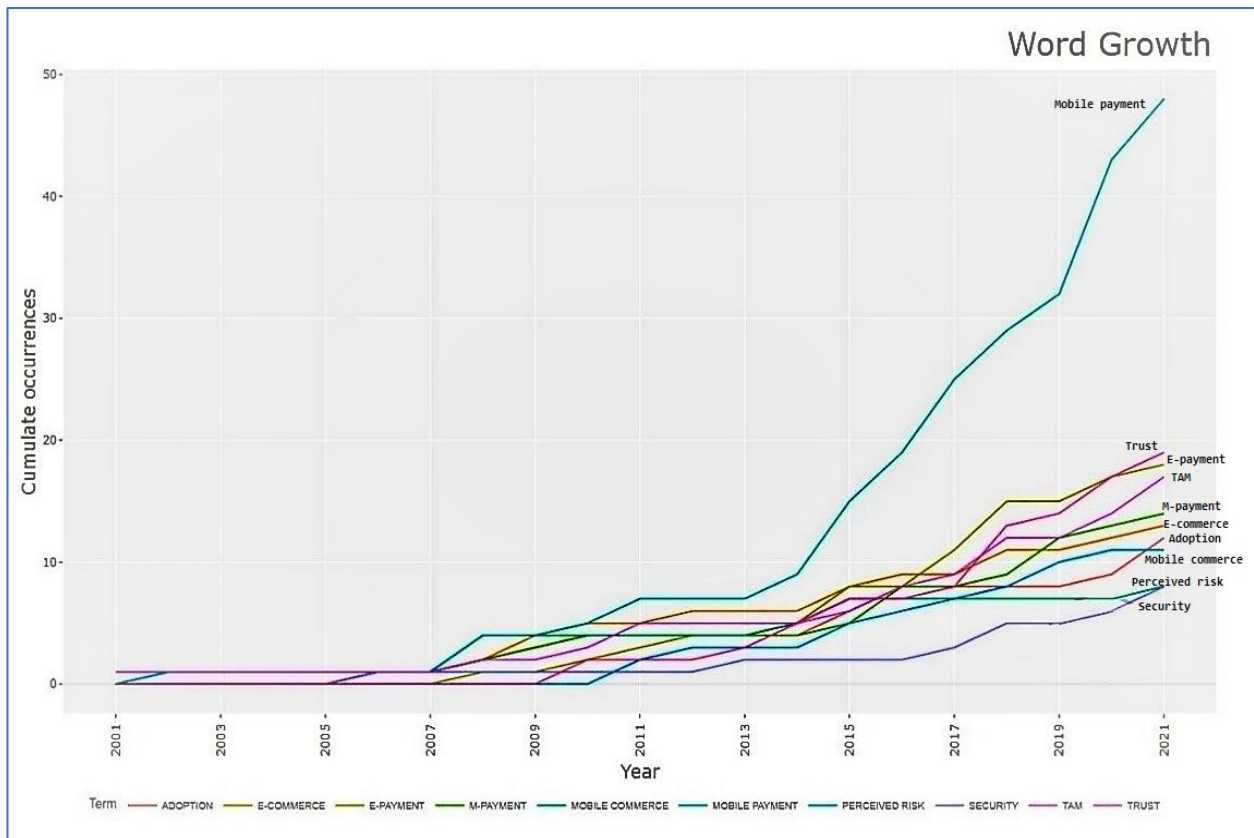
Figure 9. Change and evolution of keywords over time.

Figure 10 demonstrates that e-payment, m-payment, and trust continue to be prominent topics in the studied research publications. "TAM," "perceived risk," and "security" are also present and accounted for. Prior searches employing these keywords within the same search subject have now revealed a connection. Trust, TAM, Adoption, Ease of use, perceived risk, Security, Intention to use, and User acceptance may be correlated with EPS/MPS.

Muñoz-Leiva et al. [76] investigated the relative presence of several topics within a network of publications in the same context and their important work. By combining network and cluster analysis, they identified four categories of themes in a two-dimensional coordinate system. The centrality and density of the distinct themes may be described using these measures.

The motor themes, which show in the top right corner of the graph in Figure 11, are at the core of the search field: they are fully performed and have a broad and powerful association with other themes. The primary themes show in the chart's lower right corner and serve as the foundation for the particular publishing series. These have a high degree of centrality but a low density. Subjects with a high density and a low centrality may be well developed yet separated.
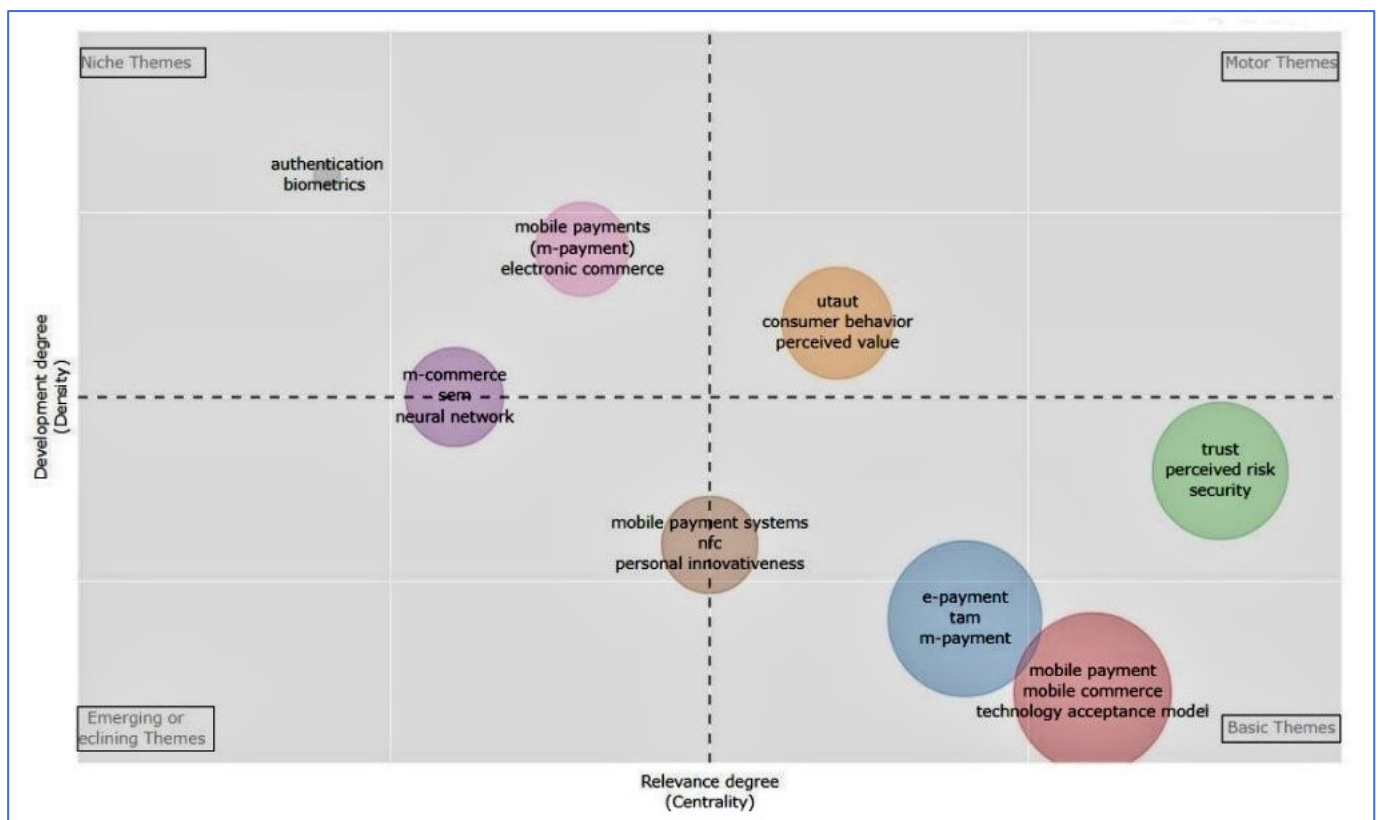
Figure 10. Word map of keywords.

Figure 11. Strategic map of publications.

These topics are the focus of heated intellectual debate, yet their contribution is little in comparison to the general population. Low centrality and density can be used to identify emerging or decreasing themes. Co-integration is implemented on the dividing line between fundamental and motor themes. The impacts of "UTAUT" on "perceived value" and "customer behavior" were the key novel subjects examined in this investigation. It has become clear over the last few years that "customer acceptance" is not exclusively a local issue. Basic themes, as previously explained, indicate themes with high centrality.

This section's themes are essential since they reflect the most commonly discussed issues with a high number of publications. Technological components relating to "consumer acceptance" have emerged as significant topics under these circumstances. On EPS (e-payment) and MPS (m-payment), certain relatively new factors, such as "Trust", "Perceived risk", and "Security", evolved as new challenges.

This research examined keyword use and classification in order to conduct an analysis of keyword co-occurrence. Figure 12 depicts three-field plots with their associations with countries, author keywords, and sources. The connection between the components is shown by the strength of the network's grey linkages. The velocity of the identified objects is proportional to the width of the lines [77,78]. The height of the rectangle represents the frequency with which the country, keyword, and source appear. The width of the lines interconnecting rectangles shows the number of associations. In proportion to the thickness of the line, the number of interactions is considerable. As seen in Figure 12, China ranked top with the greatest number of connections, followed by Spain and Malaysia.
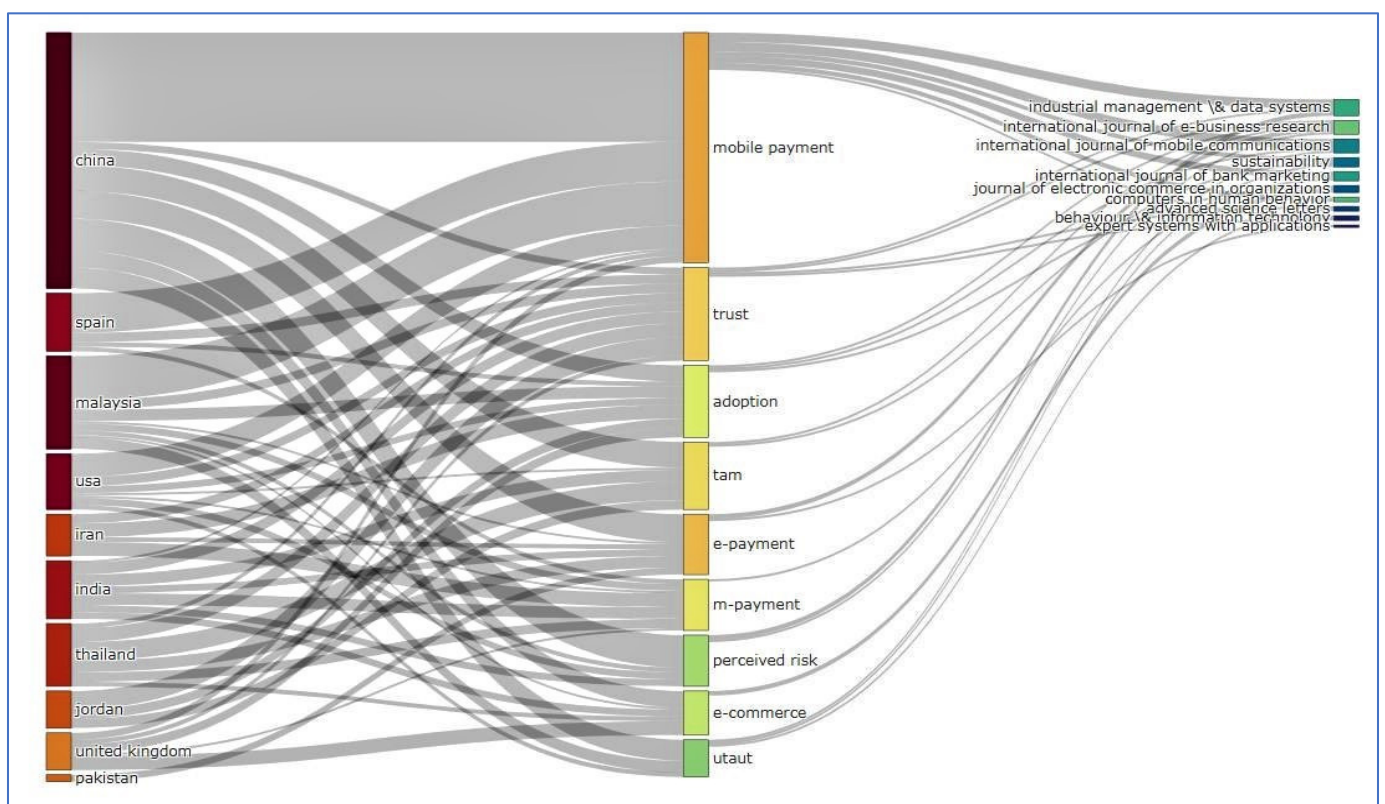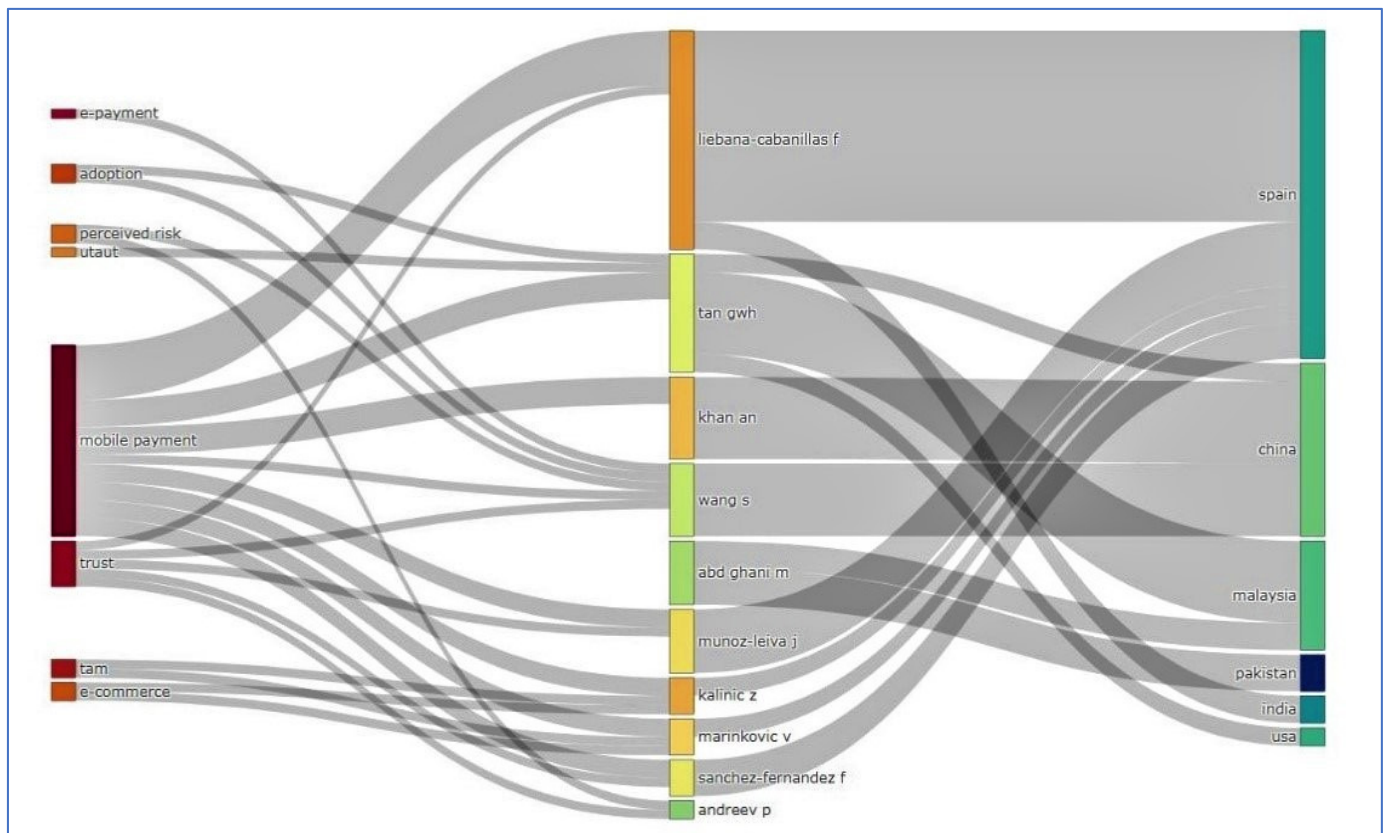

Figure 12. Three fields plot illustrating a relationship between countries (**left**), author keywords (**middle**), and sources (**right**).

The words "Mobile payment" and "Trust" were utilized the most by authors across a range of reviews. According to an analysis of the primary countries, journals, and keyword authors, there are four main countries (Spain, China, Malaysia, and the United States) and four primary sources (*Industrial Management & Data Systems, International Journal of Mobile Communications,* and *International Journal of E-Business Research and Sustainability*) with strong connections to main research topics (mobile payment, e-payment, security, trust, TAM, user adoption and acceptance).

Figure 13 depicts the relationships between the top author keywords, authors, and countries. This graph displays which authors and countries cover the topics of mobile payment and trust as relevant author keywords in a high proportion of these articles. This validates what we have mentioned before. In addition, the Sankey diagram in Figure 13 reveals that Liébana-Cabanillas F., from Spain, concentrates on mobile payment and trust

in their publications, meaning that mobile payment is the most important issue suggested by the authors' keywords.

Figure 13. Three fields plot illustrating the relationship between author keywords (**left**), authors (**middle**), and countries (**right**).

5. Discussion

In this part, we discuss the answers to the research questions that were posed after the presentation of the primary study findings. The results of RQ (1) emphasized the research of the most relevant authors on the topic of our investigation. During the research period, Liébana-Cabanillas, F., and Sánchez-Fernández, F., from Spain, produced the most significant scientific contributions in this topic (Table 5).

Furthermore, our findings are followed by the results published by Abdullah and Khan in 2021 [30] in the field of m-payment since 2014. According to Abdullah and Khan, the most influential authors in this area of research with the greater number of scientific contributions, citations, and papers can share knowledge, inspiration, and discoveries in various fields by creating new standards in the literature are Liébana-Cabanillas, F., Muñoz-Leiva, F., and Sánchez- Fernández F., from Spain. Otherwise, our field of study is more comprehensive since it is relevant to EPS, MPS, PI, TAM, PF, User preferences, and Acceptance. During the time of analysis, we used keyword analysis in response to our QR (2), with the top ten countries contributing the most to research. China continues to dominate with 34 total papers published (domestic and international), followed by Malaysia with 13, the United States with 12, and Spain with 8 national scientific articles published out of a total of 11 scientific publications published in our field of study (Table 7).

According to previous research [13,30], India and China, followed by the United States and Spain, are the leading significant contributors to mobile payment technology. Therefore, we can observe that the same countries (China and Spain) are common. Furthermore, Liébana-Cabanillas et al. (2020) [17] showed that China is the current leader in payment transactions. Similarly, as previously indicated, electronic (mobile) payment systems are

a recent topic of study that may be described by the analyses provided. In response to RQ (3), we created a network map based on the studied bibliographic data, which reveals important patterns and themes in the topic of e-payment, m-payment, and the emergence of distinct thematic clusters aids in defining the intellectual structure of the subject area. The largest circle on the network map represents three significant keyword groups: mobile payment, electronic payment, and trust.

Mobile payment has a greater association with intention to use, continuation intention, technology adoption, and technology acceptability (Figure 7). Furthermore, the e-payment term has a shorter distance than the m-payment keyword, indicating their proximity.

The findings include a close association between electronic payment, mobile payment, trust, simplicity of use, security, and perceived risk, all of which have a substantial positive influence on the payment method. Another study [30] found that the term "mobile payment" was the most used author keyword, with 22 instances, followed by TAM with 9 occurrences. Consequently, we constantly maintain the resources necessary to make timely and efficient payments and transactions. Our research was primarily concerned with electronic payment (e-payment), mobile payment (m-payment), the technology acceptance model (TAM), the unified theory of acceptance and use technology (UTAUT), the intention to use, technology adoption, ease of use, security, trust, perceived risk, and user acceptance. The analysis of an author's keywords provides valuable information. First, it demonstrates that conventional theoretical adoption models such as TAM and UTAUT are widely used by academics in the construction of theoretical models [30].

To respond to our QR (4), another important factor to consider in maintaining the relationship between authors, sources, author keywords, and nations is that the collaborative network is small, with just a few writers collaborating with others. Therefore, more research is required to identify the qualities that make the subject of electronic (mobile) payment intriguing for investigation but do not keep researchers' attention after an initial publication. Furthermore, the offered analysis of countries, journals, and author keywords (Figure 12) identifies four leading countries (Spain, China, Malaysia, and the United States). Previous research [30] indicates that research efforts are mostly focused on emerging and developing economies such as China, India, and Thailand, since these countries have seen an increase in m-payment acceptance in recent years. Furthermore, the United States emerged as the country with the strongest overall connection strength among all countries.

Furthermore, the four primary sources offered (*Industrial Management and Data Systems*, *International Journal of Mobile Communications*, *International Journal of E-business Research*, and *Sustainability*) have significant linkages to the key subject's literature search (i.e., mobile payment, e-payment, security, trust, technology acceptance model, adoption and user acceptance).

In contrast, our findings revealed that mobile payment and electronic payment were categorized as the most relevant subject of the research papers evaluated based on their co-occurrence (Figure 9). According to Liébana-Cabanillas et al. (2020) [17], from Spain, whose writings are focused on this topic, the mobile payment indicates the growing potential of this type of payment today. Furthermore, security, ease of use, perceived risk, trust, adoption, intention to use, technology acceptance model (TAM), and user acceptance are developing as keywords in research investigations (Table 8). This highlights the importance of researching the interaction between these factors. Otherwise, previous research [2,17,20,30] using similar themes in the same search subject has revealed a link. From this point on, mobile payment and trust were regarded to be the most often utilized keywords (Figure 13) across a variety of assessments [33,76] by authors. These findings confirm that the authors' keywords are appropriate for characterizing the centrality and density of a variety of subjects and for providing potential routes for future scientific research.

6. Conclusions

To the best of our knowledge, this is the first bibliometric study to incorporate electronic and mobile payment systems, payment interfaces, technological acceptance models, payment frameworks, and user preferences and acceptance. Electronic payment systems

and mobile payment systems are the most prominent sources. We observe that electronic payment, m-payment, and trust are always presented in the previous research materials, and their prominence among targeted keywords grows with time. Thus, governments must establish clearer measures that efficiently handle the control of technology policy for e-commerce and IT [36]. It is necessary to have the tools and knowledge sufficient to detect and identify the determinants of secure online payment and the capacity to protect individuals from insecure transactions.

In addition, it was emphasized that not only developed countries are interested in electronic and mobile payment systems and platforms, but also developing countries are focusing on enhancing their analysis of electronic (mobile) payments due to their increasing use.

The study of consumer preference and acceptance of new payment systems and frameworks, as well as how trust and security may adapt to user preferences, is a developing area of research. To analyze and assess the empirical influence of user acceptance on electronic and mobile payment systems, further research is required. It should be noted that the Technology Acceptance Model (TAM), as well as perceived risk, trust, and security, are prominent and have emerged as keywords.

This shows the importance of integrating the evaluation of electronic and mobile payment systems with user acceptance, adoption, and the ability to trust and achieve security to provide a sustainable payment framework. The research has several limitations. First, it is based on a restricted number of papers discovered on the Web of Science and spans a relatively brief reference period; second, it does not include all articles from 2021; third, only a subset of articles were examined; and fourth, the Web of Science database was the only source of publications.

Future researchers are anticipated to expand the scope of this study in order to overcome the limitations of the present investigation by using other databases such as Scopus, Google Scholar, and IEEE Explore. Existing research is defined by a constrained search strategy, which is a limitation inherent to the research itself. Future research studies may use manual keyword searches to find relevant articles in the current literature.

Despite the limitations noted above, this study gives a comprehensive analysis of electronic and mobile payments, payment interfaces, technological acceptance models, payment frameworks, user preferences, and acceptance studies that will be extremely useful to researchers and practitioners. Furthermore, governments must establish more efficient and timely strategies to appropriately handle e-commerce and online payment policies (e-payment and m-payment).

Typically, government policies predict future emerging trends or favored sectors [36], and this will facilitate the establishment and progression of research on this subject.

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