# METHODS

This study collected data from the Scopus database on July 25, 2023. The researchers utilized the Scopus database due to its recognition as the largest abstract and indexing database, which is a comprehensive source for searching abstracts and a large repository of searchable citations (Baas et al., 2020). The data collected encompassed various aspects, including document type, source type, languages, subject areas, publication trends, the number of authors per document, institutional contributions to publications, country-wise publication distribution, and prevalent keywords, among other factors.

## Search Strategy

The search focused on documents related to e-commerce adoption, using a combination of keywords – e-commerce, ecommerce, or electronic commerce- in conjunction with the terms adoption or acceptance. The search was performed using the article title as the primary search field, allowing for accurate and relevant results pertaining to e-commerce adoption. The query used was TITLE (("e-commerce" OR ecommerce OR "electronic commerce") AND (adoption OR acceptance)). This query returned 709 documents, constituting a broad collection of articles addressing the intersection of e-commerce adoption. This dataset provides the basis for our systematic review, facilitating an accurate representation of the state of the field and the identification of emerging trends and challenges within e-commerce adoption. These articles assessed the current state of e-commerce adoption research and identified key trends, challenges, and opportunities. This strategy ensured that our analysis was based on primary sources, capturing recent and relevant findings within the field of e-commerce adoption. This process is visualized in Figure 1.

## Data Cleaning and Harmonisation

Data cleaning and harmonization are critical steps in bibliometric analysis to ensure the accuracy and reliability of the results. In this study, we used OpenRefine (Ahmi, 2023) and biblioMagika (Ahmi, 2024), two tools designed for cleaning and harmonizing messy data. These tools were used to clean and harmonize bibliographic data, including author names, keywords, affiliations, and other essential information. The cleaning process began with the researchers downloading the Scopus data in a .csv file format. The necessary files were then selected for cleaning, and specific columns, such as keywords and author’s name and affiliation, were identified and edited using various methods and functions available within the clustering tools. This process helped to effectively identify and rectify inconsistencies, errors, and duplicates in the dataset. After the initial cleaning, all screened and edited keywords were manually checked for accuracy. Multivalued cells were joined, and the separators initially used during the splitting process were re-entered to maintain data consistency. Finally, the cleaned and harmonized data was exported back into its original format and ready for further analysis.

## Data Analysis

Data analysis was structured to answer the research questions outlined in the introduction. Our approach included documenting the current landscape of e-commerce adoption research regarding the document type, source type, languages, subject areas, and citation metrics. The results are presented based on various parameters, such as the number of papers published per year, papers by the most productive authors, institutions, countries, and source titles, to identify key contributors and dominant trends in the field. Bibliometric measurements such as total publications, number of cited papers, total citations, citations per paper, citations per cited papers, h-index, g-index, m-index, and citation sum within h-core were also employed to provide a comprehensive assessment of the impact and relevance of the identified publications. Furthermore, we visualized the author's keywords using co-occurrence network analysis, thematic mapping, and factorial analysis to illuminate key themes and concepts in the field. These visualizations helped us identify clusters of related topics, uncover hidden patterns, and gain insights into the interconnections between research subdomains.

## Tools

A variety of tools were employed in this study to conduct a comprehensive bibliometric analysis. Microsoft Excel was used for initial data cleaning and organization, while biblioMagika (Ahmi, 2024) streamlined the cleaning process, harmonizing and standardizing author, affiliation, and country data. OpenRefine was used to clean and harmonize the author's keywords data (Ahmi, 2023). With the data prepared, we used VOSviewer (van Eck & Waltman, 2014) and Biblioshiny (Aria & Cuccurullo, 2017) to create informative visual representations of our findings. Combining these tools and techniques facilitated a thorough and robust examination of the e-commerce adoption field.

**Database:** Scopus

**Search Field:** Article Title

**Time Frame:** All

**Language:** All

**Source Type:** All

**Document Type:** All

TITLE(("e-commerce" OR ecommerce OR "electronic commerce") AND (adoption OR acceptance))

Keywords & Search String

n = 709

Record Identified, Screened and Included for Bibliometric Analysis

E-Commerce Adoption

Topic

Scope & Coverage

25 July 2023

Date Extracted

**Figure 1.** Flow diagram of the search strategy.

Source: Zakaria et al. (2021), Moher et al. (2009)

# RESULTS

In the forthcoming results section, we will delve into a comprehensive analysis of the e-commerce adoption research landscape, addressing the research questions (RQs) listed in the introduction section to provide an in-depth understanding of the field. By aligning our analysis with these research questions, we aim to offer a thorough and nuanced exploration of the e-commerce adoption research landscape, providing valuable insights for academics, practitioners, and policymakers alike.

## Current Landscape

To address the first research question, which seeks to understand the current landscape of e-commerce adoption research, we will analyze the distribution of publications by various factors, such as document type, source type, languages, and subject area. Additionally, we will discuss the overall citation metrics for publications within the e-commerce adoption domain to gain insight into their impact and relevance. Initially, the obtained data were classified based on document types. Table 2 presents the breakdown of the total publications in the field of e-commerce adoption research according to their document type. Out of the 709 documents analyzed, it is apparent that Articles form the bulk of these publications, comprising 410 documents or 57.83% of the total. This prevalence highlights the predominance of Articles as the preferred medium for disseminating research findings in this field. Conference Papers are the second most common type of document, making up 32.02% or 227 out of the total publications. The significant proportion of Conference Papers reflects the ongoing, dynamic discussion and progression of ideas within the field of e-commerce adoption, often presented and debated in academic conferences before being refined for journal articles.

In contrast, Book Chapters, while making up a relatively smaller proportion of the documents (6.91% or 49 publications), indicate the consolidation of e-commerce adoption research within thematic compilations, likely providing comprehensive overviews or exploring specific facets of the field in depth. Moreover, it's noteworthy to observe a small percentage of Reviews (1.97%), Retracted Documents (0.56%), Books (0.42%), and Erratum (0.28%). The presence of Reviews suggests efforts towards summarizing and synthesizing the existing body of knowledge, while the low number of Retracted Documents, Books, and Erratum might imply rigorous scrutiny, less propensity for comprehensive volumes solely on e-commerce adoption, and careful preparation and revision practices in the research process, respectively.

**Table 2.** Document Type

|  |  |  |
| --- | --- | --- |
| **Document Type** | **Total publications** | **Percentage (%)** |
| Article | 410 | 57.83 |
| Conference Paper | 227 | 32.02 |
| Book Chapter | 49 | 6.91 |
| Review | 14 | 1.97 |
| Retracted | 4 | 0.56 |
| Book | 3 | 0.42 |
| Erratum | 2 | 0.28 |
| **Total** | **709** | **100** |

Table 3 outlines the distribution of the total publications in e-commerce adoption research by source type. The table clearly illustrates that Journals are the leading medium for publishing these studies, accounting for 430 publications, or 60.65% of the total. This dominance of Journals underscores their role as the primary platform for disseminating and exchanging scholarly ideas, findings, and debates in e-commerce adoption. Following Journals, Conference Proceedings comprise the second most common source type, encompassing 27.36% or 194 of the total publications. This substantial presence of Conference Proceedings underscores the active and ongoing discourse in this field, suggesting that researchers frequently use conferences as venues to present preliminary findings, innovative ideas, or research in progress, thereby enabling immediate feedback and scholarly discussion.

Books account for a smaller percentage of the total publications (6.91% or 49). The presence of Books indicates that comprehensive treatments of specific topics, overarching themes, or seminal works within the field are made accessible to the scholarly community and beyond. Lastly, Book Series, comprising 5.08% or 36 of the total publications, offer periodic or thematic volumes that likely delve into particular aspects or trends in e-commerce adoption research. This source type may cater to niche or specialized topics, affording a focused exploration that might not be possible in single journal articles or conference proceedings.

**Table 3.** Source Type

|  |  |  |
| --- | --- | --- |
| **Source Type** | **Total publications** | **Percentage (%)** |
| Journal | 430 | 60.65 |
| Conference Proceeding | 194 | 27.36 |
| Book | 49 | 6.91 |
| Book Series | 36 | 5.08 |
| **Total** | **709** | **100** |

Table 4 provides a view into the distribution of languages across the e-commerce adoption research landscape. English is the overwhelmingly predominant language of publication, representing 698 documents, or 98.45% of the total. This dominance mirrors the global trend of English being the lingua franca of scientific and scholarly communication, enabling wide dissemination and comprehension of research findings. A relatively small fraction of the publications are in other languages, constituting 1.55%. Spanish is the most prevalent, with nine publications (1.27%). The remaining languages — French, Lithuanian, Malay, Portuguese, and Romanian — each have one publication (0.14%), illustrating the presence of non-English research outputs, albeit in a limited capacity. It is also interesting to note that three documents have been published in more than one language, indicating an effort to reach a broader, multilingual audience and possibly increase the visibility and impact of the research.

While the dominance of English in e-commerce adoption research publications is clear, the presence of publications in other languages signifies the global interest and contribution to the field. However, the disparity suggests a potential language barrier that could limit the accessibility and inclusivity of research findings in this domain. Future research may benefit from strategies such as multilingual abstracts or translations to enhance the reach of e-commerce adoption studies across different linguistic communities.

**Table 4.** Languages

| **Language** | **Total publications\*** | **Percentage (%)** |
| --- | --- | --- |
| English | 698 | 98.45 |
| Spanish | 9 | 1.27 |
| French | 1 | 0.14 |
| Lithuanian | 1 | 0.14 |
| Malay | 1 | 0.14 |
| Portuguese | 1 | 0.14 |
| Romanian | 1 | 0.14 |

\*Three documents have been published in more than one language

The current study also analyzed the documents based on their subject area to gain insights into the interdisciplinary nature of e-commerce adoption research. Table 5 provides a diverse snapshot of the subject areas contributing to e-commerce adoption research, demonstrating the field's interdisciplinary nature. Topping the list is Computer Science, which accounts for 398 publications, or 56.14% of the total. This prevalence highlights the fundamental role that technology and its advancements play in e-commerce, from designing and implementing online platforms to user interface and security considerations. Closely following, Business, Management, and Accounting is the second most represented subject area, with 338 publications (47.67%). This substantial representation indicates that studies of e-commerce adoption frequently involve understanding business models, managerial decisions, and financial implications, making it a key area of focus.

In 20.03% of the publications, Social Sciences further underscore the importance of examining societal and human factors in e-commerce adoption. Likewise, Decision Sciences (17.49%) and Engineering (16.08%) highlight the relevance of decision-making processes and technical solutions in this field. Economics, Econometrics, and Finance (13.96%) represent a considerable share of the publications, underscoring the importance of economic considerations and financial analysis in e-commerce adoption research. While having fewer publications, the rest of the subject areas indicate the broad spectrum of disciplines that intersect with e-commerce adoption. For instance, Mathematics (4.94%), Environmental Science (2.54%), and Arts and Humanities (2.12%) each contribute unique perspectives and methodologies to the field.

It's also notable that even highly specialized domains like Medicine, Physics and Astronomy, Biochemistry, Genetics and Molecular Biology, and Chemical Engineering are represented, albeit at lower rates, showing the universal relevance and application of e-commerce adoption. The diversity in subject areas underpins the complexity and interdisciplinary nature of e-commerce adoption research. From Computer Science to Chemistry, each discipline adds a unique facet to understanding e-commerce adoption, creating a rich, multifaceted field of study.

**Table 5.** Subject Area

| **Subject Area** | **Total Publication** | **Percentage (%)** |
| --- | --- | --- |
| Computer Science | 398 | 56.14 |
| Business, Management and Accounting | 338 | 47.67 |
| Social Sciences | 142 | 20.03 |
| Decision Sciences | 124 | 17.49 |
| Engineering | 114 | 16.08 |
| Economics, Econometrics and Finance | 99 | 13.96 |
| Mathematics | 35 | 4.94 |
| Environmental Science | 18 | 2.54 |
| Arts and Humanities | 15 | 2.12 |
| Agricultural and Biological Sciences | 12 | 1.69 |
| Energy | 12 | 1.69 |
| Multidisciplinary | 12 | 1.69 |
| Psychology | 9 | 1.27 |
| Materials Science | 6 | 0.85 |
| Earth and Planetary Sciences | 5 | 0.71 |
| Medicine | 4 | 0.56 |
| Physics and Astronomy | 4 | 0.56 |
| Biochemistry, Genetics and Molecular Biology | 2 | 0.28 |
| Chemical Engineering | 2 | 0.28 |
| Chemistry | 1 | 0.14 |
| Pharmacology, Toxicology and Pharmaceutics | 1 | 0.14 |

Table 6 presents the citation metrics, providing an understanding of the impact and influence of the e-commerce adoption research body, spanning the publication years from 1997 to 2023. A total of 709 publications were contributed to by a considerable number of authors - 1885, which equates to an average of approximately 2.66 authors per paper. This relatively high rate suggests that collaborative efforts are common in this field. The total of 22,641 citations implies that the research on e-commerce adoption has a substantial impact within the academic community and possibly beyond. The average number of citations per paper (31.93) and per cited paper (38.90) indicates that the research outputs in this domain are frequently referenced in subsequent studies, underscoring their relevance and contribution to advancing knowledge in the field. Regarding the citation rates over time, the average of 870.81 citations per year further underlines the ongoing influence and impact of e-commerce adoption studies. The metric of citations per author (12.01) suggests that each contributing author's work in this field, on average, has received a decent level of recognition and impact.

The citation sum within the h-core, which stands at 21,266, emphasizes the robustness of the research in e-commerce adoption. The h-index, a commonly used indicator of research impact, is 70 for this field, implying that 70 papers have been cited at least 70 times, suggesting a strong influence of these papers on subsequent research. The g-index, another measure of a scientific researcher's impact, stands at 138, further supporting the significant influence of this body of research. Lastly, the m-index (2.59), which is the h-index divided by the number of years since the first published paper of the scientist, provides a measure of the impact or productivity of an author or group of authors adjusted over time. In this case, it reflects the sustained impact of the e-commerce adoption research over time. These citation metrics reveal that the e-commerce adoption research has a substantial and sustained impact in the academic field, with a significant collaboration among authors. These findings provide a robust answer to the first research question, offering an overview of the current landscape of e-commerce adoption research, characterized by high-impact, collaborative, and continually relevant research outputs.

**Table 6.** Citations Metrics

|  |  |
| --- | --- |
| **Main Information** |  |
| Publication Years | 1997 - 2023 |
| Total Publications | 709 |
| Citable Year | 27 |
| Number of Contributing Authors | 1885 |
| Number of Cited Papers | 582 |
| Total Citations | 22,641 |
| Citation per Paper | 31.93 |
| Citation per Cited Paper | 38.90 |
| Citation per Year | 870.81 |
| Citation per Author | 12.01 |
| Author per Paper | 2.66 |
| Citation sum within h-Core | 21,266 |
| h-index | 70 |
| g-index | 138 |
| m-index | 2.59 |

Our thorough examination of the document types, source types, languages, subject areas, and citation metrics in e-commerce adoption delivers a comprehensive and insightful response to our first research question (RQ1). We explore these dimensions by unraveling a dynamic and multidimensional landscape of e-commerce adoption research. The analysis demonstrates a dominant preference for publishing articles in scholarly journals, indicating that these forms provide the principal platforms for academic discourse in this field. English emerges as the lingua franca of this research area, catering to a global audience, although the presence of other languages acknowledges contributions from diverse linguistic communities. A striking aspect revealed through this investigation is the inherently interdisciplinary nature of e-commerce adoption research. We find a confluence of diverse disciplines including, but not limited to, computer science, engineering, business management, and accounting. These various subject areas enrich the discourse and emphasize the breadth and depth of considerations in studying e-commerce adoption.

Furthermore, the significant citation metrics underscore this field's considerable impact and influence within the academic community and potentially beyond. High citations per paper, a robust h-index, and a significant g-index testify to the field's relevance, sustained interest, and role in shaping subsequent research trajectories. Our findings paint a vivid picture of a vibrant and evolving field characterized by diversity in contributions, substantial academic impact, and a unique interplay of multiple disciplines converging on e-commerce adoption. This comprehensive insight into the current landscape of e-commerce adoption research provides a robust foundation for addressing the subsequent research questions.

## Publication Trends

Addressing our second research question, "What emerging trends can be observed in e-commerce adoption publications?" we chart the growth trajectory of this burgeoning field. Table 7 reveals the trends in e-commerce adoption research from 1997 to 2023, answering our second research question (RQ2). The total number of publications (TP) per year measures the yearly productivity in the field. Notably, there has been a significant increase in the total publications over time, indicating the growing interest in e-commerce adoption studies. While there were only two publications in 1997, this has escalated to 58 by 2022. This substantial growth signifies the importance and relevance of e-commerce adoption in both academic and practical arenas.

The number of contributing authors (NCA) has also increased, suggesting a growing body of researchers engaging with e-commerce adoption studies. There were only two contributing authors in 1997, but this number has escalated dramatically to 181 by 2022, reinforcing the conclusion about the increasing appeal of this field of study. The average citations per publication (C/P) and per cited publication (C/CP) provide an understanding of the impact of research. In the early years, such as 2000, the average citations per publication were extremely high (514.00 C/P and 514.00 C/CP) due to fewer publications receiving many citations. As the number of publications increased over the years, the average citations per publication and per cited publication seem to decrease, reflecting a more widespread distribution of citations across a larger number of papers. However, higher C/P and C/CP values, such as in 2003 (203.08 C/P and 232.10 C/CP), still suggest that certain papers published in these years had a significant influence.

The h-index, g-index, and m-index provide insight into the depth of impact within the research community. The h-index has steadily increased over the years, peaking at 17 in 2011, indicating a consistent contribution of high-impact publications. Similarly, the g-index and m-index values have increased, suggesting an increasing recognition and influence of e-commerce adoption research over time. The emerging trends suggest that e-commerce adoption research has been gaining momentum over the years, with a steady increase in the number of publications, authors contributing to the field, and a consistent production of impactful research. This progress signifies this field's continued relevance and importance in the ever-evolving digital business environment.

**Table 7.** Publication by Year

| **Year** | **TP** | **NCA** | **NCP** | **TC** | **C/P** | **C/CP** | ***h*** | ***g*** | ***m*** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1997 | 2 | 2 | 2 | 7 | 3.50 | 3.50 | 1 | 2 | 0.04 |
| 1998 | 3 | 6 | 3 | 107 | 35.67 | 35.67 | 2 | 3 | 0.08 |
| 2000 | 1 | 1 | 1 | 514 | 514.00 | 514.00 | 1 | 1 | 0.04 |
| 2001 | 8 | 23 | 8 | 487 | 60.88 | 60.88 | 7 | 8 | 0.30 |
| 2002 | 14 | 30 | 12 | 999 | 71.36 | 83.25 | 9 | 14 | 0.41 |
| 2003 | 24 | 45 | 21 | 4874 | 203.08 | 232.10 | 14 | 24 | 0.67 |
| 2004 | 14 | 30 | 14 | 1709 | 122.07 | 122.07 | 12 | 14 | 0.60 |
| 2005 | 19 | 44 | 18 | 1072 | 56.42 | 59.56 | 9 | 19 | 0.47 |
| 2006 | 36 | 75 | 30 | 2787 | 77.42 | 92.90 | 15 | 36 | 0.83 |
| 2007 | 33 | 77 | 29 | 801 | 24.27 | 27.62 | 14 | 28 | 0.82 |
| 2008 | 33 | 74 | 25 | 811 | 24.58 | 32.44 | 13 | 28 | 0.81 |
| 2009 | 37 | 98 | 28 | 1210 | 32.70 | 43.21 | 14 | 34 | 0.93 |
| 2010 | 39 | 100 | 32 | 618 | 15.85 | 19.31 | 11 | 24 | 0.79 |
| 2011 | 31 | 75 | 30 | 1233 | 39.77 | 41.10 | 17 | 31 | 1.31 |
| 2012 | 38 | 96 | 33 | 506 | 13.32 | 15.33 | 10 | 21 | 0.83 |
| 2013 | 36 | 96 | 27 | 664 | 18.44 | 24.59 | 12 | 25 | 1.09 |
| 2014 | 24 | 53 | 19 | 379 | 15.79 | 19.95 | 11 | 19 | 1.10 |
| 2015 | 34 | 98 | 32 | 1119 | 32.91 | 34.97 | 16 | 33 | 1.78 |
| 2016 | 33 | 94 | 30 | 624 | 18.91 | 20.80 | 15 | 24 | 1.88 |
| 2017 | 23 | 57 | 21 | 510 | 22.17 | 24.29 | 10 | 22 | 1.43 |
| 2018 | 39 | 105 | 34 | 512 | 13.13 | 15.06 | 11 | 21 | 1.83 |
| 2019 | 37 | 137 | 30 | 332 | 8.97 | 11.07 | 7 | 17 | 1.40 |
| 2020 | 32 | 101 | 27 | 347 | 10.84 | 12.85 | 10 | 18 | 2.50 |
| 2021 | 39 | 120 | 31 | 265 | 6.79 | 8.55 | 9 | 15 | 3.00 |
| 2022 | 58 | 181 | 39 | 141 | 2.43 | 3.62 | 6 | 8 | 3.00 |
| 2023 | 22 | 67 | 6 | 13 | 0.59 | 2.17 | 2 | 3 | 2.00 |
| **Total** | **709** | **1885** | **582** | **22641** | **31.93** | **38.90** | **70** | **138** | **2.59** |

Notes: TP=total number of publications; NCA=Number of contributing authors; NCP=number of cited publications; TC=total citations; C/P=average citations per publication; C/CP=average citations per cited publication; h=h-index; g=g-index; m=m-index.

Figure 2 depicts the trend in total publications and citations in e-commerce adoption research from 1997 to 2023. The bar graph, representing the total publications per year, showcases a general trend of increasing publication count over the years. Starting with a minimal number of publications in 1997 and 1998, there's a substantial rise in output from the early 2000s, peaking at 58 in 2022. This growing number of publications reflects the escalating interest and progressive expansion of the e-commerce adoption research field. However, in 2023, there is a slight dip in the number of publications. This could be due to various reasons, such as the ongoing data collection for 2023 or a potential shift in research focus towards other emerging topics.

The line graph, depicting total citations per year, provides an understanding of the influence and impact of the research published yearly. The citations display a more varied trend than the steadily increasing publication count. The total citations peaked in 2003, suggesting that studies published this year have had a profound impact and have been frequently referenced in subsequent research. Post-2003, despite a few fluctuations, there is a general downward trend in total citations. One plausible explanation could be that more recent publications have needed more time to accumulate citations. Another factor could be the increase in the number of publications per year, leading to a wider distribution of citations among the growing body of research. Figure 2 highlights the evolving dynamics of the e-commerce adoption research landscape. It demonstrates the continuous growth in research output, complemented by the significant impact reflected through citations, reaffirming the relevance and influence of e-commerce adoption research in the academic community.

**Figure 2.** Total Publications and Citations by Year

Figure 3 presents the annual growth of publications on e-commerce adoption studies from 1997 to 2023. The line graph illustrates the count of publications per year. At the same time, the overlaid polynomial trendline provides a quantitative model of the growth trend, with the equation and r-squared value displayed on the chart. The polynomial trendline, represented by the equation y = -0.106x2 + 4.1735x - 3.7885, captures the changing growth rate in publications over time. The negative coefficient of the quadratic term (-0.106) suggests that the growth rate has slowed after reaching a peak. This pattern is typical of a maturing research field where the initial rapid growth phase eventually stabilizes.

However, the annual growth rate of 9.66% implies a substantial increase in research output over the years, affirming the ongoing relevance and expansion of the field. Despite the decelerating growth rate, the consistent positive growth reflects the sustained interest in e-commerce adoption research among scholars. The r-squared value of 0.6813 indicates that the polynomial model explains about 68.13% of the variation in the annual publication counts. While it is a relatively strong fit, the remaining unexplained variation might be due to other factors not considered in the model, such as varying funding or shifting global research priorities. In summary, Figure 3 provides a quantitative perspective on the growth dynamics of e-commerce adoption research. It depicts a field that continues to expand, albeit at a decreasing rate, reflecting its evolving maturity and sustained academic interest.

**Figure 3.** Annual Growth of Publications in E-commerce Adoption Research (1997-2023)

## Publications by Authors

As we address the third research question (RQ3), we focus on identifying the key contributors and influential works in e-commerce adoption research. One method to gauge an author's productivity and impact is through bibliometric indicators such as the total number of publications, total citations, h-index, g-index, and m-index. In this context, we present Table 8, providing a detailed breakdown of these measures for authors who have published more than five documents in this field. Table 8 presents the most productive authors, their affiliation and country, and key citation metrics, including the total number of publications (TP), number of cited publications (NCP), total citations (TC), average citations per publication (C/P), average citations per cited publication (C/CP), h-index, g-index, m-index, and citation sum within the h-core (CSwHC). The data in Table 8 shows a diverse group of scholars from various countries who have significantly contributed to e-commerce adoption research. Robert MacGregor from the University of Wollongong, Australia, tops the list with the highest total publications (15), closely followed by Lejla Vrazalic from Middlesex University Dubai, United Arab Emirates, with 11 publications.

Elizabeth E. Grandón from the University of Bío-Bío, Chile, boasts the highest average citations per publication (120.63) and total (965). This suggests that Grandón's work has a significant influence in the field. The h-index, which represents a balance between productivity (number of publications) and citation impact (number of citations), is highest for Robert MacGregor, Elizabeth E. Grandón, and J. Michael Pearson, all having an h-index of 6. The m-index, which is the h-index divided by the number of years since the first published paper of an author, is highest for Mohammad I. Merhi, from Indiana University South Bend, United States, and Ángel Herrero Crespo, from the University of Cantabria, Spain, suggesting they have sustained impact over time. This analysis shows these researchers' significant contributions to e-commerce adoption, acknowledging their productivity and influence based on their bibliometric indicators.

**Table 8.** Most Productive Authors that Published more than 5 Documents

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Author's Name** | **Affiliation** | **Country** | **TP** | **NCP** | **TC** | **C/P** | **C/CP** | ***h*** | ***g*** | ***m*** | **CSwHC** |
| MacGregor, Robert | University of Wollongong | Australia | 15 | 13 | 276 | 18.40 | 21.23 | 6 | 15 | 0.29 | 259 |
| Vrazalic, Lejla | Middlesex University Dubai | United Arab Emirates | 11 | 9 | 196 | 17.82 | 21.78 | 4 | 11 | 0.21 | 188 |
| Kurnia, Sherah | University of Melbourne | Australia | 9 | 7 | 292 | 32.44 | 41.71 | 5 | 9 | 0.29 | 286 |
| Grandón, Elizabeth E. | University of Bío-Bío | Chile | 8 | 6 | 965 | 120.63 | 160.83 | 6 | 8 | 0.29 | 965 |
| Del Bosque, Ignacio Rodríguez | University of Cantabria | Spain | 7 | 7 | 369 | 52.71 | 52.71 | 5 | 7 | 0.31 | 365 |
| Herrero Crespo, Ángel | University of Cantabria | Spain | 7 | 7 | 369 | 52.71 | 52.71 | 5 | 7 | 0.31 | 365 |
| Al-Somali, Sabah Abdullah | King Abdulaziz University | Saudi Arabia | 6 | 5 | 92 | 15.33 | 18.40 | 5 | 6 | 0.33 | 92 |
| Gholami, Roya | University of Illinois Springfield | United States | 6 | 5 | 92 | 15.33 | 18.40 | 5 | 6 | 0.33 | 92 |
| Clegg, Ben | Aston University | United Kingdom | 6 | 5 | 92 | 15.33 | 18.40 | 5 | 6 | 0.33 | 92 |
| Pearson, J. Michael | Southern Illinois University Carbondale | United States | 6 | 6 | 918 | 153.00 | 153.00 | 6 | 6 | 0.29 | 918 |
| Kartiwi, Mira | International Islamic University Malaysia | Malaysia | 6 | 5 | 85 | 14.17 | 17.00 | 4 | 6 | 0.22 | 81 |
| Merhi, Mohammad I. | Indiana University South Bend | United States | 5 | 5 | 30 | 6.00 | 6.00 | 3 | 5 | 0.43 | 28 |
| Abou-Shouk, Mohamed | University of Sharjah | United Arab Emirates | 5 | 5 | 157 | 31.40 | 31.40 | 5 | 5 | 0.45 | 157 |
| Govindaraju, Rajesri | Institut Teknologi Bandung | Indonesia | 5 | 5 | 62 | 12.40 | 12.40 | 5 | 5 | 0.38 | 62 |
| Chaparro-Peláez, Julián | Polytechnic University of Madrid | Spain | 5 | 3 | 68 | 13.60 | 22.67 | 3 | 5 | 0.21 | 68 |
| Scupola, Ada | Roskilde University | Denmark | 5 | 4 | 193 | 38.60 | 48.25 | 3 | 5 | 0.14 | 190 |
| Zhu, Ling | Long Island University | United States | 5 | 3 | 114 | 22.80 | 38.00 | 3 | 5 | 0.17 | 114 |

**Notes:** TP=total number of publications; NCP=number of cited publications; TC=total citations; C/P=average citations per publication; C/CP=average citations per cited publication; h=h-index; g=g-index; m=index; CSwHC=citation sum within h-core.

## Publications by Institutions

Continuing our discussion on individual authors, we now focus on the institutional level. Institutions also play a crucial role in research production and development. We can gain insights into the global hotbeds of e-commerce adoption research by looking at the institutions behind the authors. Table 9 lists the most productive institutions in total publications (TP) in e-commerce adoption studies, with a minimum of five publications. The table also provides several bibliometric measures, including total citations (TC), number of cited publications (NCP), average citations per publication (C/P), average citations per cited publication (C/CP), h-index, g-index, m-index, and citation sum within h-core (CSwHC). The University of Wollongong tops the list with the highest total publications of 19 and a respectable h-index of 7, suggesting high productivity and influence in e-commerce adoption. Following closely are Universiti Kebangsaan Malaysia, with 12 publications, and Universiti Utara Malaysia, with 10 publications. It is noteworthy to mention Southern Illinois University, which, despite having only nine total publications, has the highest total citations of 1195 and the highest average citations per publication (132.78), indicating a strong influence in the domain. It also boasts an impressive h-index of 8, underscoring the high impact of its research output. Furthermore, the institutions represented are diverse, with universities from Malaysia, Australia, the United States, China, the United Kingdom, and several others contributing significantly to the body of knowledge in e-commerce adoption studies.

Institut Teknologi Bandung from Indonesia and Plymouth University from the UK stand out with an m-index of 0.46 and 0.55, respectively, suggesting that they have maintained consistent influence over time. The contribution of these institutions to e-commerce adoption research is significant, given their productivity and the impact of their research, as evidenced by the various bibliometric indicators provided in Table 9. This analysis underlines the collaborative and international nature of research in this domain, with institutions from various corners of the globe contributing to the growing body of knowledge.

**Table 9.** Most productive institutions with a minimum of 5 publications

| **Institution** | **TP** | **TC** | **NCP** | **C/P** | **C/CP** | ***h*** | ***g*** | ***m*** | **CSwHC** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| University of Wollongong | 19 | 412 | 16 | 21.68 | 25.75 | 7 | 19 | 0.33 | 388 |
| Universiti Kebangsaan Malaysia | 12 | 227 | 11 | 18.92 | 20.64 | 5 | 12 | 0.26 | 209 |
| Universiti Utara Malaysia | 10 | 248 | 10 | 24.80 | 24.80 | 6 | 10 | 0.40 | 240 |
| Bina Nusantara University | 9 | 16 | 6 | 1.78 | 2.67 | 2 | 4 | 0.33 | 11 |
| University of Melbourne | 9 | 292 | 7 | 32.44 | 41.71 | 5 | 9 | 0.29 | 286 |
| Universiti Teknologi Malaysia | 9 | 96 | 5 | 10.67 | 19.20 | 3 | 9 | 0.21 | 92 |
| Southern Illinois University | 9 | 1195 | 8 | 132.78 | 149.38 | 8 | 9 | 0.38 | 1195 |
| Zhejiang University | 8 | 185 | 7 | 23.13 | 26.43 | 5 | 8 | 0.36 | 183 |
| Institut Teknologi Bandung | 8 | 95 | 8 | 11.88 | 11.88 | 6 | 8 | 0.46 | 90 |
| Institut Teknologi Sepuluh Nopember | 7 | 59 | 7 | 8.43 | 8.43 | 4 | 7 | 0.36 | 51 |
| Curtin University of Technology | 7 | 58 | 5 | 8.29 | 11.60 | 3 | 7 | 0.16 | 55 |
| Aston University | 7 | 92 | 5 | 13.14 | 18.40 | 5 | 7 | 0.33 | 92 |
| University of New South Wales | 7 | 126 | 6 | 18.00 | 21.00 | 4 | 7 | 0.21 | 118 |
| Universiti Tunku Abdul Rahman | 7 | 33 | 5 | 4.71 | 6.60 | 3 | 5 | 0.20 | 29 |
| Universitas Indonesia | 6 | 40 | 5 | 6.67 | 8.00 | 4 | 6 | 0.57 | 38 |
| University of Botswana | 6 | 171 | 6 | 28.50 | 28.50 | 5 | 6 | 0.29 | 168 |
| Plymouth University | 6 | 221 | 6 | 36.83 | 36.83 | 6 | 6 | 0.55 | 221 |
| Universiti Putra Malaysia | 6 | 112 | 5 | 18.67 | 22.40 | 4 | 6 | 0.31 | 111 |
| Indiana University South Bend | 5 | 30 | 5 | 6.00 | 6.00 | 3 | 5 | 0.43 | 28 |
| Universidad de Cantabria | 5 | 185 | 5 | 37.00 | 37.00 | 3 | 5 | 0.19 | 181 |
| Edith Cowan University | 5 | 138 | 4 | 27.60 | 34.50 | 4 | 5 | 0.21 | 138 |
| Roskilde University | 5 | 193 | 4 | 38.60 | 48.25 | 3 | 5 | 0.14 | 190 |
| RMIT University | 5 | 60 | 5 | 12.00 | 12.00 | 3 | 5 | 0.14 | 54 |
| Universiti Sains Malaysia | 5 | 107 | 5 | 21.40 | 21.40 | 4 | 5 | 0.29 | 106 |
| Nanyang Technological University | 5 | 211 | 5 | 42.20 | 42.20 | 4 | 5 | 0.17 | 210 |
| Multimedia University | 5 | 110 | 4 | 22.00 | 27.50 | 3 | 5 | 0.19 | 109 |
| Monash University Malaysia | 5 | 248 | 5 | 49.60 | 49.60 | 3 | 5 | 0.18 | 246 |

**Notes:** TP=total number of publications; NCP=number of cited publications; TC=total citations; C/P=average citations per publication; C/CP=average citations per cited publication; h=h-index; g=g-index; m=index; CSwHC=citation sum within h-core.

## Publications by Countries

The final analysis within RQ3 addresses the geographical dispersion of research productivity. Table 10 highlights the countries that have contributed 20 or more publications in e-commerce adoption studies. The United States leads in total publications with 124, demonstrating the country's significant contribution to this field of research. The US also showcases the highest total citations (TC) of 11336 and the highest h-index of 37, illustrating the quality and influence of its research. Malaysia, China, Australia, and the United Kingdom follow the US in the total number of publications, making substantial contributions as well. Each of these countries has over 60 publications, pointing towards a global interest and effort in studying e-commerce adoption. Regarding citations per publication (C/P), South Korea stands out despite having only 17 publications. An average of 105.35 citations per publication reflects South Korean research's significant impact and quality in this area. From another perspective, the United Kingdom demonstrates a high average of citations per cited publication (C/CP), indicating that their contributions are often cited in other studies, thus enhancing knowledge in e-commerce adoption research. The global dispersion of contributions from the United States to Malaysia, China, Australia, the United Kingdom, and beyond indicates international interest and investment in e-commerce adoption studies. This diversity strengthens the research field and allows for varying perspectives and methodologies, enriching the discourse on e-commerce adoption.

It's also important to highlight countries like Indonesia, Spain, and India, which, despite contributing fewer publications than the top five countries, still exhibit strong h-indices and total citation counts. This suggests that their research has a meaningful impact on the field. Overall, Table 10 shows a clear global interest in e-commerce adoption, with research contributions from various corners of the world. This research area continues to be dynamic and significant as e-commerce becomes an increasingly crucial part of global business and economy.

**Table 10.** Countries that contributed five or more publications

| **Country** | **TP** | **TC** | **NCP** | **C/P** | **C/CP** | ***h*** | ***g*** | ***m*** | **CSwHC** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| United States | 124 | 11336 | 114 | 91.42 | 99.44 | 37 | 106 | 1.37 | 10427 |
| Malaysia | 83 | 1225 | 69 | 14.76 | 17.75 | 17 | 35 | 0.89 | 980 |
| China | 76 | 776 | 56 | 10.21 | 13.86 | 15 | 27 | 0.88 | 632 |
| Australia | 72 | 1445 | 61 | 20.07 | 23.69 | 17 | 38 | 0.74 | 1198 |
| United Kingdom | 69 | 2975 | 64 | 43.12 | 46.48 | 26 | 54 | 1.18 | 2611 |
| Indonesia | 58 | 411 | 48 | 7.09 | 8.56 | 11 | 20 | 0.85 | 258 |
| Spain | 29 | 1107 | 24 | 38.17 | 46.13 | 15 | 29 | 0.83 | 1065 |
| India | 28 | 284 | 23 | 10.14 | 12.35 | 9 | 16 | 0.43 | 233 |
| South Africa | 21 | 286 | 15 | 13.62 | 19.07 | 7 | 16 | 0.32 | 258 |
| South Korea | 17 | 1791 | 15 | 105.35 | 119.40 | 11 | 17 | 0.48 | 1778 |
| Canada | 15 | 435 | 15 | 29.00 | 29.00 | 10 | 15 | 0.50 | 409 |
| United Arab Emirates | 14 | 444 | 13 | 31.71 | 34.15 | 8 | 14 | 0.44 | 432 |
| Taiwan | 13 | 161 | 9 | 12.38 | 17.89 | 7 | 12 | 0.37 | 155 |
| Nigeria | 13 | 311 | 11 | 23.92 | 28.27 | 8 | 13 | 0.44 | 303 |
| Saudi Arabia | 13 | 215 | 11 | 16.54 | 19.55 | 6 | 13 | 0.40 | 198 |
| Jordan | 11 | 400 | 10 | 36.36 | 40.00 | 7 | 11 | 0.54 | 388 |
| Iran | 10 | 128 | 10 | 12.80 | 12.80 | 5 | 10 | 0.31 | 119 |
| Singapore | 10 | 468 | 10 | 46.80 | 46.80 | 8 | 10 | 0.35 | 465 |
| Egypt | 8 | 111 | 6 | 13.88 | 18.50 | 5 | 8 | 0.45 | 108 |
| Italy | 8 | 130 | 6 | 16.25 | 21.67 | 4 | 8 | 0.19 | 122 |
| Sweden | 8 | 8 | 3 | 1.00 | 2.67 | 2 | 2 | 0.10 | 7 |
| New Zealand | 7 | 220 | 6 | 31.43 | 36.67 | 5 | 7 | 0.24 | 218 |
| Germany | 7 | 141 | 7 | 20.14 | 20.14 | 4 | 7 | 0.15 | 134 |
| Viet Nam | 7 | 285 | 7 | 40.71 | 40.71 | 5 | 7 | 0.24 | 278 |
| Netherlands | 7 | 41 | 6 | 5.86 | 6.83 | 4 | 6 | 0.21 | 34 |
| Thailand | 7 | 200 | 6 | 28.57 | 33.33 | 4 | 7 | 0.18 | 196 |
| Chile | 7 | 273 | 5 | 39.00 | 54.60 | 5 | 7 | 0.28 | 273 |
| Ghana | 7 | 241 | 7 | 34.43 | 34.43 | 5 | 7 | 0.31 | 238 |
| France | 7 | 206 | 6 | 29.43 | 34.33 | 4 | 7 | 0.19 | 202 |
| Botswana | 6 | 171 | 6 | 28.50 | 28.50 | 5 | 6 | 0.29 | 168 |
| Denmark | 6 | 194 | 5 | 32.33 | 38.80 | 3 | 6 | 0.14 | 190 |
| Hong Kong | 6 | 298 | 5 | 49.67 | 59.60 | 4 | 6 | 0.19 | 296 |
| Pakistan | 6 | 21 | 6 | 3.50 | 3.50 | 3 | 4 | 0.17 | 16 |
| Belgium | 5 | 12 | 3 | 2.40 | 4.00 | 2 | 3 | 0.17 | 11 |
| Colombia | 5 | 70 | 4 | 14.00 | 17.50 | 3 | 5 | 0.50 | 69 |
| Portugal | 5 | 55 | 4 | 11.00 | 13.75 | 3 | 5 | 0.20 | 54 |

**Notes:** TP=total number of publications; NCP=number of cited publications; TC=total citations; C/P=average citations per publication; C/CP=average citations per cited publication; h=h-index; g=g-index; m=index; CSwHC=citation sum within h-core.

## Publications by Source Titles

RQ4 likely aims to understand which sources or publications are most influential or active in the research field of e-commerce adoption. The analysis of Table 11 directly relates to this question by identifying the leading sources that contribute to the body of knowledge on e-commerce adoption. Table 11 illustrates the most active source titles that have published five or more documents, providing valuable insight into the leading publications in e-commerce adoption. The "Journal of Electronic Commerce in Organizations" tops the list with 12 total publications. It also has a fairly high h-index of 8 and a g-index of 12, indicating that its publications have been widely cited. It also shows a strong average of 19.25 citations per publication (C/P) and per cited publication (C/CP). Another noteworthy source is the "Journal of Global Information Technology Management," with 11 publications and an impressive 540 total citations. Its C/P and C/CP values are significantly high, demonstrating the impact of its publications in the field.

However, the journal "Information and Management" clearly stands out when looking at the average citations per publication. Despite having just nine publications, it has a stunning C/P and C/CP average of 232.89, by far the highest on the list. This suggests that the articles it publishes are highly relevant and significant in the field, often referenced in other research. Similarly, "Journal of Small Business and Enterprise Development" and "Industrial Management and Data Systems" also show high citation averages, indicating their significant influence in the field. In terms of h-index and g-index, which measure the productivity and impact of the published work, several journals, including "Journal of Electronic Commerce in Organizations," "Information and Management," and "Journal of Small Business and Enterprise Development," have robust scores, implying that a substantial number of their papers have been cited frequently.

However, some source titles, like "Sustainability (Switzerland)" and "ACM International Conference Proceeding Series," despite publishing a substantial number of papers, do not have high citation metrics. This could be due to various reasons, such as the recency of the publications or the specificity of the topics they cover. These insights answer RQ4 by identifying the most active and influential publications and providing valuable guidance for researchers in this field. Knowing which sources publish influential work on e-commerce adoption could help future researchers locate key literature for their reviews. It can also help them identify where to target their research for publication to ensure it reaches an audience that is deeply engaged with e-commerce adoption.

**Table 11.** Most active source titles that published five or more documents

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Source Title** | **TP** | **NCA** | **NCP** | **TC** | **C/P** | **C/CP** | ***h*** | ***g*** | ***m*** | **CSwHC** |
| Journal of Electronic Commerce in Organizations | 12 | 25 | 12 | 231 | 19.25 | 19.25 | 8 | 12 | 0.44 | 219 |
| Journal of Global Information Technology Management | 11 | 26 | 10 | 540 | 49.09 | 54.00 | 9 | 11 | 0.43 | 539 |
| Information and Management | 9 | 21 | 9 | 2096 | 232.89 | 232.89 | 8 | 9 | 0.31 | 2091 |
| Information Development | 8 | 24 | 6 | 115 | 14.38 | 19.17 | 3 | 8 | 0.38 | 109 |
| International Journal of Business Information Systems | 8 | 21 | 7 | 185 | 23.13 | 26.43 | 6 | 8 | 0.38 | 181 |
| Electronic Journal of Information Systems in Developing Countries | 8 | 18 | 8 | 256 | 32.00 | 32.00 | 7 | 8 | 0.32 | 250 |
| Journal of Small Business and Enterprise Development | 8 | 17 | 8 | 812 | 101.50 | 101.50 | 8 | 8 | 0.36 | 812 |
| Sustainability (Switzerland) | 7 | 19 | 6 | 20 | 2.86 | 3.33 | 3 | 4 | 1.50 | 14 |
| Electronic Commerce Research | 7 | 25 | 5 | 283 | 40.43 | 56.60 | 3 | 7 | 0.25 | 278 |
| ACM International Conference Proceeding Series | 7 | 20 | 5 | 29 | 4.14 | 5.80 | 3 | 5 | 0.16 | 25 |
| Journal of Global Information Management | 6 | 15 | 6 | 287 | 47.83 | 47.83 | 6 | 6 | 0.32 | 287 |
| Journal of Business Research | 6 | 22 | 6 | 466 | 77.67 | 77.67 | 6 | 6 | 0.38 | 466 |
| Communications in Computer and Information Science | 6 | 17 | 4 | 10 | 1.67 | 2.50 | 2 | 3 | 0.14 | 8 |
| Industrial Management and Data Systems | 6 | 16 | 6 | 566 | 94.33 | 94.33 | 5 | 6 | 0.26 | 561 |
| Advances in Intelligent Systems and Computing | 5 | 22 | 5 | 30 | 6.00 | 6.00 | 3 | 5 | 0.38 | 27 |
| International Journal of Information Management | 5 | 13 | 4 | 174 | 34.80 | 43.50 | 4 | 5 | 0.22 | 174 |
| Journal of Internet Commerce | 5 | 11 | 5 | 168 | 33.60 | 33.60 | 4 | 5 | 0.22 | 165 |
| Journal of Enterprise Information Management | 5 | 12 | 5 | 311 | 62.20 | 62.20 | 5 | 5 | 0.25 | 311 |
| Proceedings of the International Conference on Electronic Business (ICEB) | 5 | 10 | 2 | 2 | 0.40 | 1.00 | 1 | 1 | 0.05 | 1 |

**Notes:** TP=total number of publications; NCA=Number of contributing authors; NCP=number of cited publications; TC=total citations; C/P=average citations per publication; C/CP=average citations per cited publication; h=h-index; g=g-index; m=m-index; CSwHC=citation sum within h-core.

## Highly Cited Documents

RQ5 likely pertains to understanding the most influential studies in e-commerce adoption. Analyzing the top 20 highly cited articles, as presented in Table 12, allows for identifying key themes, theories, and perspectives that have shaped the discourse in this area of research. The most cited article is Pavlou's 2003 study, "Consumer acceptance of electronic commerce: Integrating trust and risk with the technology acceptance model". This paper stands out because of its impressive citation count (3294 TC) and its ongoing influence, as demonstrated by a high average number of citations per year (156.86 C/Y). This underscores the enduring relevance of technology acceptance models and the importance of trust and risk considerations in e-commerce.

Pavlou's work along with Fygenson in 2006 ("Understanding and predicting electronic commerce adoption: An extension of the theory of planned behavior") expands upon this approach, pointing to the application of behavior theories as a fruitful research direction in the field. This affirms the importance of psychological and sociological perspectives in understanding e-commerce adoption. It's also notable that many of the listed papers focus on the adoption of e-commerce by SMEs, with papers by Ghobakhloo et al. (2011), Grandon & Pearson (2004), Daniel et al. (2002), Al-Qirim (2007), and Kurnia et al. (2015) among others. This indicates the significance of SMEs in e-commerce research, suggesting that the dynamics of e-commerce adoption may vary significantly between large corporations and smaller entities, necessitating separate investigations.

Cultural factors also emerge as an important theme, with Yoon's 2009 study ("The effects of national culture values on consumer acceptance of e-commerce: Online shoppers in China") and Tan et al.'s 2007 work ("Business-to-business adoption of eCommerce in China") both focusing on China. This underscores the need for culturally sensitive research, recognizing that adoption patterns may differ across different cultural contexts. This analysis also uncovers the continued development of theoretical frameworks in the field. For instance, Awa et al.'s 2015 paper integrates Technology Acceptance Model (TAM), Theory of Planned Behavior (TPB), and Technology-Organization-Environment (TOE) frameworks and expands their characteristic constructs for e-commerce adoption by SMEs. This reflects the ongoing refinement and expansion of theoretical models in response to the complex and evolving phenomenon of e-commerce adoption.

This analysis underscores the multifaceted nature of e-commerce adoption research, demonstrating its roots in diverse disciplines and perspectives, including psychology, sociology, business, and cultural studies. This in-depth examination of Table 12 thus provides crucial insights into the most significant research in the field, informing RQ5 and offering a robust foundation for further scholarly exploration.

**Table 12.** Top 20 highly cited articles

| **No.** | **Authors** | **Title** | **Source Title** | **TC** | **C/Y** |
| --- | --- | --- | --- | --- | --- |
| 1 | Pavlou (2003) | Consumer acceptance of electronic commerce: Integrating trust and risk with the technology acceptance model | International Journal of Electronic Commerce | 3294 | 156.86 |
| 2 | Pavlou & Fygenson (2006) | Understanding and predicting electronic commerce adoption: An extension of the theory of planned behavior | MIS Quarterly: Management Information Systems | 1801 | 100.06 |
| 3 | Grandon & Pearson (2004) | Electronic commerce adoption: An empirical study of small and medium US businesses | Information and Management | 707 | 35.35 |
| 4 | Suh & Han (2003) | The impact of customer trust and perception of security control on the acceptance of electronic commerce | International Journal of Electronic Commerce | 560 | 26.67 |
| 5 | Bhattacherjee (2000) | Acceptance of e-commerce services: The case of electronic brokerages | IEEE Transactions on Systems, Man, and Cybernetics Part A: Systems and Humans. | 514 | 21.42 |
| 6 | Ghobakhloo et al. (2011) | Adoption of e-commerce applications in SMEs | Industrial Management and Data Systems | 359 | 27.62 |
| 7 | Molla & Licker (2005) | ECommerce adoption in developing countries: A model and instrument | Information and Management | 336 | 17.68 |
| 8 | Yoon (2009) | The effects of national culture values on consumer acceptance of e-commerce: Online shoppers in China | Information and Management | 305 | 20.33 |
| 9 | Kim et al. (2009) | Modeling roles of subjective norms and eTrust in customers' acceptance of airline B2C eCommerce websites | Tourism Management | 276 | 18.40 |
| 10 | Hong & Zhu (2006) | Migrating to internet-based e-commerce: Factors affecting e-commerce adoption and migration at the firm level | Information and Management | 265 | 14.72 |
| 11 | Eastin (2002) | Diffusion of e-commerce: An analysis of the adoption of four e-commerce activities | Telematics and Informatics | 262 | 11.91 |
| 12 | Molla & Licker (2005) | Perceived e-readiness factors in e-commerce adoption: An empirical investigation in a developing country | International Journal of Electronic Commerce | 255 | 13.42 |
| 13 | Daniel et al. (2002) | Adoption of e-commerce by SMEs in the UK: Towards a stage model | International Small Business Journal | 242 | 11.00 |
| 14 | Kim & Prabhakar (2004) | Initial trust and the adoption of B2C e-Commerce: The case of Internet banking | Data Base for Advances in Information Systems | 237 | 11.85 |
| 15 | Chen & Tan (2004) | Technology adaptation in E-commerce: Key determinants of virtual stores acceptance | European Management Journal | 226 | 11.30 |
| 16 | Tan et al. (2007) | Business-to-business adoption of eCommerce in China | Information and Management | 218 | 12.82 |
| 17 | Al-Qirim (2007) | The adoption of eCommerce communications and applications technologies in small businesses in New Zealand | Electronic Commerce Research and Applications | 202 | 11.88 |
| 18 | Awa et al. (2015) | Integrating TAM, TPB and TOE frameworks and expanding their characteristic constructs for e-commerce adoption by SMEs | Journal of Science and Technology Policy Management | 193 | 21.44 |
| 19 | Scupola (2009) | SMEs' e-commerce adoption: Perspectives from Denmark and Australia | Journal of Enterprise Information Management | 181 | 12.07 |
| 20 | Kurnia et al. (2015) | E-commerce technology adoption: A Malaysian grocery SME retail sector study | Journal of Business Research | 175 | 19.44 |

**Note:** TC=Total Citations; C/Y=Citations per Year.

## Author’s Keywords Analysis

This section focuses squarely on an in-depth analysis of the author's keywords and answering the RQ6. The keywords employed by authors offer significant insights into the central themes of their research, often acting as signposts that guide readers through the complex landscape of academic inquiry (Punj et al., 2023). These keywords form the basis for our multi-layered analysis of the core constructs and evolving trends within e-commerce adoption studies. This exploratory venture begins with (1) Network Visualisation, an innovative approach to unravel the dominant themes in e-commerce adoption research. By connecting co-occurring keywords, we can construct a network that maps the landscape of e-commerce research, shedding light on the critical focus areas.

Next, we venture into (2) Overlay Visualisation, which helps us trace the evolution of keywords over time. This temporal mapping allows us to chronicle the shifting paradigms in e-commerce adoption studies, reflecting the dynamic nature of the field as it adapts to the ever-evolving digital world. The third stage of our analysis is (3) Density Visualisation. We will identify the research hotspots in e-commerce adoption studies by focusing on the frequency and co-occurrence of keywords. This heat map of keyword usage focuses on the areas attracting the most academic interest and engagement. Next, we conduct (4) Trend Topics Analysis, focusing on the field's most current and pressing issues. This analysis is crucial in identifying the cutting-edge topics shaping the discourse on e-commerce adoption and will inform future research trajectories.

The fifth phase of our analysis is (5) Thematic Map development, which offers a graphical representation of the research themes prevalent in e-commerce adoption studies. It offers a bird's eye view of the conceptual landscape, facilitating understanding the interplay between various research themes. Finally, we conclude our analysis with (6) Factorial Analysis, which will guide the development of a robust data model. By analyzing the underlying variables that account for the data set's structure and variance, we aim to enhance our understanding of the intricacies of e-commerce adoption studies. Each layer of this multifaceted analysis uncovers a different aspect of e-commerce adoption research, providing a comprehensive overview reflecting this ever-evolving field's depth and breadth. The culmination of these analytic approaches will guide future research endeavors, informing and shaping the continued exploration of e-commerce adoption.

### Network Visualisation

The dataset represents a comprehensive mapping of co-occurring keywords in e-commerce adoption research. The co-occurrence of these keywords signifies the interrelation and mutual relevance of the themes they represent in the context of e-commerce adoption. The dataset shown in Table 13 and Figure 4, derived from it, represents an overview of the e-commerce adoption research landscape, revealing the main thematic clusters that mark the different research trajectories within this field. This multi-faceted study of e-commerce adoption research is segmented into four clusters: Technological Infrastructure and Innovation, User-Centric Factors and Behavioural Models, Business and Regional Perspectives, and Cultural and Developmental Aspects.

**Table 13.** Co-occurrence network of the author’s keywords in e-commerce adoption research

| **Label** | **Cluster** | **Weight** | | | **Score** | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Links** | **TLS** | **Freq.** | **Avg. Pub. Year** | **Avg. citations** | **Avg. norm. citations** |
| e-commerce acceptance | 1 | 7 | 7 | 6 | 2010.83 | 121.17 | 0.82 |
| cloud computing | 1 | 7 | 11 | 6 | 2017.33 | 6.67 | 0.40 |
| culture | 1 | 9 | 13 | 6 | 2011.50 | 10.50 | 0.43 |
| COVID-19 | 1 | 8 | 14 | 5 | 2021.60 | 9.20 | 2.78 |
| gender | 1 | 9 | 15 | 7 | 2009.86 | 25.29 | 1.41 |
| security | 1 | 10 | 15 | 6 | 2010.83 | 30.33 | 0.58 |
| online shopping | 1 | 11 | 17 | 9 | 2016.22 | 22.33 | 0.80 |
| digital divide | 1 | 13 | 18 | 7 | 2011.00 | 19.71 | 1.03 |
| supply chain management | 1 | 10 | 19 | 9 | 2012.00 | 43.33 | 2.73 |
| IT adoption | 1 | 11 | 22 | 13 | 2012.54 | 19.08 | 0.83 |
| innovation | 1 | 9 | 24 | 8 | 2013.63 | 43.50 | 2.25 |
| information systems | 1 | 15 | 25 | 8 | 2011.50 | 59.13 | 1.55 |
| IT | 1 | 18 | 27 | 8 | 2011.63 | 52.50 | 2.41 |
| Malaysia | 1 | 14 | 30 | 14 | 2011.79 | 41.07 | 1.29 |
| B2C | 1 | 16 | 33 | 10 | 2010.70 | 26.70 | 1.72 |
| B2B | 1 | 21 | 38 | 13 | 2014.23 | 20.69 | 1.36 |
| ICT | 1 | 22 | 45 | 15 | 2015.67 | 9.80 | 0.89 |
| technology adoption | 1 | 24 | 58 | 25 | 2011.56 | 100.08 | 1.92 |
| TOE | 1 | 23 | 59 | 21 | 2018.19 | 34.81 | 2.21 |
| Internet | 1 | 30 | 78 | 32 | 2009.84 | 41.31 | 1.63 |
| e-commerce | 1 | 68 | 597 | 348 | 2013.68 | 32.04 | 1.13 |
| m-commerce | 2 | 4 | 7 | 5 | 2017.40 | 3.40 | 0.23 |
| UTAUT2 | 2 | 4 | 7 | 5 | 2019.40 | 5.60 | 0.82 |
| user acceptance | 2 | 6 | 11 | 9 | 2014.78 | 16.78 | 1.03 |
| PLS-SEM | 2 | 8 | 14 | 7 | 2020.14 | 3.29 | 0.60 |
| intention | 2 | 12 | 15 | 5 | 2015.60 | 17.80 | 2.12 |
| subjective norm | 2 | 11 | 15 | 6 | 2012.50 | 86.50 | 3.11 |
| behavioral intention | 2 | 11 | 16 | 6 | 2020.67 | 2.33 | 0.79 |
| cross-border e-commerce | 2 | 12 | 17 | 13 | 2020.08 | 7.92 | 0.87 |
| attitude | 2 | 11 | 18 | 6 | 2013.50 | 56.33 | 3.52 |
| self-efficacy | 2 | 17 | 21 | 6 | 2016.67 | 308.50 | 5.09 |
| perceived ease of use | 2 | 10 | 25 | 7 | 2010.14 | 510.57 | 3.21 |
| perceived usefulness | 2 | 14 | 30 | 8 | 2011.25 | 452.50 | 3.45 |
| technology acceptance | 2 | 23 | 33 | 11 | 2013.82 | 317.18 | 1.81 |
| consumer behavior | 2 | 17 | 35 | 14 | 2011.64 | 381.29 | 3.50 |
| perceived risk | 2 | 18 | 36 | 14 | 2012.21 | 279.07 | 2.74 |
| theory of planned behavior | 2 | 21 | 47 | 15 | 2011.27 | 161.73 | 3.29 |
| UTAUT | 2 | 26 | 50 | 17 | 2018.06 | 7.71 | 0.59 |
| structural equation model | 2 | 25 | 60 | 26 | 2017.04 | 14.08 | 0.60 |
| trust | 2 | 28 | 74 | 30 | 2014.73 | 213.73 | 2.91 |
| technology acceptance model | 2 | 34 | 129 | 55 | 2014.29 | 59.02 | 1.45 |
| consumers | 3 | 3 | 6 | 5 | 2015.20 | 5.40 | 1.00 |
| influencing factors | 3 | 5 | 7 | 6 | 2013.83 | 2.67 | 0.10 |
| e-business | 3 | 8 | 10 | 5 | 2014.80 | 15.40 | 1.05 |
| entrepreneurship | 3 | 8 | 11 | 6 | 2017.33 | 5.67 | 0.43 |
| organisational culture | 3 | 7 | 11 | 6 | 2013.50 | 4.83 | 0.29 |
| tourism | 3 | 7 | 13 | 5 | 2013.40 | 14.80 | 0.67 |
| adoption of e-commerce | 3 | 8 | 14 | 8 | 2012.50 | 18.38 | 0.60 |
| case study | 3 | 6 | 14 | 7 | 2008.14 | 32.00 | 0.78 |
| technology | 3 | 9 | 14 | 6 | 2015.00 | 9.67 | 0.48 |
| SMMEs | 3 | 11 | 15 | 6 | 2014.17 | 11.00 | 0.57 |
| Australia | 3 | 8 | 17 | 6 | 2007.67 | 86.33 | 2.21 |
| organisational factors | 3 | 11 | 17 | 7 | 2012.00 | 42.71 | 1.11 |
| small businesses | 3 | 11 | 19 | 5 | 2011.80 | 46.80 | 2.34 |
| diffusion of innovation | 3 | 14 | 27 | 10 | 2011.70 | 28.30 | 1.05 |
| Saudi Arabia | 3 | 12 | 27 | 11 | 2013.55 | 15.00 | 0.75 |
| Indonesia | 3 | 18 | 36 | 12 | 2015.50 | 10.75 | 0.72 |
| barriers | 3 | 17 | 39 | 12 | 2012.67 | 16.42 | 0.82 |
| e-commerce adoption | 3 | 44 | 152 | 106 | 2014.44 | 28.20 | 1.14 |
| SMEs | 3 | 44 | 324 | 154 | 2013.07 | 37.08 | 1.25 |
| national culture | 4 | 7 | 10 | 6 | 2012.50 | 57.00 | 1.86 |
| United States | 4 | 6 | 11 | 5 | 2012.20 | 26.60 | 1.43 |
| innovation adoption | 4 | 5 | 13 | 8 | 2007.38 | 105.63 | 2.48 |
| competitive advantage | 4 | 9 | 14 | 5 | 2014.60 | 41.80 | 2.22 |
| B2B e-commerce | 4 | 7 | 16 | 12 | 2008.00 | 38.83 | 1.31 |
| Ghana | 4 | 14 | 22 | 7 | 2016.86 | 36.29 | 2.42 |
| B2B e-commerce adoption | 4 | 16 | 25 | 12 | 2012.33 | 27.58 | 1.25 |
| e-readiness | 4 | 13 | 26 | 10 | 2013.20 | 36.80 | 1.04 |
| China | 4 | 20 | 42 | 18 | 2012.39 | 21.06 | 1.41 |
| developing countries | 4 | 35 | 122 | 44 | 2011.16 | 41.64 | 1.33 |
| adoption | 4 | 38 | 159 | 66 | 2013.15 | 33.00 | 1.15 |

***Cluster 1: Technological Infrastructure and Innovation***

The first cluster clearly indicates the increasing focus on the technological aspects of e-commerce adoption. The pivotal role of technology in e-commerce adoption is well-established. Keywords like "cloud computing", "IT adoption", and "technology adoption" reflect the infrastructural facets of e-commerce. For instance, a recent technological innovation, cloud computing, has been a game-changer for e-commerce by providing scalable and flexible resources to enterprises and customers. In addition to infrastructural terms, this cluster also includes concepts related to innovation, such as "innovation" and "information systems", signifying the importance of continuous innovation in this sector. This aligns with the broader understanding of the role of innovation in fostering competitiveness and growth in e-commerce. The term "e-commerce acceptance" in this cluster suggests a linkage between technological infrastructure and the degree of acceptance by the user or market. Similarly, "supply chain management" points towards the operational aspects of e-commerce businesses and the role technology plays in managing complex supply chain processes.

***Cluster 2: User-Centric Factors and Behavioural Models***

The second cluster is characterized by terms related to the individual-level factors that shape e-commerce adoption. This cluster mirrors the acknowledgment in academic research of the pivotal role of individual users in the adoption process. Concepts such as "user acceptance", "intention", and "self-efficacy" indicate the importance of understanding the attitudes, beliefs, and behavioral tendencies of the end-users of e-commerce. The occurrence of terms like "UTAUT2" and "Theory of Planned Behaviour" underscores the influence of prominent theoretical models in investigating user-centric factors in e-commerce adoption research. "Perceived risk" and "trust", key elements in this cluster, are particularly noteworthy, suggesting the significance of risk perceptions and trust in shaping users' attitudes towards e-commerce. In other words, they echo the importance of designing e-commerce systems that are secure, reliable, and user-friendly, thereby minimizing perceived risk and enhancing trust.

***Cluster 3: Business and Regional Perspectives***

This cluster emphasizes that e-commerce adoption is also a matter of organizational decision-making and is influenced by various organizational and regional factors. The emphasis on "entrepreneurship", "organizational culture", and "barriers" underscores the role of enterprise-level factors in the decision to adopt e-commerce. Geographical terms like "Australia", "Saudi Arabia", and "Indonesia" reflect the regional dynamics that may affect e-commerce adoption. Such factors could range from local consumer preferences and internet penetration rates to regional regulations and logistical infrastructure. This cluster's focus on "SMEs" and "small businesses" indicates the challenges and opportunities for e-commerce adoption within smaller-scale enterprises.

***Cluster 4: Cultural and Developmental Aspects***

The fourth cluster, featuring terms like "national culture", "competitive advantage", "developing countries", and "innovation adoption", represents a socio-cultural and developmental perspective on e-commerce adoption. This cluster suggests that cultural norms and the socio-economic status of a country play a role in shaping e-commerce adoption patterns. The emphasis on "developing countries" suggests a focus on the unique challenges and opportunities in these contexts. These might include infrastructure deficits, digital literacy issues, but also the potential for e-commerce to drive economic development. The presence of terms such as "competitive advantage" and "b2b e-commerce" underscore the business implications of e-commerce adoption.

This thematic analysis of co-occurring keywords in e-commerce adoption research offers a panoramic view of the field. It showcases the complexity of e-commerce adoption, involving various factors at multiple levels - individual, organizational, national, and international. It also highlights the need for a multi-dimensional approach to e-commerce adoption, encompassing technological, user-centric, organizational, cultural, and developmental aspects. This wide-ranging perspective aligns well with the understanding that successful e-commerce adoption is not just about leveraging technology, but also about taking into account the intricate web of socio-cultural, organizational, and individual factors.

A network of colored dots and lines

Description automatically generated

**Figure 4.** Network visualization ofco-occurrence of the author’s keywords in e-commerce adoption research

<https://app.vosviewer.com/?json=https://drive.google.com/uc?id=1MZOaXqt5jxoSjodjWs-mgacYY03lJ4yH>

### Overlay Visualisation

The author's keywords were subjected to an overlay visualization analysis to facilitate a comprehensive understanding of the e-commerce adoption research field. Figure 5 portrays the overlay visualization of the co-occurrence of these keywords, providing a bird’s eye view of how the focal themes have evolved. Overlay visualizations are essential in the armamentarium of bibliometric studies, tracing the temporal development of research themes and mapping the research landscape chronologically. By attributing a color to each keyword, based on the average year of publication (as given in Table 13), we can track the field's progression and the transformation of its focal themes over the years.

***Foundational Period (Up to 2010)***

E-commerce adoption research in its infancy, up to the year 2010, is illustrated by keywords such as "gender", "e-commerce acceptance", "security", and "digital divide". These keywords depict the field's foundational concerns, with average publication years falling between 2007 and 2010. At this juncture, the research community grappled with the core issues surrounding the acceptance and security of e-commerce. Researchers aimed to unravel the intricate relationships between gender and e-commerce acceptance and attempted to address the 'digital divide' that posed a formidable barrier to e-commerce adoption.

***The Period of Expansion (2011-2015)***

Advancing into the next phase, from 2011 to 2015, the focus of e-commerce adoption research expanded and became more nuanced. This era, characterized by keywords such as "b2c", "information systems", "IT", "b2b", "technology adoption", "innovation", and "internet", witnesses a gradual shift in the narrative. The discourse moved towards understanding the contrasting dynamics of B2B and B2C e-commerce and the accompanying technology adoption processes. The role of innovation in stimulating e-commerce adoption and the importance of robust information systems became increasingly evident. Additionally, the internet's position as a powerful enabler of e-commerce transactions was further cemented during this period.

***The Contemporary Phase (2016 onwards)***

The third phase, from 2016 onwards, reveals a transformation in the research landscape with keywords such as "cloud computing", "online shopping", "ICT", "TOE", "m-commerce", "UTAUT2", and "PLS-SEM" gaining prominence. The dialogue turned towards the implications of emerging technologies like cloud computing for e-commerce adoption. The ramifications of the shift towards mobile commerce (m-commerce) came under scrutiny. The exploration of sophisticated theoretical frameworks such as the TOE and the Unified Theory of Acceptance and Use of Technology (UTAUT2) was evident. The application of advanced analytical techniques like Partial Least Squares Structural Equation Modelling (PLS-SEM) also typified this era, reflecting the field's maturation. An important keyword that emerged during this period, around 2020, was "COVID-19". This indicates the responsiveness of e-commerce adoption research to real-time global events and the recognition of the impact of the pandemic on e-commerce adoption rates. Researchers have begun to explore how the pandemic-induced crisis has catalyzed the transition to e-commerce and to understand the resultant challenges and opportunities.

The overlay visualisation of co-occurring author's keywords in e-commerce adoption research provides a vibrant and comprehensive picture of the field's evolution. This analysis underscores the dynamic nature of the research discourse in e-commerce adoption. It reveals how the research community has responded to technological advancements, market dynamics, and global events by constantly adjusting and updating the focus of their investigations. In this way, the field continues to grow and adapt, ensuring its relevance and contribution to the broader discourse on technology adoption and e-commerce development.

A computer screen shot of a network

Description automatically generated

**Figure 5.** Overlay visualization ofco-occurrence of the author’s keywords in e-commerce adoption research

### Density Visualisation

To analyze the research hotspots in e-commerce adoption studies, we focus on the frequency and co-occurrence of keywords visualized in Figure 6 - a density visualization of the co-occurrence of the author's keywords. The denser clusters and most frequently observed terms point to the focal points of research in this field. Firstly, Cluster 1 centers around the word "e-commerce," which is the most weighty and frequently occurring term within this cluster. This is an intuitive observation, given that our analysis is focused on e-commerce adoption. What is remarkable is the high interconnectedness of this keyword, as demonstrated by the high score in the "Links" column, implying its centrality in the e-commerce adoption discourse. Furthermore, the relatively high average normalized citations indicate the term’s significant impact and influence in the research domain.

However, what is truly intriguing within Cluster 1 is the presence of the keyword "COVID-19." This indicates a recent shift in e-commerce adoption research brought about by the global pandemic. The high "Avg. Pub. Year" score confirms that this is a relatively recent topic. It suggests that COVID-19 has significantly impacted e-commerce, reshaping the research landscape and bringing in fresh exploration angles, such as changes in consumer behavior and online shopping trends. In the second cluster, the "technology acceptance model" is the most high-density term, reflecting its importance in understanding user acceptance and use of e-commerce platforms. This term also has a high "Avg. Pub. Year," suggesting its relevance in recent research. "Trust" is another dominant term in this cluster, highlighting the role of trust-building factors in the success of e-commerce platforms. Other important constructs, such as "perceived ease of use" and "perceived usefulness," identified as key determinants of technology adoption underline the focus on enhancing user experience and interface design in e-commerce.

Moving onto Cluster 3, the term "e-commerce adoption" is at the forefront, being the densest and most frequently appearing term, signifying a broad focus on the mechanisms and factors influencing e-commerce adoption. Moreover, "SMEs" suggest a focused interest in understanding e-commerce adoption in the context of small and medium enterprises. Interestingly, specific geographic indicators such as "Australia," "Saudi Arabia," and "Indonesia" are found within this cluster, indicating a trend of research examining e-commerce adoption from national or regional perspectives. Lastly, in Cluster 4, the keyword "adoption" takes precedence, echoing the overarching theme of adoption within the field. However, the presence of "developing countries" and location-specific terms such as "China" and "Ghana" suggests a deep interest in e-commerce adoption in the context of developing economies. The prominence of "innovation adoption" within this cluster indicates an exploration of e-commerce adoption from an innovative perspective.

This density visualization offers deep insights into the most prominent and emerging themes in e-commerce adoption studies. By examining the frequency and interconnectedness of keywords, we can discern what constitutes the 'hotspots' of research in the field. This kind of analysis provides a crucial roadmap for researchers and decision-makers alike, pointing out the primary avenues of exploration and helping guide the trajectory of future research. The integration of technological, behavioral, and geographic contexts within these hotspots provides a rich tapestry of interconnected themes, underlining the multidisciplinary and dynamic nature of e-commerce adoption studies. The emerging importance of recent phenomena such as the COVID-19 pandemic also illustrates the responsiveness of this research field to global events, adding another layer of depth and relevance to these hotspots.

A blurry image of a red dot

Description automatically generated

**Figure 6.** Density visualization ofco-occurrence of the author’s keywords in e-commerce adoption research

### Trend Topics

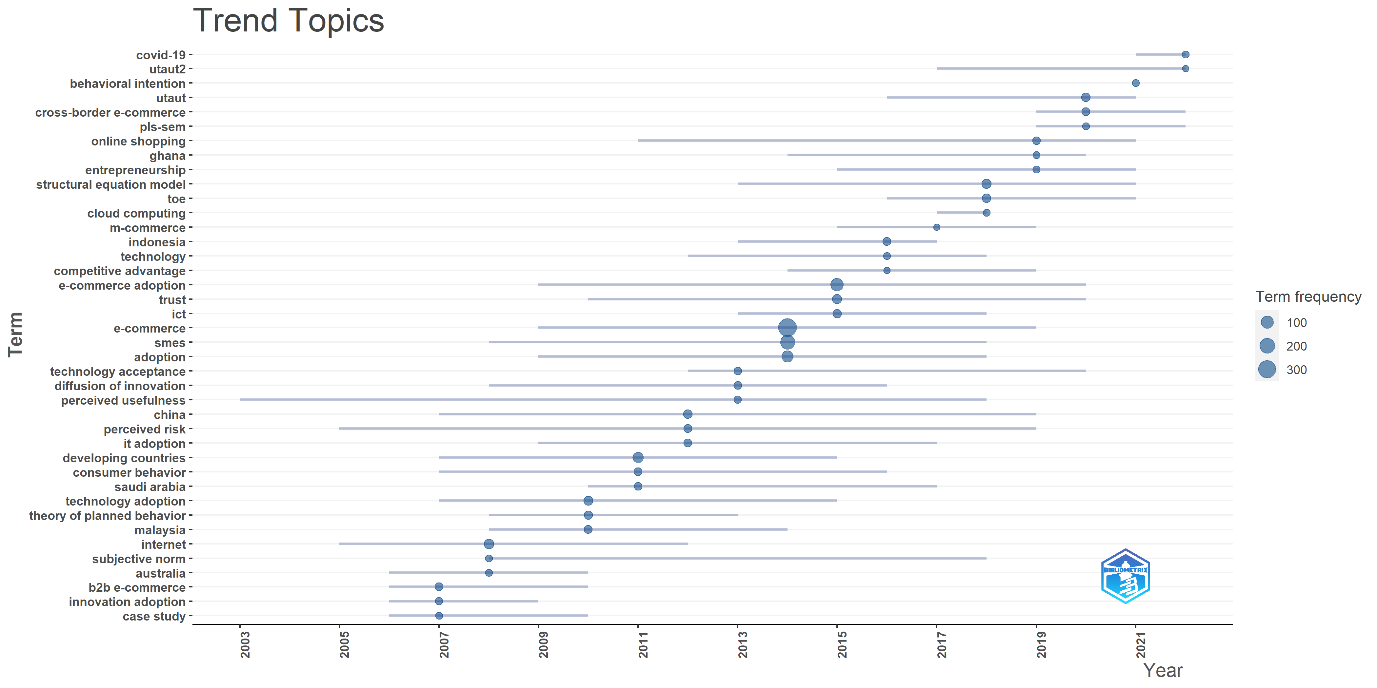
Continuing with our exploration of e-commerce adoption research, we next scrutinize the data generated from Biblioshiny to identify trend topics in this field over time. These trends provide valuable insights into the temporal shifts and focus of academic interest, revealing both continuity and evolution in research themes (see Figure 7). Let's begin with the keywords that surfaced frequently during the early years of research into e-commerce adoption. "B2B e-commerce," "innovation adoption," and "case study" all found their peak appearances between 2006 and 2010. The emphasis on "B2B e-commerce" and "innovation adoption" suggests an early focus on examining e-commerce adoption in business-to-business contexts and through the lens of innovation theory.

Following this, a significant shift in focus occurred between 2008 and 2012, during which "internet," "technology adoption," "theory of planned behavior," "Malaysia," and "Australia" emerged as popular themes. The appearance of "Internet" and "technology adoption" indicates a growing interest in the role of the Internet and technological factors in facilitating e-commerce adoption, reinforcing the centrality of these themes that we identified in our previous analysis. Between 2010 and 2015, the attention in research literature shifted towards understanding e-commerce adoption in "developing countries." This aligns with our earlier findings, where we recognized a geographical context in the research hotspots. Additionally, "consumer behavior" and "perceived risk" emerged as trending topics, highlighting an increased interest in understanding the psychology of e-commerce users and their risk perceptions, crucial determinants in the adoption process.

More recent trend topics, observed from 2015 onward, reflect the evolution of research focus over time. A noteworthy theme is "COVID-19" appearing in 2021, reaffirming the significant impact of the global pandemic on the e-commerce landscape, as mentioned earlier. The rapid growth of "cross-border e-commerce," "UTAUT" and "UTAUT2" reflects an expanding interest in global e-commerce markets and the application of the Unified Theory of Acceptance and Use of Technology to explain e-commerce adoption. Moreover, the term "m-commerce" has been trending, reflecting the increasing importance of mobile commerce, a subset of e-commerce, which denotes buying and selling of goods and services through wireless handheld devices such as smartphones and tablets. The increased attention on "m-commerce" could be due to the prevalent use of mobile devices and the consequent surge in m-commerce activities.

The growing popularity of the "structural equation model" and "PLS-SEM" suggests a shift towards more complex analytical methodologies in e-commerce adoption research, hinting at the field's maturation. The TOE framework also became a popular choice among researchers in recent years, indicating its applicability in understanding the e-commerce adoption phenomenon. The keyword "entrepreneurship," emerging in 2019, implies a newfound focus on how entrepreneurial activities intersect with e-commerce adoption, possibly spurred by the rise of e-commerce startups and SMEs' growing participation in the digital economy.

This temporal trend analysis offers valuable insights into the evolution of research themes in e-commerce adoption studies. From the early focus on B2B contexts and innovation adoption, the field has grown and diversified, embracing various themes ranging from consumer behavior, geographical and technological contexts, and the application of various theories and methodologies. Moreover, the field's responsiveness to global events and shifts in the technological landscape, such as the impact of the COVID-19 pandemic and the rise of m-commerce, reflects its dynamism and adaptability.



**Figure 7.** Trend topics in e-commerce adoption research

### Thematic Map

Our next analysis phase revolves around a thematic map of the author's keywords in e-commerce adoption research. This map provides further context and aids in identifying the most influential and concentrated research themes within the field (see Figure 8). Here, we consider both Callon's Centrality and Density as two critical measures to determine the themes' importance and cohesion, respectively (see Table 14). One of the most prominent clusters in our map is "e-commerce," boasting the highest Callon Centrality value of 1.20, signifying its influential role in the overall network of e-commerce adoption research. Its high frequency of 1075, coupled with a considerable density, further underlines its dominance, corroborating our prior conclusion that e-commerce is the central theme in this area of research.

Other notable clusters include "B2B e-commerce adoption" and "technology acceptance model." With their high centrality and density ranks, these themes are both highly influential and focused, highlighting that research in this field often revolves around business-to-business scenarios and frequently employs the technology acceptance model as a theoretical framework. These observations align with our previous analysis where we identified B2B context and technological factors as significant areas of interest. The "adoption of e-commerce" and "supply chain management" clusters suggest an ongoing interest in the operational aspects of e-commerce, specifically within the supply chain context. As identified earlier, understanding e-commerce adoption dynamics forms a major part of the overall research focus, with the supply chain acting as a crucial operational aspect in its implementation. Interestingly, "e-commerce acceptance," "user acceptance," and "consumers" are clusters with high densities, pointing to their internal cohesion. This finding complements our previous analysis, where consumer behaviour emerged as a significant theme.



**Figure 8.** Thematic map of the author’s keywords in e-commerce adoption research

The "cross-border e-commerce" cluster, while not the most central theme, has a high-density rank, implying a high degree of internal cohesion. This echoes our earlier observations of a growing interest in global e-commerce markets and aligns with the increase in globalization and cross-border business operations facilitated by digital technologies. Lastly, the "PLS-SEM" cluster, though modest in frequency, has high centrality and density ranks. This re-emphasizes our prior discussion about the increased utilization of sophisticated statistical methods like PLS-SEM in recent e-commerce adoption research. The thematic map reaffirms our previous findings while highlighting the key themes within the e-commerce adoption research field. These include the importance of understanding consumer behavior, the focus on technological aspects of adoption, the rise in cross-border e-commerce, and the application of advanced analytical methodologies. These clusters' high centrality and density hint at their sustained relevance in the foreseeable future of e-commerce adoption research.

**Table 14.** Thematic map of the author’s keywords in e-commerce adoption research

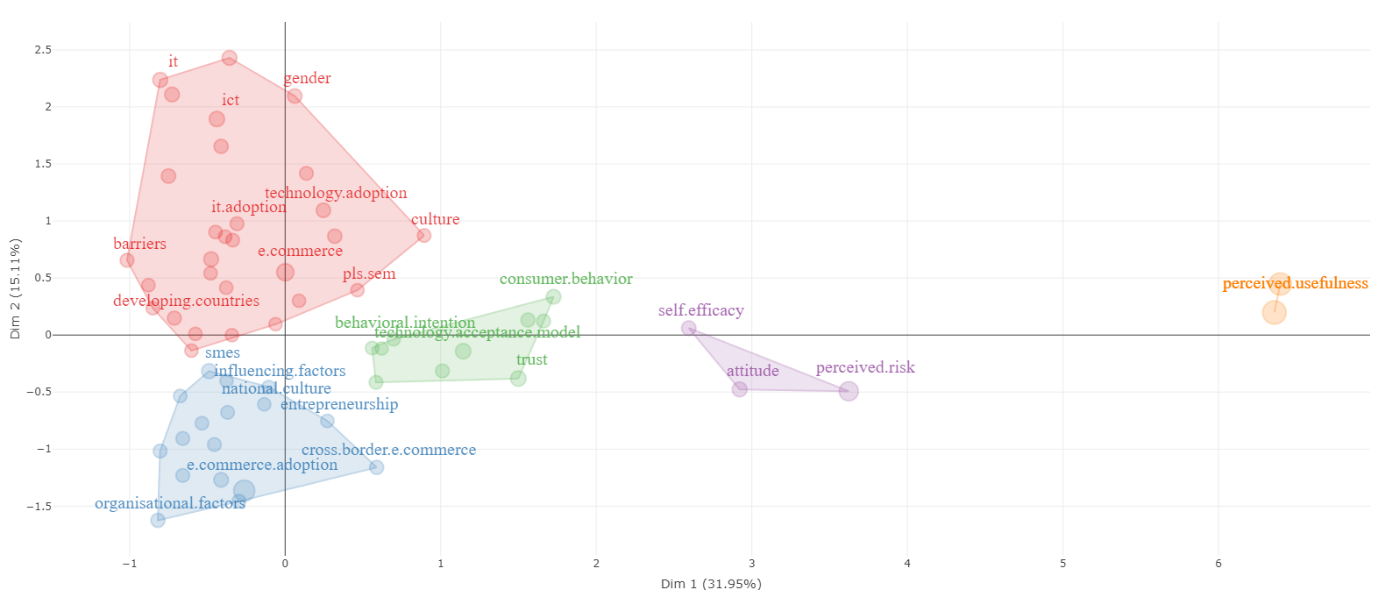
| **Cluster** | **Callon Centrality** | **Callon Density** | **Rank Centrality** | **Rank Density** | **Cluster Frequency** |
| --- | --- | --- | --- | --- | --- |
| supply chain management | 0.13 | 21.35 | 7 | 8 | 25 |
| B2B e-commerce adoption | 0.32 | 17.55 | 9 | 4 | 41 |
| adoption of e-commerce | 0.14 | 26.63 | 8 | 11 | 25 |
| e-commerce | 1.20 | 19.14 | 11 | 6 | 1075 |
| e-commerce acceptance | 0.07 | 16.67 | 5 | 3 | 6 |
| user acceptance | 0.10 | 21.53 | 6 | 9 | 23 |
| technology acceptance model | 0.60 | 18.81 | 10 | 5 | 255 |
| consumers | 0.05 | 20.00 | 4 | 7 | 5 |
| cross-border e-commerce | 0.00 | 7.69 | 1.5 | 1 | 13 |
| PLS-SEM | 0.03 | 14.29 | 3 | 2 | 7 |

### Factorial Analysis

The factorial analysis results in a word map that further elucidates the themes underpinning e-commerce adoption research. This analysis essentially positions the author's keywords along two dimensions: Dim.1 and Dim.2 (see Figure 9). It also sorts them into clusters, each representing a unique theme or topical focus in the literature. Cluster 1 primarily revolves around technology adoption, as suggested by positioning keywords like 'e-commerce,' 'adoption,' 'internet,' 'technology adoption,' and 'ICT'. Furthermore, the regional focus on 'developing countries,' 'Malaysia,' 'Indonesia,' and 'Saudi Arabia' indicates an interest in the challenges and potential of e-commerce adoption within emerging markets. The inclusion of 'B2B' and 'supply chain management' implies a special interest in the role of technology adoption in enhancing operational efficiencies in businesses. Cluster 2 strongly focuses on models, theories, and the behavioral aspects of e-commerce adoption, with keywords such as 'technology acceptance model,' 'theory of planned behavior,' 'consumer behavior,' 'UTAUT,' and 'user acceptance.' Region-specific keywords such as 'China' suggest an interest in particular geographic contexts. It also shows an inclination towards B2B e-commerce adoption, as indicated by 'B2B e-commerce' and 'B2B e-commerce adoption.'

Cluster 3 features keywords such as 'perceived risk' and 'attitude,' pointing towards the perception and psychological aspects influencing e-commerce adoption. This theme aligns with our earlier conclusion about the importance of understanding consumer behavior in this field of research. Cluster 4 hosts keywords 'perceived usefulness' and 'perceived ease of use,' representing constructs from the TAM. Despite being clustered separately, these keywords underline the TAM's significance in investigating e-commerce adoption.

The factorial analysis provides a valuable insight into the interrelationships among various research themes and their relative importance in the broader context of e-commerce adoption research. The focus on technology adoption, especially in developing economies, the importance of theoretical models like the TAM and UTAUT, the emphasis on consumer behavior, and the perceived risk and usefulness are all recurrent themes across our analyses. The word map visualization underscores the multifaceted nature of e-commerce adoption research, highlighting the combination of technological, behavioral, and regional aspects. This aligns with our previous analyses, further reinforcing the intricate interplay of these factors in shaping the trajectory of e-commerce adoption studies.



**Figure 9.** Word map of the author’s keywords in e-commerce adoption research