Two Decades of M-Commerce Consumer Research: A Bibliometric Analysis Using R Biblioshiny

Packiaraj Thangavel * and Bibhas Chandra

Abstract: The aim of this study is to consolidate the state of mobile commerce consumer research from 2001 to 2022. Based on a systematic literature review employing a bibliometric technique, this study not only reports the significant contributions of authors and their affiliations but also discusses the evolution of m-commerce research over the last two decades. Examination of annual production trends revealed that publications were on the rise all along; the year 2022 clocked the highest number of publications (53 documents), which further reinforces that the research on this domain is in its blooming season. China is the most contributing country in terms of the number of publications and citations received, followed by the USA. The author Keng-Boon Ooi has been the most productive researcher; his studies continue to be the foundation on which m-commerce consumer research continues to thrive. The analysis of scientific mapping revealed that, although many studies were carried out on mobile commerce adoption intention, the focus of the researchers lately shifted towards studying continuous use intention (since 2018). Further, it was observed that the base theory, the Technology Acceptance Model, which has been widely used for determining antecedents of technology adoption intention, is losing its significance and is being overtly replaced by the Unified Theory of Acceptance and Use of Technology. While the topics “trust, loyalty, satisfaction, mobile banking, UTAUT, continuance intention, perceived enjoyment, and COVID-19” were identified as mother (engine) themes, the keywords “privacy, self-efficacy, social influence, TAM, attitude, and intention to use” became diminishing themes. The following topics have been identified as emerging themes: “Mobile social commerce, Mobile payment, Mobile marketing, Omnichannel, Fintech, and Live streaming commerce”. This study provides useful insights to potential researchers.

Keywords: m-commerce; mobile commerce; consumer behavior; mobile shopping; m-shopping; bibliometric analysis; literature review; RStudio Biblioshiny

1. Introduction

Mobile commerce is not the next big thing; it is a phenomenon that is already happening. It is neither a new technology nor a trend but an extension of electronic commerce that has been around for more than two decades now. The increased penetration of smartphones has not only changed the way people reach out to one another but also their purchasing behavior, which has drawn the attention of consumer behavior scholars. According to Statista (2022) [1], the number of smartphone subscriptions worldwide today surpasses six billion, translating to about 80% of the world’s population. Further, this number is forecasted to grow by several hundred million in the next few years. This increase in smartphone penetration and strong internet connectivity drive m-commerce growth [2].

While e-commerce is the umbrella term that refers to the sale and purchase of goods and services over the internet, m-commerce is the extension of e-commerce where the transaction is made using mobile devices such as smartphones and tablets with wireless internet connection [3]. M-commerce has changed the face of retailing as a new business model with unique advantages that create new value for customers. This is due to its distinctive...
features such as mobility and flexibility, which makes it usable anywhere, anytime without space or time limits” [4,5]. The benefits of convenience, personalized offers, and faster shopping experiences have prompted shoppers to prefer mobile shopping over other modes of shopping [6,7]. Further, the digital wallets embedded in the mobile shopping app have an extra layer of security and authentication to keep financial information secure, such as Face ID and Touch ID, which are largely absent in desktop computer-mediated shopping [8]. Owing to these advantages, numerous m-commerce applications have emerged, such as mobile payment, mobile health, mobile entertainment, mobile ticket booking/vacation/travel assistance, mobile learning, mobile financial applications (Fintech), and e-governance through mobile apps. Moreover, the biometric technologies enabled in mobile commerce apps allow firms to identify and profile customers based on their search and purchase history. This profiling of customers permits retailers to personalize product offerings, which enhances customer satisfaction [9].

It is estimated that global mobile commerce sales will reach nearly USD 4.5 trillion by 2024, making up about 69% of total e-commerce sales [10]. Overall, m-commerce is changing the nature of trade worldwide; however, this revolution is taking place at different speeds in different parts of the world. Though it made significant inroads in developed countries, its acceptance in developing markets has just begun picking up [11]. More people in emerging economies have smartphones than PCs because they are more affordable [12]. Countries like India and Indonesia have made significant investments in building broadband infrastructure over the last two decades. This access to smartphones, coupled with cheap broadband connectivity, drives the rapid growth of mobile commerce [13]. Further, the COVID-19 crisis accelerated mobile commerce penetration and shifted every aspect of our lives to a contactless world. Even the domains where person-to-person relationships are valued the most, such as doctor consultation and grocery shopping, were pushed to online mode. Interestingly, the trend persists; people continued to transact virtually even after the pandemic ceased to exist [14]. The report on the usage of mobile phones by Data Ai (a consumer and market data publisher) states that, in the year 2021 alone, Android users spent about 100 billion hours browsing through shopping apps, and it was just below 48 billion in the year 2018 [15]. This means that, in a span of a few years, the amount of time spent on shopping apps has more than doubled. This trend has made the business houses consider m-commerce an important part of their growth strategy.

From this perspective, it is not surprising that, in the last ten years, m-commerce consumer research has been a coveted domain of interest among scholars. Many studies have been published on m-commerce, and it has become an established domain of study. While this extensive body of literature can be viewed positively for the field, the large amount of research can become overwhelming for potential researchers trying to understand where their work best fits and what investigation they need to conduct going forward. Hence, a systematic review of the literature needs to be carried out. In addition, very few studies have presented a comprehensive review and analysis of m-commerce research from the perspective of consumer behavior.

The author Hew (2017) [16] conducted a bibliometric analysis on m-commerce research, but his study was limited to a performance analysis of authors, journals, institutions, and countries, and the evolutionary aspect of the field through content analysis was not examined, which is a major limitation. Only through evolutionary analysis can we unearth the themes which received major attention and the emerging trends in a field of research. Further, two broad communities are observed within m-commerce research, one focusing on technical aspects related to m-commerce interface (website) construction and another addressing non-technical aspects of m-commerce with a focus on consumer behavior. The study by Hew (2017) [16] combined both technical and non-technical aspects of m-commerce research for bibliometric analysis. It is to be noted here that there is a vast difference between these two aspects, and considering them together for a systematic review will result in misleading conclusions. To address these limitations, the focus of this study was restricted to reviewing articles related to m-commerce consumer research.
only. Further, evolutionary analysis was performed with due diligence to report the areas which received significant attention within m-commerce consumer research in the last two decades, and the emerging trends were also identified. Additionally, Hew’s study carried out performance analysis on the literature published in the period 2000–2015, but the research on mobile commerce has grown by leaps and bounds since then. Hence, it is crucial to review this field through bibliometric analysis, which provides the quantity and quality of the research carried out.

We present a comprehensive analysis of annual production, citations, collaboration patterns, and trends in m-commerce literature from 2001 to 2022. This work contributes to the literature on the following aspects: (i) it provides detailed information on performing bibliometric analysis with the help of a computer software program, which scholars can utilize to perform systematic literature review in their field of research, (ii) it presents the top contributing authors, journals, institutions, countries, and most impactful articles in the domain of mobile commerce research from the perspective of consumer behavior, (iii) it visualizes the scientific mapping of the changing trends in m-commerce consumer research over the years and provides future research directions to the scholarly community, and (iv) overall, it provides a comprehensive understanding of the research themes which received significant attention from m-commerce researchers globally over the last two decades. Moreover, this study also acts as a good reference point for potential m-commerce researchers to know where to look for articles relevant to their work and potential journals for publication. Moreover, this study’s result would also benefit practitioners as they get to know the experts in the field for a consultation to improve their m-commerce business performance. They also learn the important journals to subscribe to obtain first-hand information on m-commerce consumer behavior.

The remainder of the article is organized as follows: we first present the methodology used for bibliometric analysis in Section 2. Then, the performance analysis and scientific mapping results are laid out, along with their interpretation, in Section 3. Finally, conclusions of the study and suggestions for future research directions are provided towards the end of the article in Section 4.

2. Methodology

A quantitative bibliometric analysis was employed to analyze the literature produced in the last 22 years on “mobile commerce consumer research.” Bibliometric analysis is used to identify the annual number of publications, citations, collaboration patterns, top-performing authors, institutions, and countries; most importantly, it enables scholars to uncover emerging trends in a specific research domain. In other words, bibliometric analysis is used for rigorously sequencing and mapping large volumes of scientific documents [17]. The analysis is split into two major parts: “performance analysis and scientific mapping analysis”. While performance analysis evaluates the field based on descriptive characteristics of the contributions (authors, journals, institutions, and countries), scientific mapping analysis examines the evolutionary aspects of the field through content analysis [18,19]. Scientific mapping, otherwise known as co-word networks, shows the conceptual structure that uncovers links between concepts through keyword co-occurrences [20]. It is often utilized to understand the areas covered by the scientific community and to identify emerging areas in a field of research. This technique has been gaining grounds in recent years in different disciplines due to the availability of open-source bibliometric software packages and easy access to large volumes of data from Scopus, Web of Science, Dimensions, and PubMed database platforms [21–23]. The open-source bibliometric software Biblioshiny 4.1 from RStudio was used to perform bibliometric analysis. The supremacy of Biblioshiny lies in the fact that, in comparison to other bibliometric tools, it provides a full suite of statistical techniques and visualizations that enables performance analysis and conceptual mapping of the field of study [21,24,25]. Further, unlike VOSviewer or Citespace, Biblioshiny is made available as an open-source R package [26].
This study was carried out in two phases: first, identifying the research contributions in the Web of Science (WoS) database, and, second, performing a bibliometric analysis of those contributions using the RStudio bibliometrics package. The steps followed in this research are presented as a flowchart, below, in Table 1.

Table 1. Research framework.

<table>
<thead>
<tr>
<th>Step 1. Scope of investigation</th>
<th>A bibliometric analysis of m-commerce consumer research from 2001 to 2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 2. Database selection</td>
<td>Web of Science (WoS)</td>
</tr>
<tr>
<td>Step 3. Documents selection</td>
<td>First selection criteria: TITLE-ABSTRACT-KEYWORD PLUS</td>
</tr>
<tr>
<td></td>
<td>TS = (“m-commerce” or “mobile commerce” or “m-shopping” or “mobile shopping”) AND (Resulted in 934 documents)</td>
</tr>
<tr>
<td></td>
<td>TS = (“antecedent” or “determinant” or “adoption” or “acceptance” or “intention” or “involvement” or “purchase” or “continuance” or “behavior” or “risk” or “trust” or “choice” or “satisfaction” or “loyalty”)</td>
</tr>
<tr>
<td></td>
<td>Second selection criteria: TIME INTERVAL</td>
</tr>
<tr>
<td></td>
<td>2001–2022 (Resulted in 932 documents)</td>
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<tr>
<td></td>
<td>Third selection criteria:CATEGORY OF DOCUMENTS</td>
</tr>
<tr>
<td></td>
<td>“Research Article” (Resulted in 882 documents)</td>
</tr>
<tr>
<td></td>
<td>Fourth selection criteria: WEB OF SCIENCE CATEGORIES</td>
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<tr>
<td></td>
<td>Fifth selection criteria: INDEXED IN</td>
</tr>
<tr>
<td></td>
<td>SSCI, SCIE, ESCI, &amp; AHCI (Resulted in 761 documents)</td>
</tr>
<tr>
<td></td>
<td>Sixth selection criteria: PRUNING AND SKIMMING OF DOCUMENTS</td>
</tr>
<tr>
<td></td>
<td>2001–2022 (Resulted in 467 documents)</td>
</tr>
</tbody>
</table>

2.1. Phase-I Document Selection

First, we have defined the scope of research: m-commerce consumer research in the period 2001–2022. Second, the Web of Science (WoS) database was chosen as a research platform to mine documents published in the defined area of research. WoS was chosen because it is one of the main bibliographic databases conventionally accepted as a comprehensive data source [27]. The search for scientific documents was performed by keying in the following keywords in “Title-Abstract-Keyword Plus”: (“m-commerce” or “mobile commerce” or “mobile shopping”) and (“antecedent” or “determinant” or “adoption” or “acceptance” or “intention” or “involvement” or “purchase” or “continuance” or “behavior” or “risk” or “trust” or “choice” or “satisfaction” or “loyalty”).
commerce” or “m-shopping” or “mobile shopping”), designating them as the first line of search. Moreover, these keywords have been associated with additional keywords: (“antecedent” or “determinant” or “adoption” or “acceptance” or “intention” or “involvement” or “purchase” or “continuance” or “behavior” or “risk” or “trust” or “choice” or “satisfaction” or “loyalty”) in the second line of search (AND TS) “Topic”, which searches the title, abstract, author keywords, and keywords plus together. These additional keywords were used to represent the characteristic features of m-commerce research from the consumer behavior perspective.

Mobile commerce refers to the “process of performing commercial transactions via mobile devices, such as smartphones and tablets, over wireless telecommunication networks” [28]. The systematic examination of highly cited articles in the domain of “mobile commerce consumer behaviour” showed that the terms “m-commerce, mobile commerce, m-shopping, and mobile shopping” are predominantly used author keywords [9,29–32]. Further, the terms “antecedent, determinant, adoption, acceptance, intention, purchase, behavior, risk, trust, and satisfaction” were used to explore the factors influencing the acceptance and adoption of mobile commerce [7,33–37]. Additionally, the keywords “continuance and loyalty” refer to the sustained usage or loyalty towards mobile commerce platforms or services [11,38,39]. Combining these main and additional keywords, the Boolean query retrieved research articles that cover a broad range of topics related to “mobile commerce consumer behaviour” from the WoS database.

The initial search without any filtering resulted in 934 documents. Narrowing down the result using the filtering option “years of publication” (2001–2022) reduced the number of documents to 932. The year 2001 was set as the starting point for sourcing and analyzing the articles, owing to the widespread penetration of mobile technologies into society at the beginning of 21st century, which prompted the research community to explore the significance of these technologies for consumers [40–42]. By extending the analysis until 2022, the study included as many relevant articles as possible. Further, the period “2001–2022” witnessed significant advancements in mobile technologies, the emergence of smartphones, and the proliferation of mobile applications, all of which have had a profound impact on consumer behavior in the m-commerce domain [43].

Moving on with the inclusion and exclusion criteria, using the filter document type, we chose only research articles (not opted for proceeding papers, early access, review articles, or book reviews), which reduced the number of documents to 882. Further, we restricted the search results by choosing only the following, most relevant, Web of Science disciplines: Business, “Computer Science Information Systems”, Management, Telecommunications, “Computer Science Interdisciplinary Applications”, “Information Science Library Science”, Communication, Psychology Multidisciplinary, Psychology Experimental, “Computer Science Theory Methods”, Computer Science Cybernetics, Social Science Interdisciplinary, Economics, Psychology Applied, Multidisciplinary Sciences, Psychology Social, and Social Issues. This further brought down the number of documents to 761. The inclusion and exclusion criteria used for filtering the articles are presented in Table 1, above. These 761 documents were subjected to manual screening. In bibliometric analysis, manual screening based on titles and abstracts is a common practice to identify relevant publications from a larger set of articles [17]. This step helps researchers narrow down the initial pool of documents and select those that align with the research objectives. Examining the titles and abstracts resulted in the 467 most relevant articles, which were downloaded in BibTeX format for further analysis.

2.2. Phase-II Bibliometric Analysis

As stated above, bibliometric analysis constitutes two major areas: performance analysis and scientific mapping analysis. In the performance analysis, the characteristics of the contributions are investigated. Some performance analysis indicators include “the annual number of publications,” top most-cited articles, most-cited journals and authors, collaboration patterns, top-performing institutions, and countries [17].
In the scientific mapping analysis, the structural and evolutionary aspect of the research field is unraveled through keyword co-occurrence. The review period is normally divided into two parts to perform scientific mapping: the first period, usually the longest, is used to identify the major themes (research fronts) on which most of the scholarly observation was concentrated. The second period is used to identify emerging or disappearing themes and to obtain insights into where the research field is headed [44]. However, our analysis divided the study period (2001–2022) into three sub-periods—2001–2014, 2015–2018, and 2019–2022—for two primary reasons. First, we wanted to investigate whether any niche themes emerged during the COVID-19 period. Second, only during the period 2015–2018 did widespread penetration of smartphones occur across the world, and its reach among people made scholars revisit the field with renewed interest. Hence, we wanted to investigate this period separately to bring out insightful information. The result of the analysis is presented below in the results section.

3. Results and Discussion

3.1. Performance Analysis

Figure 1a, below, presents the number of contributions by year from 2001 to 2022. It shows that the publication on m-commerce consumer research was fairly steady from 2002 to 2006 but experienced dips from 2007 to 2011 before a sudden rise in 2012. Overall, studies on m-commerce consumer research rose and have remained popular among scholars. Therefore, a greater number of publications will follow in the coming years. In addition, the number of average article citations per year is presented in Figure 1b, which shows that citations for m-commerce studies have fluctuated widely. However, it clocked average of 7.49 citations per year per document, which is above average compared to other fields of study and gives the indication that there has been substantial interest among scholars on mobile commerce consumer behavior. China has been identified as the most contributing country, with 104 publications (equivalent to 22.27% of total contributions), followed by the USA with 92 contributions (equivalent to 19.7% of total publications). The contributions of these two countries account for more than one-third of total publications. Taiwan (79 publications) and South Korea (42 contributions), are in third and fourth place, respectively. England is ranked first among European countries, with 21 publications. Table 2, below, presents the top 10 most-cited articles in the field of mobile commerce consumer research. It provides useful insights into understanding the impact of publications in the scientific community. Though these articles were published a few years ago, they continue to remain as base studies on which m-commerce consumer research continues to thrive.

Global contributions to m-commerce consumer research in terms of citations were analyzed and are presented in Figure 2a. China has received the highest number of citations (8609, 32.79% of total citations), followed by the USA (6368, 24.25%) and the United Kingdom (1381, 5.26%). The collaborative relationship among these countries is demonstrated in Figure 3a, below. While China and the USA have close collaboration with each other, they also demonstrate equal global links with other countries. Further, analysis of institutions’ contributions (see Figure 2b) shows that the University of Burgos from Spain and Universiti Tunku Abdul Rahman Kampar Campus from Malaysia have published the most articles (20 and 19 records, respectively). These two institutions combined account for 8.35% of total publications. Huazhong University of Science and Technology from China and the University of Craiova from Romania are placed third with 16 publications each (3.43%), followed by National Cheng Kung University from Taiwan with 15 records (3.21%). Additionally, the collaboration network among these institutions is presented in Figure 3b.
Figure 1. (a) Annual publication trends on m-commerce consumer research from 2001 to 2021 and (b) average article citations per year.
Table 2. Top 10 most-cited articles.

<table>
<thead>
<tr>
<th>Ranking</th>
<th>Title</th>
<th>Author(s)</th>
<th>Journal</th>
<th>Year</th>
<th>TC</th>
<th>AC/Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>“Toward an understanding of the behavioral intention to use mobile banking”</td>
<td>Luarn and Lin [45]</td>
<td>Computers in Human Behavior</td>
<td>2005</td>
<td>819</td>
<td>45.50</td>
</tr>
<tr>
<td>4</td>
<td>“An empirical examination of factors influencing the intention to use mobile payment”</td>
<td>Kim, Mirusmonov, and Lee [3]</td>
<td>Computers in Human Behavior</td>
<td>2010</td>
<td>533</td>
<td>41.00</td>
</tr>
<tr>
<td>6</td>
<td>“An examination of the determinants of customer loyalty in mobile commerce contexts”</td>
<td>Lin and Wang [30]</td>
<td>Information &amp; Management</td>
<td>2006</td>
<td>460</td>
<td>27.05</td>
</tr>
<tr>
<td>8</td>
<td>“Design aesthetics leading to m-loyalty in mobile commerce”</td>
<td>Cyr, Head, and Ivanov [48]</td>
<td>Information &amp; Management</td>
<td>2006</td>
<td>389</td>
<td>22.88</td>
</tr>
<tr>
<td>10</td>
<td>“Understanding dynamics between initial trust and usage intentions of mobile banking”</td>
<td>Kim, Shin, and Lee [50]</td>
<td>Information Systems Journal</td>
<td>2009</td>
<td>371</td>
<td>26.5</td>
</tr>
</tbody>
</table>
Figure 2. (a) Global contributions to m-commerce consumer research and (b) most contributing institutions.
Figure 3. Collaboration network of countries and institutions. (a) Network map of countries, (b) network map of institutions.

Moving the analysis to contributing authors, Figure 4a presents the top 10 most relevant authors. In terms of the number of publications, Ooi KB is the most productive author with 15 documents (3.21% of total publications), followed by San-Martin S with 10 articles (2.14%) and Lin B with 9 documents (1.93%). In terms of local impact by citations received, Ooi KB is again ranked first with 125 citations, followed by Chong AYL, who is placed second with 64 citations, and Lin B is in the third spot with 54 citations. By examining Figure 4a–d, below, it can be seen that the author Ooi KB has emerged as a top contributor in the field of m-commerce consumer research. Further, Figure 4d shows that the authors DiepNgoc Su DNS, Duy Q. Nguyen-Phuoc, and Paul J received an M-index of
1 each, which is higher than Ooi KB, suggesting that these authors can be characterized as the most promising scholars.

Figure 4. Analysis of contributing authors. (a) most relevant authors, (b) author local impact by total citation, (c) author local impact by H-index, (d) author local impact by M-index, (e) top authors’ production over the time.

Moreover, looking at Figure 4e, we can infer that most of the top authors’ publications were published between 2014 and 2018. The publications by outstanding scholars in this
field, such as Ooi KB, San-Martín S, and Lin B, in the years 2021 and 2022 suggest that this domain continues to be a field of interest; thus, a greater number of articles are expected to be published in the coming years. Additionally, the collaboration network among these authors is demonstrated in Figure 5. It shows that the co-authorship is largely confined to the country where the authors reside and work. For example, Ooi KB, Chong AYL, Lin B, Leong LY, Tan GWH, and Hew TS have close collaboration with each other, and all of them belong to the country China. Figure 6 below presents the source analysis. The 467 articles were published in 126 journals, with 6 journals publishing more than or equivalent to 13 articles each on m-commerce consumer behavior. The top 10 journals in terms of the number of documents published are shown in Figure 6a. The journal *International Journal of Mobile Communications*, with 44 articles, is ranked first, followed by the *Journal of Retailing and Consumer Services* (35 articles) and *Computers in Human Behavior*, with 29 published articles. Additionally, the top 10 journals ranked by total citation index (source local impact) are shown in Figure 6b. The journal *Computers in Human Behavior* received the highest number of citations (1290) with IF = 6.83, followed by *MIS Quarterly* with 1186 citations (IF = 5.43) and the *Journal of Retailing and Consumer Services* with 865 citations (IF = 7.14). It should be noted that the journal *Information & Management* has received the highest impact factor (IF = 7.55) due to fewer publications, but they are highly impactful.

![Figure 5. Network map of authors.](image-url)
Figure 6. Analysis of sources (journals). (a) Most relevant sources, (b) most local impact sources, (c) source local impact by H-index, (d) source growth.
Figure 6c presents the top 10 journals ranked by H-index (source local impact). The H-index is a numerical indicator of how productive and influential a researcher or a journal is. It is also used as a measure to predict the impact of future publications. Hence, we can conclude from the results that the journals *Computers in Human Behavior* and the *Journal of Retailing and Consumer Services* will continue to drive impactful publications in m-commerce consumer research. Meanwhile, we obtain the same insight from Figure 6d. Further, the interconnections among countries, journals, authors, and institutions are presented in Figure 7a–c, which provide useful insights. For instance, studies on m-commerce consumer behavior are mostly published in the *International Journal of Mobile Communications*, most of which are authored by Chinese and American scholars from Louisiana State University.
3.2. Evolutionary Analysis (Thematic Mapping)

Network analysis can be used to describe the evolution of a research field. It divides the two-dimensional graph into four quadrants of clusters, and each cluster represents a research theme or community of themes within the field. Based on where the clusters are positioned, the network characteristics of centrality and density can be utilized to describe the evolutionary stage of each theme [20]. Figure 8, below, presents four themes characterized by the semantic strength of their internal (“Density; Y-axis”) and external associations (“Centrality; X-axis”).

A cluster’s position in a strategic diagram can be explained as follows: the “upper right quadrant” (I) signifies the maximum density and centrality of the themes to the field.
of review. These mainstream clusters represent the large portion of research carried out in the period under review. The “upper left quadrant” (II) displays a high density of themes but unimportant external links (low centrality), meaning they have limited importance to the domain. The clusters in this quadrant can be inferred as specialized and separate from the overall focus. The clusters in quadrant three (lower left) are in flux, representing either emerging or declining themes. The fourth quadrant (lower right) contains clusters that represent centrality but have not yet matured and have the potential to grow [18].

The period of review, 2001–2022, was divided into three sub-periods—2001–2014, 2015–2018, and 2019–2022—to perform network analysis, and an individual data set corresponding to each period was extracted. This way, a separate bibliometric strategic map can be developed for each of these three periods. The first period (2001–2014) is longer than the rest because a sufficient number of publications are required to investigate the structural and evolutionary aspects of the domain of inquiry [51]. The second and third periods (2015–2018, 2019–2022) can be shorter, as they are used for discussing emerging or declining trends, the major focus, and future opportunities. The number of documents analyzed in each period is shown in Figure 9. The output from RStudio’s Biblioshiny is examined in the following section.

![Figure 9. Number of articles analyzed per period.](image)

### 3.2.1. Analysis of the Period 2001–2014

In this period, a total of 138 articles were published pertinent to m-commerce consumer research. Figure 10 below shows that the clusters mobile commerce and trust emerged as the motor themes during 2001–2014. They exhibit the highest centrality (strongly connected to clusters from other parts of the network) and a fairly high density (strong internal links). Mobile commerce, the topic of our study, has the highest number of articles (76), followed by trust, with 38 articles associated with the motor theme of this period.
Examining the mobile commerce theme in detail, we find associations with the keywords “technology adoption, perceived risk, technology acceptance, and mobile banking”. The primary focus of research in this period centered on identifying the determinants of mobile commerce acceptance. It refers to examining the factors that facilitate or deter individuals from accepting and integrating m-commerce into their day-to-day life [52]. The widely used theory to ascertain the antecedents of m-commerce acceptance in this period was the “Technology Acceptance Model” (TAM). Before we delve into the studies carried out on determinants of m-commerce acceptance, it is important to highlight the work of Balasubramanian et al., 2002 [53], as their study was the first to underline the significance of mobile technologies for business units. They asserted that m-commerce was in its nascent stage, and challenges related to “consumers, technology, and public policies” remained to be identified and resolved. The study concluded that it was only a matter of time before m-commerce became ubiquitous in consumer business if these challenges and issues were addressed.

Concerning literature on antecedents of m-commerce acceptance, the study by Jih and Lee (2004) [54] among Taiwan’s college students supported the notion that both hedonic aspects of mobile shopping and traditional utilitarian motivations were important. Further, Luarn and Lin (2005) [45] examined the antecedence of mobile banking acceptance by extending TAM by adding one trust-based construct, “perceived credibility”, and two resource-based constructs, “perceived self-efficacy and perceived financial cost”. Their study confirmed the positive influence of perceived credibility and self-efficacy and the negative influence of perceived financial cost (equipment cost, access cost, and transaction fees) on the intention to use mobile banking.

Further, the study by Li and McQueen (2008) [55] presented the country-level (New Zealand) barriers to mobile commerce adoption. It reported that customer-related and technological barriers were not major concerns for m-commerce adoption; instead, lack of collaboration from the supply side (e.g., mobile network providers, banks, mobile technology solution providers, and merchants) seemed to have a larger influence on mobile commerce adoption in New Zealand. The study by Zhou (2011) [56], an examination of critical success factors for a mobile commerce website to be accepted by the commoners,
revealed that system (website) quality, information quality, and service quality were critical factors affecting user satisfaction. The role of personality traits on user trust in mobile commerce was examined by Zhou and Lu (2011) [57]. The study revealed that, among the five personality traits, “extraversion, agreeableness, and open to new experience” had a significant positive effect on trust, whereas neuroticism was found to affect trust negatively, and conscientiousness did not have any significant effect on user trust. The role of demographic variables (age, education, and gender) on m-commerce usage among Chinese consumers was investigated by Chong (2013) [35,58]. The study revealed that younger users actively engaged in m-commerce activities more than their older counterparts. Regarding education, as expected, individuals with higher educational levels were found to be more likely to use m-commerce services. Concerning gender, though IS studies generally asserted that males tend to be more interested in computer technologies, this study did not find any significant difference between men and women in their m-commerce use behavior.

The second most developed motor theme is “trust,” which is strongly connected to customer IS acceptance, continuance intention, and user satisfaction. Building trust in e-commerce is difficult due to security concerns [50]. Customers generally do not feel secure conducting financial transactions without direct personal interactions, and e-commerce also requires customers to make purchase decisions without physically examining the products [59]. M-commerce, the subset of e-commerce, suffers from all of these issues and some of its own. Desktop computers have been in use since 1995; though mobile devices (tablets and smartphones) have almost all the features as desktop computers (even better features with respect to certain functionalities), they are relatively new to people and come with smaller screen sizes. Hence, in general, people are more concerned about security issues when it comes to mobile commerce [60]. The article by Siau and Shen (2003) [61] was the first to highlight the importance of customer trust for the growth and success of mobile commerce. They stressed honest business practices at every interaction to sustain consumer trust and win loyalty in the long run. As trust is a vital parameter for a customer to accept a mobile commerce platform, continue to use it, and remain loyal, researchers paid increased attention to trust beliefs and their effect during this period of review as m-commerce penetration gained momentum [30,50,59]. Numerous studies showed that consumers with higher trust in m-commerce had greater confidence in the m-commerce channel and were more likely to continue to use it in the future [47,60,62].

In the analysis of the second quadrant of the strategic diagram for 2001–2014, the one displaying a high density of themes but unimportant external links, meaning their importance to the domain was limited, we found the keywords “China” and “communication technologies”. This theme, China, does not reflect a line of study in the mobile commerce context but simply highlights the several studies that were carried out on the Chinese population. This is due to the fact that there have been a considerable number of studies on m-commerce carried out by Chinese scholars focusing on Chinese consumers during this period [63–67]. China’s progress has been remarkable in research publications in the last two decades. The country has implemented a few policies to make progress in science; one among them is to pay monetary incentives to scientists and scholars for publication. This approach to publication made them achieve a 3000 percent increase in scientific publications. The report released by U.S.-based National Science Board (NSB) states that China produced the largest number of scientific publications in 2016 and 2017 [68]. The effect of the country’s policy towards publication spilled over to the field of m-commerce research, and, thus, the same is reflected here as a theme. The term communication technologies, which has appeared as a niche theme in this review period along with China, refers to early literature on mobile communication technologies. For as long as humans have been on this planet, the form, type, and medium of communication has evolved remarkably, especially in the last two centuries. Communication and commerce, which was tied to horse carts and waterways, have come a long way to seamless connectivity and access due to the invention of the electric telegraph in 1831 and the internet towards the end of the 20th century [41,69].
In the third quadrant, which constitutes the emerging or declining themes, as it lacks both density and centrality, the terms attitude, intention, mobile advertising, privacy, and social influence are positioned. These themes cannot be propositioned as declining themes in this period. The examination of strategic diagrams for the subsequent periods (2015–2018 and 2019–2022) revealed that the researchers pursued these themes rigorously to determine the antecedents of loyalty and continuance use intention of m-commerce, m-payment, or m-service apps.

In the m-commerce context, the term advertising refers to the activity that promotes products and services via mobile devices, such as tablets and smartphones. There are five types of mobile advertising: “app-based advertising, social media advertising, location-based advertising, mobile search ads, and SMS” [70]. In app-based advertising, brands carry out advertising campaigns in their proprietary apps or partner with third-party apps to target their customers. Mobile social media advertising involves hosting ads in social media apps such as Facebook, Twitter, and Instagram to reach potential customers. Location-based advertising works because people carry their smartphones wherever they go. As such, mobile marketers post ads based on the user’s location. For example, restaurant marketers let an ad appear on the mobile screen of individuals when they are within a radius of a few miles of their business establishments. Mobile search advertisements refer to hosting advertisements on web pages browsed on mobile phones, and clicking on the ad takes the users directly to the brand’s website. Short Messaging Services (SMS) advertising refers to texting a consumer’s phone with specific offers or information about ongoing sales. It is also performed based on a user’s location. The factors affecting consumers’ attitudes toward mobile advertising was examined by Xu (2006) [67] in China. The result revealed that personalization is a major influencer that positively affects consumers’ attitudes toward mobile advertising, especially for female users. The examination of consumers’ perceptions of mobile advertising via SMS by Carroll et al., 2007 [71], revealed that users are happy to receive messages at a higher frequency so long they are relevant.

In the fourth and last quadrant of the strategic diagram, containing relevant but poorly developed themes, we find the keywords consumer behavior and security. Consumer behavior refers to how consumers’ emotions, attitudes, and preferences affect buying behavior. In the context of our study, it refers to how various inherent features of mobile commerce (convenience, ubiquity, personalization, information richness, aesthetic appeal, and other relative advantages), personal traits (innovativeness, risk-taking propensity, self-efficacy), perceived risk (privacy and security concerns), and social norms shape up the attitude and behavioral intention of people to use mobile devices as a medium of shopping. Consumer behavior, being a vast area of study encompassing the entire gamut of mobile commerce, appeared as a general theme in this period of review (2001–2014), with the potential to grow multifold in the years ahead. The other theme in this quadrant is security. It is a relevant and sensitive issue that has emerged with the development of mobile commerce. As more and more people use mobile phones for browsing the web, banking, and shopping, the risks associated with mobile commerce have grown.

Further, m-commerce usage involves sharing one’s credit/debit card details and disclosing personal information, including one’s residential address. Moreover, it also subjects consumers to the vulnerability that counterfeit items might be delivered. The assessment of benefits and risks associated with soliciting additional information from m-commerce consumers was conducted by Benou et al., 2012 [72]. The result revealed that, while the additional information about customers enables the e-vendor to provide better-personalized services, it raises concerns among the consumers regarding their privacy and security.

In summary, in the period between 2001 and 2014, the literature on m-commerce centered on identifying the antecedents of mobile commerce and mobile banking acceptance using the Technology Acceptance Model as a base theory and the impact of factors such as trust, mobile advertising, and security also have been widely pursued by the scholars.
3.2.2. Analysis of the Period 2015–2018

The strategic diagram for the second period of analysis (2015–2018) unearthed nine relevant themes (Figure 11). Although this period of review is much shorter than the previous period of analysis, there has been a greater number of articles (145) published. It implies that, between the years 2015 and 2018, there was an increased interest among scholars in mobile commerce. The reason for this could be that the highest penetration of smartphones happened across the globe during this period, and everyone began noticing its potential for modern retailing. Figure 11, below, shows that the cluster “mobile commerce” has again emerged as the motor theme, the topic of our study. The primary focuses of this period were trust, satisfaction, loyalty, and mobile payment. The examination of antecedents of continuous use intention of mobile shopping among Chinese consumers by Gao, et al., 2015 [38], identified satisfaction as the major driving factor of continuance intention. The satisfaction is, in turn, significantly influenced by “system quality” (refers to access speed, ease of use, navigation, visual appeal, and connection) and “security and privacy concerns”.

Figure 11. Strategic diagram for the period 2015–2018.

The second-most developed motor theme in this period of review was loyalty. In the context of m-commerce, the term loyalty refers to repeat use, the desire to recommend, the willingness to pay more, and the resistance to switching to another app [39,73]. Developing customer loyalty takes time and will not happen overnight. It is usually a by-product of an excellent service that delights customers and makes them keep coming. Creating and maintaining loyalty helps the firm develop long-term, mutually beneficial customer relationships. Customer loyalty is driven by consumers’ micro-experiences. For customers, every step of the buying journey is one seamless experience, from discovery to checkout and receiving the delivery; it is all one experience, even if they are different functional units for the company. Each micro-experience has an impact on customer loyalty. The examination of loyalty in mobile app hotel booking by Ozturk et al., 2016 [74], revealed that “convenience, compatibility, and perceived ease of use (PEOU)” positively influence customers’ loyalty intentions. The study by Jimenez et al., 2016 [39], examined the development of...
customer loyalty; their results revealed that trust and satisfaction were the key influencers of loyalty in m-shopping.

In examining the second quadrant (Figure 11), which contains the developed but isolated themes, we find the keywords social networks and perceived risk. The theme “social networks” is related to the studies investigating social commerce. Social commerce refers to e-commerce transactions carried out on social media platforms; the whole shopping journey, from product search and evaluation to checkout and payment, is performed right on social media platforms without ever having to open another browser. While social media marketing enables businesses to inform and educate customers about products/services or ongoing offers, social commerce allows customers to checkout directly from social platforms such as Facebook, Instagram, and Pinterest [75]. The examination of the effect of perceived benefits on purchase intention in social commerce by Gan and Wang, 2017 [36], revealed that utilitarian, hedonic, and social values significantly and positively impact purchase intention and satisfaction. The impulse buying behavior in Facebook commerce (F-commerce) was examined by Leong et al., 2018 [76], which resulted in the unexpected outcome that the hedonic motives have a negative effect on the intention to engage in F-commerce shopping. They stated that the possible reason for this peculiar finding might be due to the presence of various online games on Facebook, which draw greater attention compared to driving shopping activities.

The other theme that emerged in this quadrant is perceived risk. Despite the benefits of mobile commerce, security and privacy risks associated with this medium of commerce abound. Mobile phones are viewed as a mode of payment mechanism and have replaced paper money and even credit/debit cards to a greater extent. However, it suffers from inherent limitations, e.g., “small screen size,” and its usage among people has emerged recently compared to e-commerce, which has been around since the beginning of the 20th century. People, in general, exercise caution about anything new.

Further, in mobile commerce, QR codes are often used to make payments or learn more about products/services, but they are not always safe. Users do not know what they scan, and it may take them to sites containing viruses or malware that can be downloaded into their devices. From this perspective, the examination of barriers to m-commerce continuous use intention by Groß, 2016 [77], found that overall risk perception hinders consumers from regularly engaging in m-shopping. Further, the study also revealed that transaction processing and financial risks, rather than privacy or security concerns, hinder the continuous use intention of mobile shopping.

Moving on to the third quadrant, which contains the emerging or disappearing themes, the terms motivation, attitude, customer satisfaction, Technology Acceptance Model, and self-efficacy are positioned. The strategic position of these themes and the examination of the graph for the next period of analysis, i.e., 2019–2022, indicate that these are declining themes. The reason for their decline is evident from the fact that m-commerce adoption intention (or motivation to adopt) was widely examined through attitude and utilitarian aspects of mobile commerce employing the Technology Acceptance Model. As the effect of these variables has been well investigated and documented by many scholars in the first period of analysis, i.e., 2001–2014, these keywords have subsequently become declining themes.

The fourth quadrant contains the themes Malaysia and PLS-SEM. The term Malaysia refers to studies carried out about the geography—Malaysia, and the PLS-SEM refers to the methodology used for examining the hypotheses—“Partial Least Squares Structural Equation Modelling”. Supported by a strong national investment in research, Malaysia has been embarking on a path to become a knowledge-based society. A report by ELSEVIER and the Ministry of Education, Malaysia, states that the nation has been highly productive in terms of producing highly impactful publications [78]. The same is reflected here as a theme because several m-commerce studies were carried out focusing on Malaysian consumers during this review period. Reviewing the theme PLS-SEM, it has been observed that, in recent years, PLS-SEM has emerged as a preferred software package among researchers to test hypotheses. While CB-SEM (covariance based) is advised for testing the existing
(established) theory, PLS-SEM is used in exploratory research, where the theory is less developed or to extend/modify the existing model. Further, PLS-SEM can also be used when the sample size is small. These advantages prompted researchers to employ PLS-SEM to study the determinants of m-commerce adoption or continuous use intention [7,79]. Further, the theme “mobile applications” also emerged as the basic and transversal theme during this period of review, as it is the sub-set of our research.

3.2.3. Analysis of the Period 2019–2022

Examining the strategic diagram (Figure 12) for 2019–2022 shows that mobile commerce is no longer a mother theme. This phenomenon means that “the field as a whole has become more bottom-up” because “fundamental research” has developed its ideas, and new themes have begun emerging. Alternatively, the keywords “Mobile payment, UTAUT, COVID-19, and Fintech” have become engine themes with high centrality and density. There were 47 documents associated with the themes m-payment and UTAUT. They comprise the studies which used UTAUT or UTAUT2 as a base model to determine the antecedents of m-payment app adoption intention or continuous use intention [37,80–82]. Though the “Technology Acceptance Model (TAM)” has been the extensively used theory to predict the new technology adoption intention, scholars have advocated that TAM needs to be integrated with factors from other theories to improve its predictability power [83–85]. On this line, Venkatesh et al., 2003 [69], developed the “Unified Theory of Acceptance and Use of Technology” (UTAUT), integrating eight different behavioral prediction theories. Subsequent studies by Information Systems (IS) scholars confirmed that UTAUT has a stronger predictability power than any other IS behavior prediction models [86,87]. This probably made the scholars employ the UTAUT or UTAUT2 models widely as a base theory to investigate the antecedents of m-commerce adoption or continuance use intention; thus, they appear here as a mother theme.

Figure 12. Strategic diagram for the period 2019–2022.
The other keyword that emerged as a mother theme in this period of review (2018–2022) is COVID-19. It is owing to the impact COVID-19 had on consumers’ shopping behavior and the operational difficulty it caused to e-commerce firms due to the restrictions imposed on mobility and heightened health risks for employees. Further, e-commerce firms have also witnessed an explosion in the number of new customers who adopted online shopping for the first time during the pandemic. The examination of antecedents that affect users’ mobile shopping actual usage during the pandemic found that “perceived vulnerability” and “perceived severity” were significant determinants of actual usage of m-shopping [88]. The study of mobile shopping adoption during the COVID-19 lockdown in Malaysia by Chan et al., 2022 [34], revealed that behavioral intention exhibits a higher significant impact on the adoption of m-shopping. The assessment of COVID-19 on mobile shopping sales in Korea by Yang and Kwon (2022) [14] asserted that its impact is short-term and that the growing number of mobile network subscribers is a key long-term factor for m-commerce sales growth.

Further, Chopdar et al. (2022) [81] examined the effects of COVID-19 phobia and news exposure on individuals’ psychological states and the resulting mobile shopping behavior using the theoretical model ABC (Activate, Belief, and Consequences). The obtained results confirmed that COVID-19 phobia and the exposure to news related to the pandemic propelled individuals to become addicted to excessive smartphone usage and rely on online shopping even for basic goods available in the next-door “mom-and-pop” stores. In essence, a significant amount of research has been carried out during the COVID-19 pandemic and afterward to gauge its effect on individuals’ mobile commerce adoption behaviors. The other topic that emerged as a major theme in this review period was Fintech (Financial Technology). It refers to businesses that use technology to enhance and automate financial products and services. An examination of the determinants of Fintech adoption among Polish millennials by Solarz and Swacha-Lech, 2021 [89] revealed that young men with high net income are most open to innovative Fintech services. Further, while these customers consider the opinions from social media, they do not care much about the direct opinions of their friends and relatives.

In the second quadrant of the strategic diagram (Figure 12), the one containing the marginal themes, we find the keywords Gamification and Eye tracking. Though these are developed themes by volume, they are specialized and separate from the overall focus of our research. The term—gamification refers to the usage of gamified advertising, which is advertising characterized by high interactivity and “game-like features” by e-commerce firms to engage and create awareness about firms’ products and services to customers. The examination of how gamification experience shapes the attitude and behavioral intention to use mobile apps for shopping was carried out by Rialti et al., 2022 [90]. The results revealed that gamification-induced experiences foster in-app purchases; however, this relationship is mediated by perceived consumer benefits.

Further, the study of female consumers’ preferences for playing games in shopping apps resulted in a positive correlation between the frequency of “playing games” and the amount of money spent on the shopping app. To summarize, the studies on the theme of gamification examined the impact of “gamified advertising” employed by the firms to engage and educate the customers about their products and services.

Moving the analysis to the third quadrant of the strategic diagram for 2019–2022, we find the keywords Technology Acceptance Model, intention to use, and social commerce. This quadrant contains emerging or declining themes, as it lacks both centrality and density. The examination of all three strategic diagrams (Figures 10–12), which represent the whole 22 years of review, leads to the inference that the themes Technology Acceptance Model (TAM) and intention to use are declining themes, as they matured and became over-studied concepts in the last two decades. The same has been voiced by many authors [80,82,91] that TAM is an overused model, and it examines the role of just two immediate determinants of technology acceptance, but several factors influence the behavioral intention to use a system. Thus, it needs to be integrated with factors from other theories to improve its predictability.
power. From this perspective, scholarly observations in the field of Information Systems moved on to employ UTAUT as a base theory.

Continuing the analysis to the fourth quadrant further confirms that the theme “intention to use” in quadrant three has become a declining theme, as the keyword “continuous use intention” emerged as the general theme. It is obvious that when a system is in place for a few years, and people have accepted it, the scholarly observations move on to examine the continuous use intention. The examination of continuance usage of mobile shopping applications in India by Chopdar and Sivakumar, 2019 [11], revealed habit as the strongest predictor of continuance usage intention. Further, the study also posited that the “perceived risk” factor does not significantly affect post-acceptance behavior. The investigation of the moderating role of gender in continuance use intention of mobile commerce usage by Marinković et al., 2019 [92], confirmed that there are general differences between male and female respondents. The other themes that were observed in quadrant four include “Satisfaction” and “Trust”. As stated above, the scholarly observations in this period of review have shifted from investigating adoption intention to continuance use intention. Further, the factors Satisfaction and Trust play key roles in the continuance use intention of a new system; the research community has increasingly investigated the effect of these variables, and as such, they have become prominent themes.

4. Conclusions

This work aimed to critically review the studies on m-commerce consumer research from 2001 to 2022. We examined 467 published documents from the Web of Science (WoS) database using the Bibliometrix package RStudio (a programming language for statistical computing and graphics). This tool enables users to examine and graphically visualize the performance of journals, authors, institutions, and countries in a field of research. We comprehensively analyzed citations, co-citation structures, and trends in m-commerce consumer behavior literature. The thematic evolution technique (scientific mapping) employed in this study identified the themes of published documents through keyword co-occurrence. The inference obtained helps the scholars to obtain a clear picture of potential future directions in this field.

4.1. Summary of Performance Analysis

Publication on m-commerce consumer research was fairly steady from 2002 to 2006, but it experienced dips from 2007 to 2011 before a sudden rise in 2012. This rise is likely attributed to the introduction of the iPhone series (the first smartphone) by Apple corporation in the late 2000s and the beginning of 2010s; as such, scholars began noticing its potential for modern retailing. The year 2022 has clocked the highest number of publications (53 documents). Hence, the research on this domain is in its blooming season. Therefore, a greater number of publications are expected to follow in the coming years. The top most-cited article in this field is “What drives mobile commerce?: An empirical evaluation of the revised technology acceptance model”, published in 2005 by Jen-Her Wu and Shu-Ching Wang in the journal Information & Management. This study investigated the factors influencing mobile commerce adoption intention by extending the Technology Adoption Model (TAM). Compatibility was found to have the most significant influence on mobile commerce adoption intention among the variables examined. Though it was published a decade and a half ago, it remains a base study on which m-commerce consumer research continues to thrive.

In terms of the number of publications, citations, and top-performing authors, China is currently the world leader in m-commerce consumer research. The USA is ranked second in the number of publications and total citations received. The examination of sources revealed that the journal International Journal of Mobile Communications published the highest number of articles in this field. However, it has not appeared among the top journals in terms of citations received. This could be because this journal belongs to the publisher Inderscience, which does not provide free access to its articles as other publishers do, nor does it promote its journals as rigorously as other publishers do. The top
three journals ranked based on citations are *Computers in Human Behaviour* (4.91% of total citations), followed by *MIS Quarterly* (4.51% of total citations), and the *Journal of Retailing and Consumer Services* with 3.29% of total citations.

Further, the examination of the law of productivity gives the conclusion that, indeed, there is *Pareto Law* here; 20% of the journals published 64% of total articles. It indicates that the knowledge of m-commerce consumer research is condensed in a few academic journals, which are classified under the scientific disciplines—Business, Computer Science Information Systems, Management, and Telecommunications. The analysis of the contributions of institutions revealed that the University of Burgos from Spain and Universiti Tunku Abdul Rahman Kampar Campus from Malaysia had published the highest number of articles (20 and 19 records, respectively). These two institutions combined account for 8.35% of total publications. Further, the examination of contributing authors revealed that the author Ooi KB, a distinguished professor of Industrial Management and Information Systems from UCSI University, Malaysia, is the most productive in terms of the number of publications and citations received.

### 4.2. Summary of Evolutionary Analysis (Scientific Mapping)

To perform evolutionary analysis, the period of review—2001–2022 was divided into three sub-periods, 2001–2014, 2015–2018, and 2019–2022, and an individual data set corresponding to each period was extracted. The examination of the strategic diagram (Figure 10) for the period 2001–2014 revealed that the clusters “mobile commerce” and “trust” emerged as the mother themes. In this period of analysis, the major focus of research centered on identifying the determinants of mobile commerce acceptance. It refers to the factors that facilitate or deter individuals from accepting and integrating m-commerce into their day-to-day life. When a new technology is introduced, it is obvious, in the research fraternity, to study the factors influencing its acceptance and adoption. The widely used theory to ascertain the antecedents of m-commerce acceptance in this period was the Technology Acceptance Model (TAM). The scholarly observations concluded that utilitarian motivations such as usefulness, ease of use, and perceived control (self-efficacy) were important antecedents of mobile commerce adoption intention [93]. Further, as trust is a vital parameter for a customer to accept new technology, continue to use it, and remain loyal, researchers paid increased attention to trust beliefs and their effect during this period of review as m-commerce penetration gained momentum.

Further, examining the third quadrant, which constitutes the emerging or disappearing themes, as it lacks both density and centrality, the terms *attitude, intention, mobile advertising, privacy, security,* and *social influence* have been found to be emerging themes in this period. The examination of strategic diagrams for the subsequent period (2015–2018) revealed that the researchers pursued these themes rigorously as they are important determinants of trust and continuance use intention for m-commerce and m-payment applications. Given the rising popularity of smartphones and their applications, it is not surprising that mobile advertising has become a strategic priority for firms. Therefore, this theme began receiving attention from the scholarly community during this review period (2001–2014). Regarding the terms “privacy and security”, m-commerce usage involves sharing one’s credit/debit card details and disclosing personal information, including one’s residential address. Moreover, it also subjects users to the vulnerability that counterfeit items might be delivered. The concerns about fraud, identity theft, or inadvertent mistakes because of the small screen are foremost in the mind of users when they choose to adopt mobile applications for shopping. Further, in mobile commerce, QR codes are often used to make payments or learn more about products and services, but they are not always safe. Users do not know what they scan, and it may take them to sites containing viruses or malware that could be downloaded into their devices. To sum up, in the period between 2001 and 2014, the literature on m-commerce centered on identifying the antecedents of mobile commerce and mobile banking acceptance using the Technology Acceptance Model as the base theory.
and the impact of the factors of trust, mobile advertising, and security have also received significant attention.

Although the second review period (2015–2018) is much shorter than the previous period of analysis, there have been a greater number of articles (145) published. It implies that, between the years 2015 and 2018, there was an increased interest among scholars in mobile commerce. The reason for this could be that the highest penetration of smartphones happened across the globe during this period, and everyone began noticing its potential for modern retailing. The primary focuses of this period were trust, satisfaction, loyalty, and mobile payment. These aspects of m-commerce are highly influenced by hedonistic dimensions and aesthetic components of m-commerce applications in addition to utilitarian factors, such as usefulness and ease of use. Hence, the companies operating in the mobile commerce space need to focus more on the hedonic (enjoyment) and aesthetic aspects of m-commerce applications. This will increase customers’ likelihood of using mobile apps for shopping and allied transactions. The second most developed major theme in this period of review was loyalty. The term loyalty in m-commerce refers to repeat use, the desire to recommend, the willingness to pay more, and the resistance to switching to another app [39,73]. Developing customer loyalty takes time and will not happen overnight. It is usually a by-product of an excellent service that delights customers and makes them keep coming. Consumers’ micro-experiences drive customer loyalty. For customers, every step of the buying journey is one seamless experience, from discovery to checkout and receiving the delivery; it is all one experience, even if they are different functional units for the company. Examining the third quadrant, the terms motivation, attitude, customer satisfaction, Technology Acceptance Model, and self-efficacy were found to be declining themes. The strategic position of these themes and the examination of the graph for the next period of analysis, i.e., 2019–2022, indicated that these are indeed declining themes. The reason for their decline is evident from the fact that m-commerce adoption intention (motivation to adopt) was widely examined through attitude and utilitarian aspects of mobile commerce employing the Technology Acceptance Model in the first period of analysis, i.e., 2001–2014. As the effect of these variables has been well investigated and documented by many scholars, these keywords have subsequently become declining themes. Further, reviewing the strategic diagram for this period, it has been observed that, in recent years, PLS-SEM has emerged as a preferred software package among researchers to test hypotheses. The advantages it has over AMOS-SEM and its user-friendly interface make it a widely used statistical tool among scholars in recent times.

Examining the strategic diagram (Figure 12) for 2019–2022 showed that “mobile commerce” is no longer a mother theme. This phenomenon means that “the field as a whole has become more bottom-up” because “fundamental research” has developed its ideas, and new themes have begun emerging. Alternatively, the keywords “Mobile Payment, UTAUT, COVID-19, and Fintech” have become engine themes with high centrality and density. Though the “Technology Acceptance Model (TAM)” is the widely used theory to predict technology adoption behavior, scholars have advocated that TAM needs to be integrated with factors from other theories to improve its predictability power [83–85]. On this line, Venkatesh et al., 2003 [69], developed the “Unified Theory of Acceptance and Use of Technology” (UTAUT), integrating eight different behavioral prediction theories. The same team presented UTAUT2 in 2012 by incorporating additional factors into their original UTAUT model [94]. Subsequent studies by Information Systems (IS) scholars confirmed that UTAUT2 has a stronger predictability power than any other IS behavior prediction model [86,87]. This probably made the scholars employ UTAUT or UTAUT2 widely as a base theory to investigate the antecedents of m-commerce continuance use intention; thus, they appear here as engine themes. The appearance of TAM in quadrant three (emerging or declining themes) further confirmed that TAM had become a declining theme. The keyword COVID-19 has emerged as a mother theme in this review period (2018–2022). This is owing to the impact COVID-19 had on consumers’ shopping behaviors and the operational difficulty it caused to e-commerce firms due to the restrictions imposed
on mobility and heightened health risks for employees. Further, e-commerce firms have also witnessed an explosion in the number of new customers who adopted online shopping for the first time during the pandemic. As such, many studies have been carried out during the COVID-19 pandemic and afterward to gauge its effect on individuals’ mobile commerce adoption behavior.

Continuing the analysis to the fourth quadrant further confirmed that “intention to use” in quadrant three has become a declining theme as the keyword “continuous use intention” emerged as the general theme. It is obvious that when a system is in place for a few years, and people have accepted it, the scholarly observations move on to examine the continuous use intention. As the factors Satisfaction and Trust play a key role in the continuance use intention of a new system, the research community has increasingly investigated the effect of these variables; as such, they have emerged as general themes. Further, the overall observation revealed that the online grocery, flower, and food delivery industries are under-researched and need further attention.

4.3. Emerging Trends in M-Commerce Consumer Research

Based on this review of literature on m-commerce consumer behavior, we infer that the following themes (Mobile social commerce, Mobile payment, Mobile marketing, Omnichannel, Fintech, and Live streaming commerce) will make significant contributions in the future in bringing out useful knowledge.

**Mobile social commerce** refers to online shopping carried out on social media mobile applications (Facebook, Instagram, Pinterest). The whole shopping journey, from product search and evaluation to checkout and payment, is made right on social media platforms, without ever having to open another browser or application. While social media marketing enables businesses to inform and educate customers about their products/services or ongoing offers, social commerce allows customers to checkout directly from social platforms [75]. Social commerce takes advantage of the large number of people who are active on social media worldwide. About 59 percent of adults in the USA are active users of Instagram, and 38 percent of them log in many times a day [95]. This study observed that it is another sub-domain of m-commerce where the availability of literature is scarce, and we expect more research contributions to follow in the near future.

**Mobile payment**: Though a reasonable number of studies have been carried out on mobile banking, research focusing on peer-to-peer payment applications is at its nascent stage [88]. Further, no studies have been carried out on the factors that hinder the acceptance, adoption, and continuous use behavior of mobile payment applications among older users. The potential security issues (QR code scams, malware) associated with peer-to-peer payment applications keep a large segment of the population from using them. From this perspective, research can suggest possible measures to the government and industry bodies to address these concerns so that inclusive growth occurs in society. We urge the science community to explore this phenomenon to contribute to the existing literature on m-commerce consumer behavior.

**Mobile marketing**: Given the rising popularity of smartphones and applications, it is not surprising that mobile marketing has become a strategic priority for firms [96]. There are five types of mobile marketing: “app-based marketing, social media marketing, location-based marketing, mobile search ads, and SMS” [70]. While search engine advertisements and SMS marketing are age-old phenomena, app-based promotion and social media marketing are trends that are under-explored by the research community. Although online channels take the largest share of marketing budgets, their effectiveness largely remains to be quantified. From this perspective, research focusing on consumer behavior toward app-based advertising and social media advertising will add value to the existing literature on mobile commerce [97].

**Omnichannel** refers to integrated multichannel commerce that enables data synchronization. “The goal is to maximize convenience for customers so that every interaction with a brand across different channels feels part of one seamless experience” [98]. Further, it
enables customers to go from product search to purchase on any channel, including a physical store, online store (desktop/mobile), and even social media platforms. Purely operating over multiple channels is not enough to cultivate an omnichannel strategy; that is simply multichannel. Investments need to be made to ensure the content and offerings across channels complement and build on one another. Owing to the opportunity it provides, it has been observed that retailers are increasingly embracing the omnichannel strategy lately. From this perspective, it would be a valuable contribution if research was carried out on the issues retailers face when they go omnichannel and if researchers could suggest measures to address those challenges. It is the responsibility of academics to provide solutions to the problems faced by the industry, and, on this line, enabling retailers to go omnichannel without many hurdles will be a noteworthy contribution.

**Fintech Applications:** “Fintech is a rapidly developing industry that uses technological innovations to improve financial activities and make financial services more accessible and affordable to businesses and individuals” [99]. From mobile banking/payment and insurance to investment apps (mutual fund/stock trading), Fintech refers to an array of applications. It is an emerging area of interest for scholars. Owing to the current disconnect between academic research and the Fintech industry, we believe that there is ample scope to carry out more studies on consumer behavior with respect to different Fintech applications in order to bring out insightful knowledge which will go on to make the financial system “more efficient, effective and resilient”.

**Live streaming commerce:** Live streaming commerce refers to selling products online through live video, where shoppers interact with the brand in real-time. It is an innovative feature of e-commerce, and it has social attributes and elicits customer emotions [100–102]. It has an immense potential by virtue of its real-time interactions to persuade existing, as well as prospective, customers, enabling relationship-building in the present competitive milieu [33,103–106]. Research focusing on this emerging feature is sparse and warrants further exploration [101].

Access to the internet anytime and anywhere made m-shopping a way of life; hence, companies need to consider mobile commerce at the center of their growth strategy. The emerging technologies such as blockchain, augmented and virtual reality, machine learning, and artificial intelligence are expected to drive the next phase of customer experience in the online shopping space. The Biblioshiny application from RStudio was of great help for analyzing the literature on m-commerce consumer research, finding the most active authors, journals, and institutions, discovering hot research themes, and predicting the trends in mobile commerce consumer research.

### 4.4. Limitations and Scope for Future Studies

This study presents a comprehensive analysis of the literature on “m-commerce consumer behaviour” and provides direction to future researchers. However, it does have some limitations. The analysis is restricted to research contributions indexed in Web of Science (WoS). Though WoS is considered an important database in the research fraternity, the contributions made in other databases, such as Scopus, Dimensions, and PubMed, also hold significance. Further, like “R Biblioshiny,” the other competing platforms, such as “VOSviewer, SciMAT, CiteSpace”, etc., also possess powerful processing and visualization capabilities [19,107]. Hence, future studies may employ these competing tools to further validate the study outcomes.

Additionally, from a general perspective, this work provides a comprehensive understanding of the research themes which received significant attention from m-commerce researchers. Nonetheless, it is worth noting that these results are dynamic and may change over time, with new mainstream topics emerging and certain variables increasing or decreasing in their position of importance. Moreover, proposing a conceptual model for subsequent empirical testing is the next stage of this study. Hence, this study paves the way for future empirical studies.
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