



## A Comprehensive Bibliometric Analysis of Voice Commerce Research: Trends, Contributions, and Collaborations

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### ABSTRACT

With the increasing integration of AI, machine learning, and voice-activated technologies into various commercial sectors, voice commerce has emerged as an important area of research. In this regard, the present study undertakes a bibliometric review of voice commerce research emanating between 1965 and 2024 to map the intellectual landscape, identify key contributors, and uncover emerging trends. The analysis, then, will be based on bibliographic data from Scopus, limited to journal articles and conference papers dealing with the area of interest represented by the terms “Voice” and “Commerce.” This study will describe the growth and development of the field under consideration using, among others, the facilities offered by VOSviewer, CiteSpace, and Biblioshiny to analyze publication patterns, citation impact, and networks of research collaboration. Further, the research investigates the big themes of artificial intelligence, e-commerce, and consumer behavior, thus identifying the lacunae regarding ethical consideration, privacy issue, and the gap in exploring integrations of under-studied technologies. These findings provide useful insights into academics and practitioners and evidence of the dynamic nature of voice commerce research and its rising relevance globally. This analysis is supposed to be a basic reference for research and practical applications in voice commerce, which is now taking shape.

**Keywords:** Voice, Commerce, Bibliometric Analysis, Biblioshiny, CiteSpace, VOSviewer

**JEL Classifications:** D, L, M

### 1. INTRODUCTION

Artificial Intelligence and the development of different voice assistants, such as that of Alexa by Amazon, have hailed voice commerce as the new frontier for digital transactions. Recent growth in this sector invited deliberations on possible benefits and issues concerning the adoption of the voice-commerce market. Key findings are summarized below based on selected studies concerning adoption, potential, and impediments toward the adoption of voice commerce. According to Rzepka et al. (2020), whereas the users feel benefits related to the ease and convenience of the process, they also feel deterred

by losing control, lack of trust, and a lack of transparency in the process (Rzepka et al., 2020). These perceived shortfalls partly explain why the overall rate of voice commerce diffusion remains relatively lower than was perhaps expected. Of all of these, trust is positioned as the most important antecedent of voice commerce adoption. Schultz and Paetz (2023) examined how consumers need to place trust in voice assistants if they are to have a sense of comfort in utilizing such systems for shopping transactions. They observed that privacy concerns were the most critical barrier to voice shopping, while trust is a mitigating factor which could reduce perceived risks (Schultz and Paetz, 2023).

From a business perspective, managers view voice commerce as both an opportunity and a challenge. Mari et al. (2020) explored the potential disruptive impact of voice commerce on marketing practices. Their study found that many brand owners struggle to adapt to the new dynamics introduced by voice assistants, especially since these technologies can act as intermediaries that filter consumer choices (Mari et al., 2020). Several barriers have hindered the widespread adoption of voice commerce. According to Rzepka et al. (2020), technical immaturity, lack of user trust, and transparency issues are significant inhibitors. Additionally, consumers express concerns over privacy, security, and the lack of transparency in how voice assistants handle data. Without addressing these issues, businesses may struggle to foster widespread use of voice commerce platforms (Rzepka et al., 2020).

Sun et al. (2019) found that voice commerce positively influences shopping behavior. Their large-scale study with Alibaba's voice AI revealed that consumers increased both their spending (by 23%) and their browsing time (by 11%) after adopting voice-enabled shopping. This effect was particularly strong for male consumers and younger users. Voice commerce also demonstrated positive spillover effects on mobile shopping without cannibalizing other channels (Sun et al., 2019). Trust is a crucial factor for the success of voice commerce. Schultz and Paetz (2023) explored how privacy concerns significantly influence consumer trust in voice assistants. Their findings highlight that users need assurances of security and transparency to engage confidently in voice commerce (Schultz and Paetz, 2023).

Similarly, Zaharia and Adolphs (2022) emphasized the importance of mitigating privacy risks in VC. They found that privacy concerns negatively impacted consumers' intention to use voice commerce applications. However, perceived performance and social influence had strong positive effects on consumer adoption of voice commerce (Zaharia and Adolphs, 2022). Mari et al. (2020) explored the marketing challenges associated with voice commerce. They discovered that voice commerce disrupts traditional marketing practices by altering how consumers search for and purchase products. This shift often leaves brands with less control over consumer interactions. Managers must adapt by developing new strategies for brand visibility in voice-enabled platforms (Mari et al., 2020).

This increasing growth in voice commerce shows that the speed of growth in voice commerce is increasing. Therefore, it is an issue of great importance that consideration of trust in every respect be made when consumers go onto voice-activated devices. According to Venkatesha, 2003, consumers going to e-commerce, to which voice commerce belongs, exposes them to some new perils such as privacy and no transparency of transactions. He says these are the very barriers that, unless crossed, will hamper the building of consumer trust for seamless adoption (Venkatesha, 2003). With voice Commerce increasingly becoming woven into the aspects of daily living, this has brought an element of personalization into customers' relationships. According to Dixit and Sinha (2016), inasmuch as the wheel of artificial intelligence, on which the voice marketplace moves, has increased businesses' chances to provide truly personalized shopping experiences. Considering

this, though, they raised that the aspect of Privacy has remained one of the biggest challenges: people show wariness of how voice assistants treat their personal information (Dixit and Sinha, 2016).

For businesses, integrating voice commerce into their overall e-commerce strategy can be complex. Yasin et al. (2006) explore how small and medium-sized enterprises (SMEs) face unique challenges when adopting e-commerce technologies, including voice commerce. These challenges include limited technical expertise and financial resources. To overcome these barriers, businesses must strategically plan their voice commerce initiatives and align them with existing business models (Yasin et al., 2006). The growth of voice commerce is expected to vary across different markets. Rakunde (2016) provides insights into the development of e-commerce, including voice commerce, in India. He identifies infrastructure challenges, such as limited broadband access and insufficient technological literacy, as significant obstacles to the growth of voice commerce in developing economies. However, he also notes the potential for exponential growth as these barriers are gradually overcome (Rakunde, 2016).

Amazon Echo and Google Home integrated voice assistants have revolutionized retail experience in e-commerce. In this regard, the research by Park et al. (2022) evaluates consumer expectations about smart speakers for shopping. Using voice commerce, shoppers have the ability to find and buy products, control order status, and update quantities using voice commands only. It is expected that in a couple of years, consumers are bound to expect seamless functionality with high personalization from a voice assistant. This research signals the probable further growth of voice commerce on the back of AI (Park et al., 2022). A conceptual framework in which the factors that have influenced the user's acceptance and resistance to voice commerce was investigated in the study of Chung et al. (2022). The findings revealed that perceived accuracy, interactivity, and social presence of virtual assistants were significantly affecting user perceptions. Also, the perception of ease of use and relative advantage are the two basic drives for acceptance, whereas the perception of risks forms the drive to resistance. This really emphasizes the need to further improve user trust in these technologies (Chung et al., 2022).

AI is a significant driver of growth in the e-commerce industry, particularly in the context of voice commerce. Moshchynska and Tsalan (2023) argue that AI has revolutionized sales and marketing strategies in e-commerce by automating processes and enhancing personalization. Their research points out that AI-enabled voice assistants are shaping customer interaction by making purchasing processes more seamless and accessible (Moshchynska and Tsalan, 2023). Despite the opportunities, voice commerce faces a lot of challenges. According to Thangavel and Chandra (2023), privacy concerns and data security are major deterrents to its wide acceptance. While consumers appreciate the convenience, apprehensions about how personal data is managed by voice assistants hinder full-scale adoption. Improvement in data protection mechanisms will be the key for the future growth of this sector (Thangavel and Chandra, 2023).

Amongst these, voice commerce holds the greatest potential for change in digital commerce-in ways of convenience and

personalization-but again, trust, transparency, and technical maturity will be the issues that are barriers to mass adoption. Further research and technological advances could be the influencing factors toward a broader adaptation and smoother integration of the space into people's lives.

Bibliometric Analysis is a powerful quantitative method used to evaluate and explore academic literature in terms of publication patterns, citation impacts, and key contributions in many fields (Abbas et al., 2021; Agac et al., 2023; Cherian et al., 2024; John et al., 2024; Joseph et al., 2024; Joseph and Kartheeban, 2024). This analytical approach allows researchers to identify the intellectual structure of disciplines through which emerging trends, major works, and leading contributors can be spotted. There are a number of accessible tools that facilitate bibliometric analysis. For instance, Biblioshiny is a user-friendly web interface to the R package Bibliometrix, which allows non-programmers to create complex analyses and visualizations of citation networks or networks of research collaboration (Devaki et al., 2024; Joseph et al., n.d.; Joseph et al., 2024; Thangavel and Chandra, 2023; Thomas et al., 2023). Another powerful tool, CiteSpace, has strong functionality in tracing the structure and evolution of scientific literature, since it identifies emerging topics by tracking research fronts through an analysis of co-citation networks, keyword bursts, and cluster patterns (Joseph et al., 2023; Joseph et al., 2023; Niazi, 2016; Sun et al., 2024; Synnvestedt et al., 2005). That is its strength: pointing out the pivotal articles with regard to shifts in the research activity over time. VOSviewer is an easy-to-use software tool for visualizing networks of co-authorship, co-citation, and keyword co-occurrence. It excels in mapping dense research landscapes and showing relationships between academic elements (Guleria and Kaur, 2021; John et al., 2024; Joseph et al., 2024; Joseph et al., 2024; Lukose et al., 2024; Zhang et al., 2024). These tools taken together make for extremely useful insights to be gained in the way scholarly fields change.

The main purpose of this paper is to carry out a comprehensive bibliometric analysis of voice commerce research between 1965 and 2024, mapping its evolution, key contributors, and emerging trends. It will clearly focus on publication patterns, citation impact, and collaboration networks in order to gauge the intellectual structure of this field. The study also tries to explore major topics and themes within voice commerce, like the role of AI, machine learning, and consumer behavior, and assesses global collaboration between countries in the advance of this research. Additionally, it points out research gaps, especially on ethics, data privacy, and emerging technologies, so recommendations for future studies can be provided. It also tries to carve out the practical implications that voice commerce has for practitioners and policy makers using various bibliometric tools such as VOSviewer, CiteSpace, and Biblioshiny to make certain that the insights obtained be useful in both academic insight and real-world applications.

## 2. MATERIALS AND METHODS

In this study, Scopus was selected as the primary source of bibliographic data due to its extensive coverage of high-quality journals, providing a wider range of materials compared to other

databases. The publications were collected using the keywords "Voice" and "Commerce" without any language restrictions, focusing solely on journal articles and conference papers. A total of 1,231 documents from 888 unique sources, covering the period from 1965 to 2024, were obtained. Figure 1 shows the PRISMA methodology used in the bibliometric analysis, which followed a three-step process. The first step involved identifying and extracting relevant data from the database. In the second step, items such as reviews, editorials, letters, notes, books, and short surveys were excluded, narrowing the dataset to only articles, book chapters, and conference papers. Finally, the data was exported as a CSV file, and the bibliometric analysis was carried out using VOSviewer, CiteSpace, and Biblioshiny tools.

## 3. RESULTS

### 3.1. Main Aspects of the Study

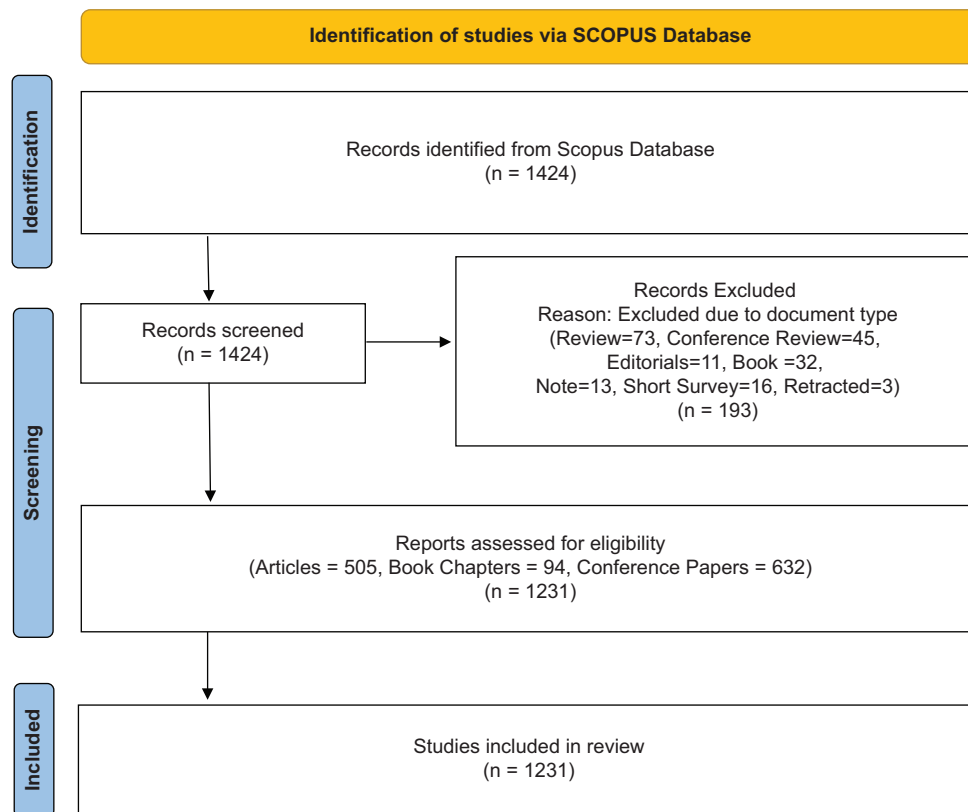
Table 1 presents key information from the investigation, covering a timespan from 1965 to 2024. The dataset includes 1,231 documents sourced from 888 journals, books, and other publications, reflecting an annual growth rate of 6.66%. The average age of the documents is 11.2 years, with an average of 10.97 citations/document. A total of 31,589 references are cited within the dataset. Regarding document content, 7,426 "Keywords Plus" (ID) and 3,273 "Author's Keywords" (DE) are used. In terms of authorship, 2,956 authors contributed to the research, with 318 single-authored documents and an overall 330 single-authored publications. On average, there are 2.68 co-authors per document, and 12.59% of the works are internationally co-authored. The document types are varied, with 505 articles, 94 book chapters, and 632 conference papers making up the dataset. This provides a comprehensive overview of publication trends, collaboration, and document types in the field.

### 3.2. Annual Scientific Production

Figure 2 illustrates the annual scientific production from 1965 to 2024, showing a clear upward trend in published articles over time. The output remained relatively low and stable from the 1960s through the 1990s, with minimal fluctuations. A significant increase is observed starting in the early 2000s, reflecting a growing interest in the field. The number of publications steadily rises, peaking in recent years, particularly around 2021-2023, when the production reached close to 100 articles/year. However, there is a notable dip in the number of publications in 2024. This overall trend suggests an increasing academic engagement in the subject matter, with some fluctuations possibly due to external factors influencing research output in the later years.

### 3.3. Most Relevant Authors

Table 2 lists the most relevant authors based on the number of articles they have contributed. Liu Y leads the group with 12 articles, followed by Li X with 9 and Li M with 7. Both Wang H and Wang Y have contributed 6 articles each, while several other authors, including Benbasat I, Chen Y, Chen Z, Kim D, and Kumar S, have each authored 5 articles. This table highlights key contributors in the field, with Liu Y standing out as the most prolific author. The concentration of similar surnames, particularly from Chinese origin, suggests that authors from this region may play a significant role in the body of research related to voice commerce.

**Figure 1:** PRISMA approach**Table 1: Main information of the investigation**

Description	Results
Main information about data	
Timespan	1965:2024
Sources (Journals, Books, etc)	888
Documents	1231
Annual growth rate %	6.66
Document average age	11.2
Average citations/doc	10.97
References	31589
Document contents	
Keywords plus (ID)	7426
Author's keywords (DE)	3273
Authors	
Authors	2956
Authors of single-authored docs	318
Authors collaboration	
Single-authored docs	330
Co-authors/doc	2.68
International co-authorships %	12.59
Document types	
Article	505
Book chapter	94
Conference paper	632

### 3.4. Most Relevant Sources

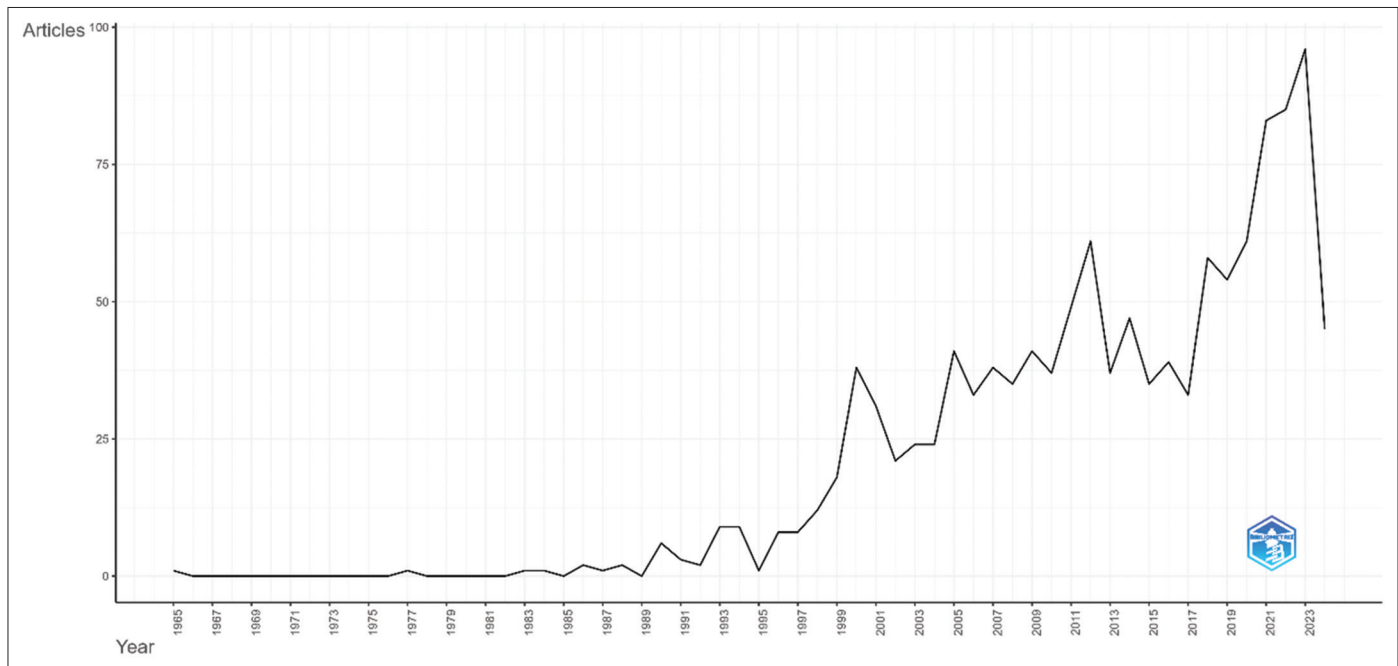
Table 3 presents the most relevant sources for publications related to voice commerce. The Lecture Notes in Computer Science, including its subseries on Artificial Intelligence and Bioinformatics, tops the list with 33 articles, indicating its prominence in this field. The ACM International Conference Proceeding Series follows with 21 articles, while Communications in Computer and Information Science accounts for 19. Other

significant sources include SAE Technical Papers with 15 articles and Advances in Intelligent Systems and Computing with 12 articles. Additionally, Telecommunications Policy has 11 contributions, and the Conference on Human Factors in Computing Systems - Proceedings contributes 9 articles. Both the Harvard Business Review and Lecture Notes in Networks and Systems have 8 articles each, and the 2011 AIMSEC Conference Proceedings account for 7. These sources highlight the interdisciplinary nature of voice commerce research, with a strong representation from computing, artificial intelligence, and management sciences.

### 3.5. Trend Topics

Figure 3 illustrates the trend topics in voice commerce research over time, highlighting the emergence and frequency of key terms. The data suggests a steady evolution in research focus, with terms like voice assistants, chatbot, and artificial intelligence gaining prominence in recent years, indicating a shift towards more AI-driven applications in voice commerce. Earlier research was more focused on topics such as voice recognition, e-commerce, and telecommunications, reflecting foundational technologies. The visualization also shows an increasing emphasis on machine learning, smart speakers, Internet of Things (IoT), and sustainability, pointing to broader integration of voice technologies in various industries and applications. Notable spikes in terms like COVID-19 reflect the impact of global events on research trends. The bubble sizes correspond to term frequency, with larger bubbles indicating more frequent use of the term within the literature. The trends depicted help in identifying the shifting landscape of voice commerce research and its interdisciplinary connections.



**Figure 2:** Annual scientific production**Table 2: Most relevant authors**

Authors	Articles
Liu Y	12
Li X	9
Li M	7
Wang H	6
Wang Y	6
Benbasat I	5
Chen Y	5
Chen Z	5
Kim D	5
Kumar S	5

nature. The Motor Themes quadrant identifies very consolidated and highly influential subjects, such as e-commerce, artificial intelligence, and machine learning, that form the core of the evolution in the area. In contrast, the Basic Themes quadrant consists of foundational topics such as sentiment analysis, natural language processing, and social media, which are intrinsic to the area and present less specialization. Finally, the Emerging or Declining Themes quadrant includes electronic commerce, security, and authentication-those themes that are either new and growing areas of interest or are declining in relevance. This thematic map gives a comprehensive overview of the research landscape, showing both core areas and emerging trends in voice commerce.

**Table 3: Most relevant sources**

Sources	Articles
Lecture notes in computer science (including subseries lecture notes in artificial intelligence and lecture notes in bioinformatics)	33
ACM international conference proceeding series	21
Communications in computer and information science	19
SAE technical papers	15
Advances in intelligent systems and computing	12
Telecommunications policy	11
Conference on human factors in computing systems - proceedings	9
Harvard business review	8
Lecture notes in networks and systems	8
2011 2 <sup>nd</sup> international conference on artificial intelligence, management science and electronic commerce, AIMSEC 2011 - proceedings	7

### 3.7. Three Field Plot

Figure 5 shows the three-field plot of the relationships among keywords (DE), authors (AU), and source titles (SO). This map depicts how research topics, important contributors, and publishing venues are interconnected. Among the most outstanding keywords on the left side of the map, the following can be found: Electronic commerce, mobile commerce, artificial intelligence, and voice assistant; these represent the main areas of interest for the period analyzed. Middle authors such as Liu Y, Wang H, and Benbasat I are key contributors linking to many research themes. Right, publication sources of importance are the Lecture Notes in Computer Science, ACM International Conference Proceeding Series, and the SAE Technical Papers: The lines linking the three fields represent the relation of some keywords with specific authors and the journals or conferences in which the work is published, giving a global view of how voice commerce research is distributed for topics, contributors, and sources. This plot enables the identification of the most influential authors and journals in specific research themes.

### 3.8. Most Cited Documents

Table 4 enumerates the documents most cited in the subject area, reflecting their influences on voice commerce and similar areas. The most frequently cited work is that by Qiu L (2008), entitled

### 3.6. Thematic Map

Figure 4 is the Thematic map of voice commerce research, dividing a selection of topics into their stage of development (density) and relevance (centrality). In the Niche Themes quadrant, topics in customer satisfaction, QoS, and telecommunications are very specialized but have limited broader influence, indicating their developed but isolated

Figure 3: Trend topics

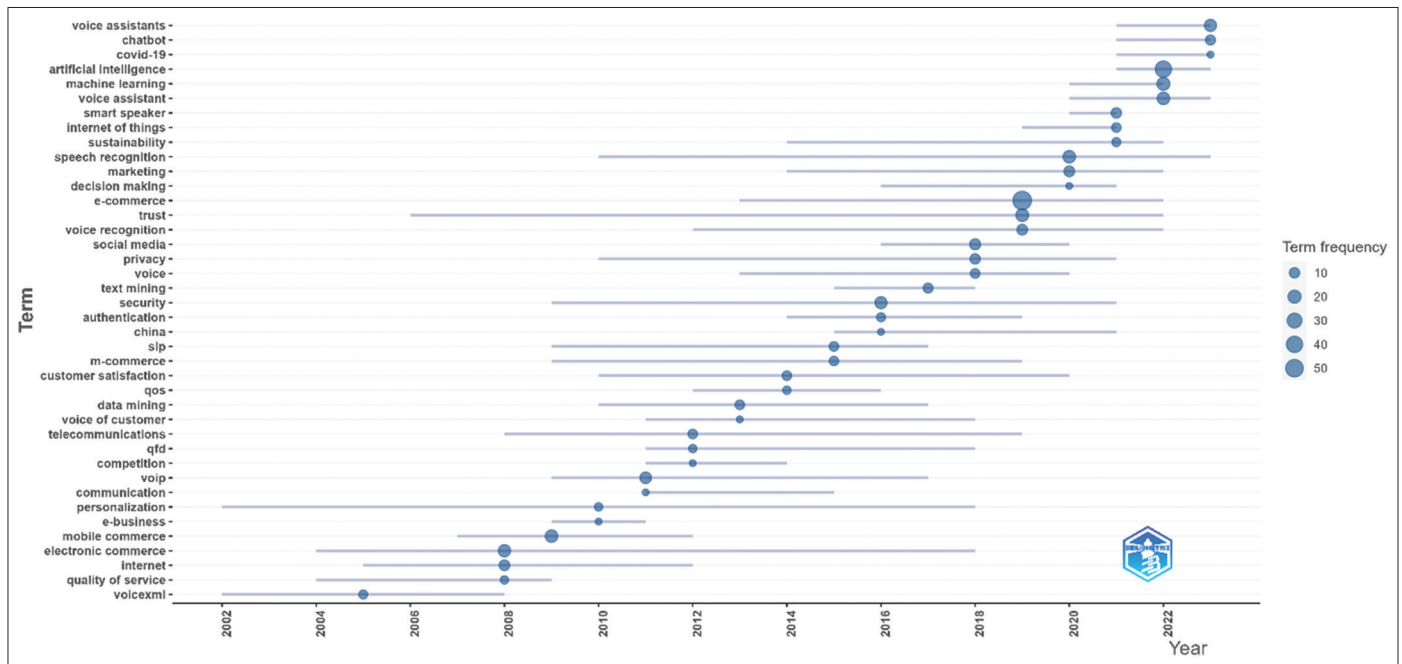
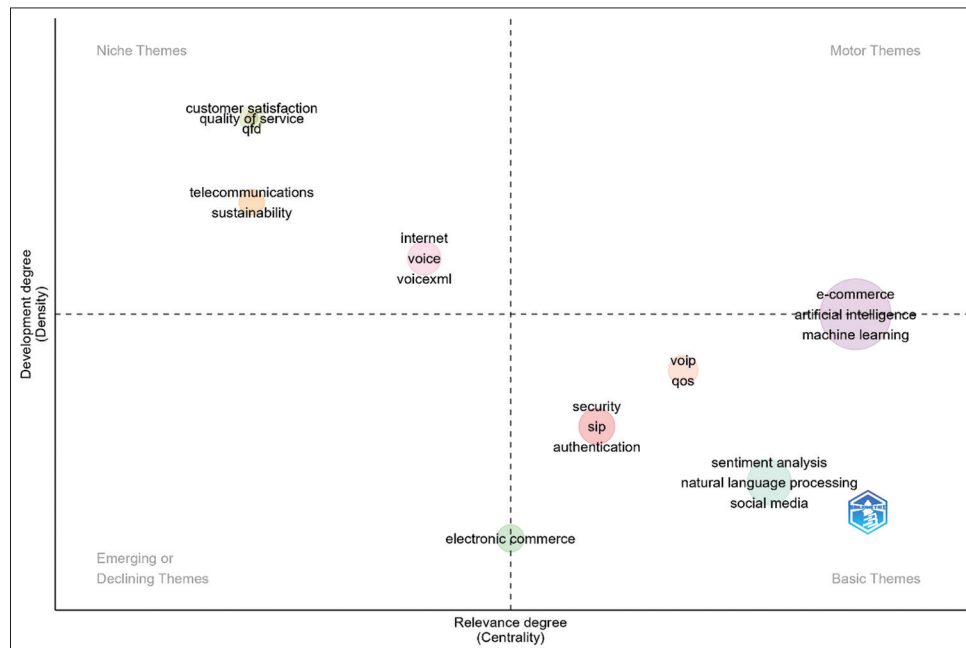
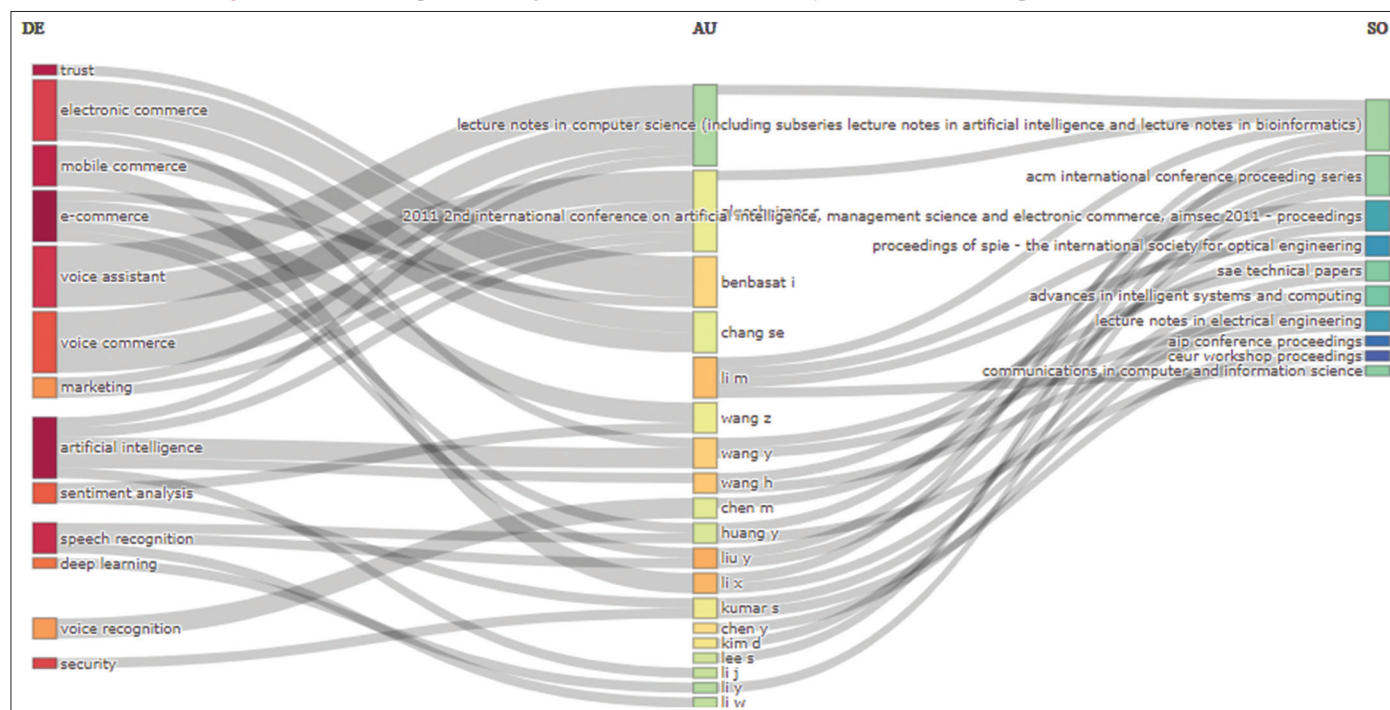


Figure 4: Thematic map



"Evaluating Anthropomorphic Product Recommendation Agents: A Social Relationship Perspective to Designing Information Systems", with 524 citations and hence has greatly influenced the research in understanding product recommendation systems (Qiu & Benbasat, 2009). The second is Kuo Y-F 2009, "Towards an Understanding of the Behavioral Intention to Use 3G Mobile Value-Added Services," which got 434 citations and contributed a great deal to the field of mobile services (Kuo & Yen, 2009). In third place, Riegelsberger J 2005 has 372 citations for "The Mechanics of Trust: A Framework for Research and Design," which has contributed much to understanding the building of trust in human-computer interaction (Riegelsberger et al., 2005).

Others have the following: Yu, J. 2005 extends TAM - Technology Acceptance Model to t-commerce 321 citations and Barnes S.J. 2001 with 302 citations (Yu et al., 2005). His work was on 'Evaluating electronic book stores: the WebQual method' (Barnes & Vidgen, 2001). Cheung CMK (2014) comes next with 291 citations studying social information cues in consumer purchase decisions (Cheung et al., 2014), while Poon W-C (2008) has been cited 257 times for the adoption of e-banking services in Malaysia (Poon, 2007). Lastly, there is Yadav M. (2017), coming in with 190 for developing a scale to measure consumer perceptions of social media marketing activities in e-commerce (Yadav & Rahman, 2017). These papers are the milestones that contributed to a better

**Figure 5:** Three-field plot showing the connections between keywords, authors, and publication sources**Table 4: Most cited documents**

Author	Title	Total citations
Qiu L, 2008, J Manage Inf Syst	Evaluating Anthropomorphic Product Recommendation Agents: A Social Relationship Perspective to Designing Information Systems	524
Kuo Y-F, 2009, Comput Hum Behav	Towards an understanding of the behavioral intention to use 3G mobile value-added services	434
Riegelsberger J, 2005, Int J Hum Comput Stud	The mechanics of trust: A framework for research and design	372
Yu J, 2005, Inf Manage	Extending the TAM for a t-commerce	321
Barnes SJ, 2001, Int J Elect Commer	An Evaluation of Cyber-Bookshops: The WebQual Method	302
Cheung CMK, 2014, Decis Support Syst	Do actions speak louder than voices? The signaling role of social information cues in influencing consumer purchase decisions	291
Poon W-C, 2008, J Bus Ind Mark	Users' adoption of e-banking services: The Malaysian perspective	257
Yadav M, 2017, Telematics Inf	Measuring consumer perception of social media marketing activities in e-commerce industry: Scale development & validation	190

understanding of e-commerce, mobile services, and consumer behavior in digital environments.

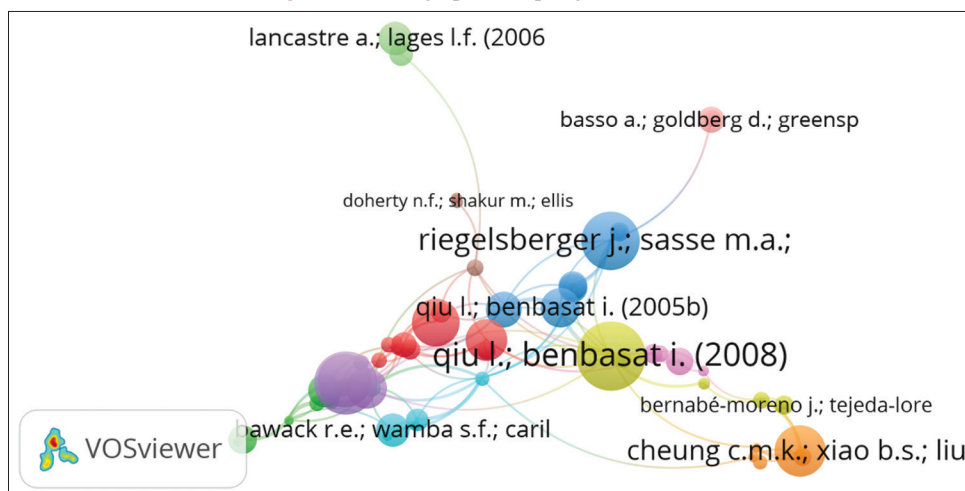
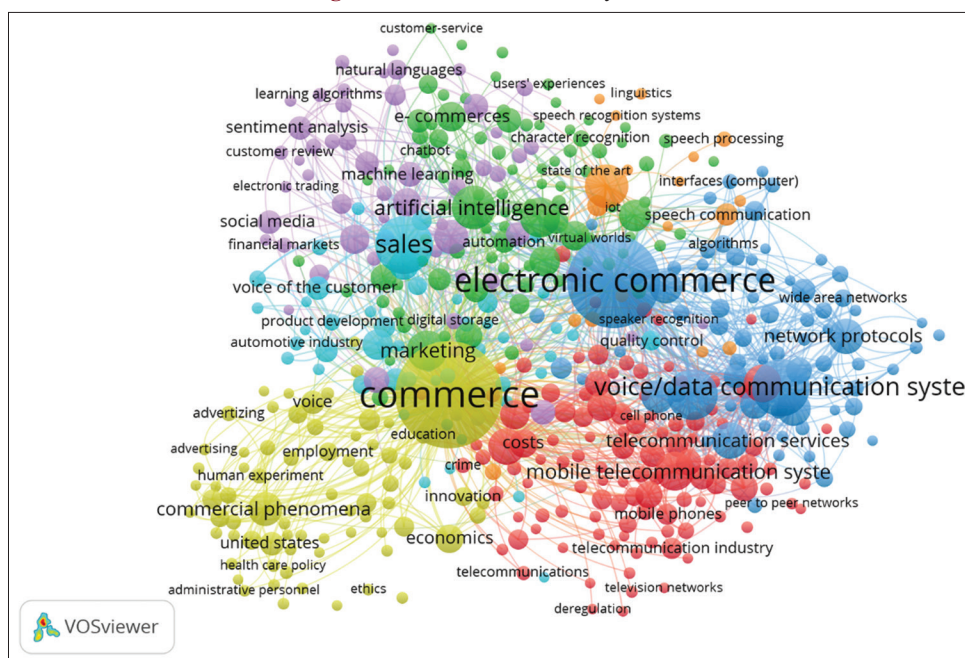
### 3.9. Bibliographic Coupling of Documents

Figure 6 is the Bibliographic coupling of voice commerce documents. The network includes 59 influential items in 11

thematic clusters from a total of 1231 documents, of which 251 reached the threshold for an input of minimum citations of 10. Color-coded nodes represent subfields or themes, from consumer trust and barriers to adoption to its technical implementations. The larger nodes—for example, Riegelberger J.; and Qiu L.; Benbasat I. (2008) (Qiu & Benbasat, 2009; Riegelsberger et al., 2005)—are the foundational works carrying greater scholarly weight. The connecting lines between the nodes illustrate shared references, thus signaling intellectual connections and areas of overlap in research areas. This visualization captures the dynamics of Voice Commerce scholarship, with key contributors and thematic diversity.

### 3.10. Co-Occurrence of Keywords

Figure 7 displays a co-occurrence network of keywords in the voice commerce field, showing how various research topics are interconnected. The larger the keyword, the more frequently it appears in the dataset, indicating major areas of focus. At the center of the network, “electronic commerce” and “commerce” stand out as the most frequently occurring keywords, reflecting their central importance in the field. Surrounding these core terms are closely related topics such as “sales”, “marketing”, and “artificial intelligence”, indicating strong links between e-commerce, sales strategies, and the growing role of AI technologies. The map also reveals clusters of specific topics. The blue cluster includes terms like “voice/data communication systems”, “network protocols”, and “mobile telecommunication systems”, emphasizing technological infrastructure’s role in supporting voice commerce. The green cluster focuses on more technical elements such as “speech recognition systems”, “machine learning”, and “natural languages”, suggesting the critical role of AI and language processing in voice commerce applications. Other notable clusters include social media, customer service, and sentiment analysis

**Figure 6:** Bibliographic coupling of documents**Figure 7:** Co-occurrence of keywords

(in purple), indicating a research focus on customer experience and digital communication. Additionally, yellow clusters capture commercial and social aspects like employment, economics, and commercial phenomena, tying broader economic and societal impacts to voice commerce. This visualization provides an insightful overview of how different research areas within voice commerce interact, identifying key trends and emerging technologies that shape the field.

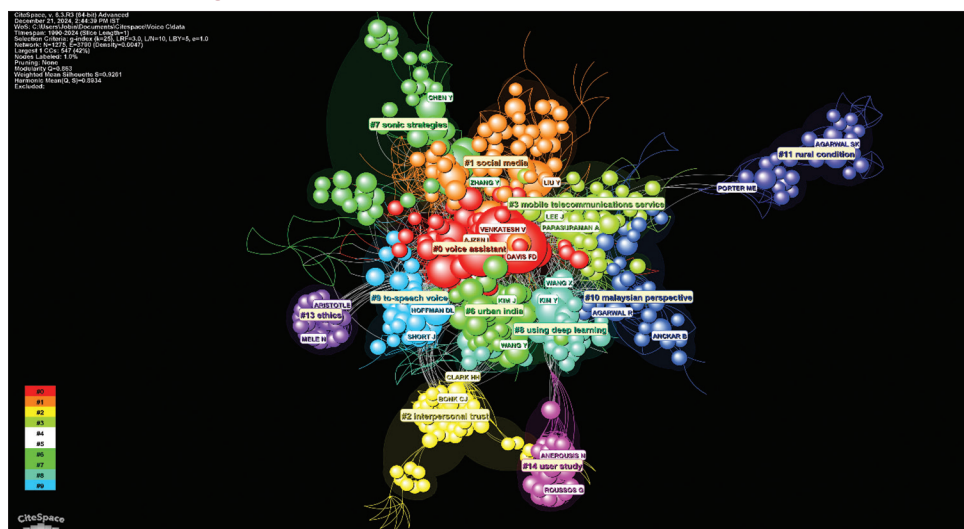
### 3.11. Network Visualization of Co-citation of Cited Authors

Figure 8 shows the co-citation network visualization of cited authors in voice commerce research, highlighting 16 distinct clusters that represent unique thematic areas and influential contributors in the field. Cluster #0, the largest, focuses on Voice Assistants with 104 members and a silhouette value of 0.823. It explores determinants of consumer adoption and trust in digital

assistants, with highly cited members such as Davis FD (40), Venkatesh V (32), and McLean G (23). Cluster #1, Social Media (63 members, silhouette 0.953), delves into the role of social media in influencing consumer behavior in voice commerce, featuring prominent contributors like Liu Y (18), Ajzen I (11), and Hennig-Thurau T (8). Cluster #2, Interpersonal Trust (47 members, silhouette 0.996), examines trust and communication in digitally mediated environments, with influential works by Clark HH (3) and Bonk CJ (2).

Cluster #3, Mobile Telecommunications Service (47 members, silhouette 0.882), focuses on the quality and innovation of mobile telecom services, with significant contributions from Parasuraman A (11) and Zeithaml VA (6). Cluster #6, Urban India (43 members, silhouette 0.872), investigates early adoption and usage patterns of smart speakers in urban India, citing researchers like Wang Y (18) and Kim J (10). Cluster #7, Sonic Strategies (41



**Figure 8:** Network visualization of co-citation of cited authors

members, silhouette 0.93), explores audio features and strategies in advertisements and voice technologies, with Zhang Y (17) and Chen Y (9) as key contributors. Meanwhile, Cluster #8, Using Deep Learning (38 members, silhouette 0.952), highlights deep learning applications in voice commerce and customer insights, citing Kim Y (11) and Wang X (9).

Cluster #9, Text-to-Speech Voice (33 members, silhouette 0.963), focuses on trust-building interfaces using text-to-speech and 3D avatars, with key citations from Hoffman DL (9) and Short J (6). Cluster #10, Malaysian Perspective (27 members, silhouette 0.951), studies e-banking adoption and voice interfaces in Malaysia, with Agarwal R (5) and Kumar N (4) as influential members. Cluster #11, Rural Condition (25 members, silhouette 0.989), emphasizes voice-based systems for rural applications, citing Porter ME (5) and Berners-Lee T (3). Cluster #13, Ethics (24 members, silhouette 1), addresses ethical considerations in voice technology, highlighting works by Aristotle (2) and Mele N (2). Cluster #14, User Study (22 members, silhouette 0.993), investigates user experiences with voice-enabled systems, with significant contributions from Anerousis N (4) and Roussos G (4). Cluster #21, Several Interface (16 members, silhouette 0.994), discusses designing systems with unified logic across interfaces, with Wang K (3) and Sutton S (1) as key contributors. Cluster #32, New Feature Selection Method (10 members, silhouette 0.993), focuses on feature selection techniques for data-driven decision-making, citing Chen J (5) and Chen L (4).

The final two clusters include Cluster #48, On-Line Heuristic Decision (4 members, silhouette 0.998), which explores personalization in e-commerce through heuristic approaches, with Agrawal R (3) as a notable contributor, and Cluster #71, Mobile Voice Diffusion (3 members, silhouette 1), which examines the adoption of mobile voice technologies and regulatory policies, citing Madden G (3) and Allen D (1). Together, these clusters encapsulate the diverse and interconnected research areas within the Voice Commerce domain. This comprehensive co-citation network highlights the multidisciplinary nature of Voice

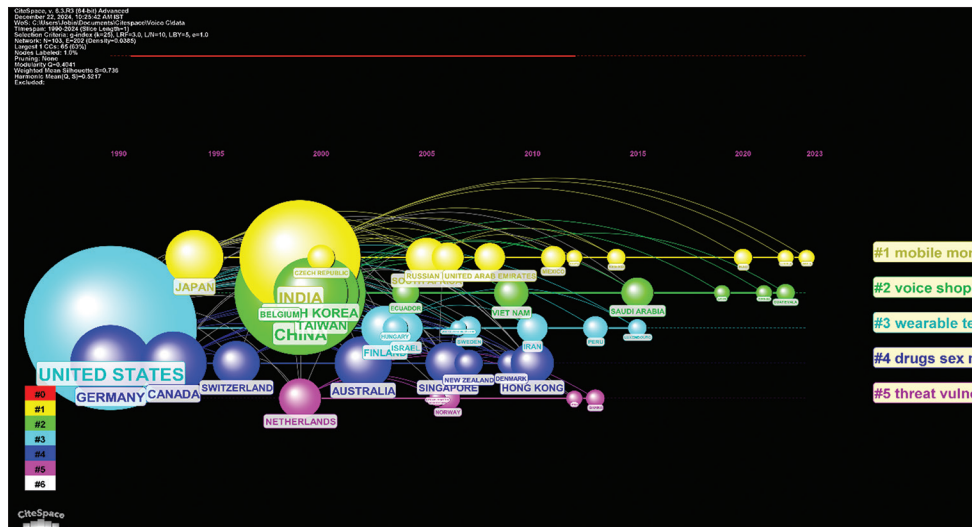
Commerce research, spanning consumer behavior, technological innovation, ethical considerations, and regional perspectives. The clusters reveal the thematic richness of the field and the key contributors driving advancements in this rapidly evolving area.

### 3.12. Timezone Network Visualization of Co-citation of Cited Authors

Figure 9 illustrates the timezone network visualization of co-citation among cited journals in Voice Commerce research comprises 14 clusters, highlighting diverse thematic areas. Cluster #0 (Voice Shopping), the largest with 148 members and a silhouette value of 0.845, focuses on consumer behavior and trust in voice assistants, with highly cited journals such as MIS Quarterly (70), Journal of Marketing (62), and Computers in Human Behavior (56). Cluster #1 (Voice Commerce), with 116 members and a silhouette value of 0.839, explores applications of voice technology in commerce, including legal and sustainability aspects, with citations from Telecommunications Policy and Journal of Cleaner Production. Cluster #2 (Empirical Evidence), containing 91 members with a silhouette value of 0.888, emphasizes studies on consumer motivations and voice assistant usage, with journals like Technological Forecasting and Social Change and IEEE Access. Cluster #3 (Ubiquitous Commerce), with 88 members and a silhouette of 0.815, addresses privacy, interoperability, and the integration of commerce into everyday life, featuring Communications of the ACM (68) as a key citation.

Cluster #4 (Text-to-Speech Voice), consisting of 26 members with a silhouette value of 0.907, examines the impact of text-to-speech systems and 3D avatars in building trust in e-commerce, with notable citations from Sensors (9) and IEEE Transactions on Systems (6). Cluster #5 (Online Boycott), with 24 members and a silhouette value of 0.888, focuses on collective online actions and the trustworthiness of smart systems, citing journals like Nature (11) and MIS Quarterly (6). Cluster #7 (Money, Commerce, and Language), comprising 20 members and a silhouette of 0.985, delves into the intersections of financial systems, commerce, and linguistics, with references from the International Journal



**Figure 10:** Co-authorship between countries

#### 4. DISCUSSION

The bibliometric analysis of voice commerce research within the period 1965-2024 provides deep insight into the development of the area, the main players, and the trends in research. The growing prominence of topics such as AI, voice assistants, and machine learning underlines the technological shift in commerce systems, where voice-enabled tools are increasingly seen as vital in enhancing consumer interactions and business operations. This represents a sharp rise in the early 2000s, peaking in the early 2020s, and reflects the global diffusion of AI and voice technologies across industries such as e-commerce, finance, and customer service. This is further reflected in the rapid commercialization of smart devices like Amazon Echo, Google Home, and Siri, among others, in which voice interaction has become mainstream, not only in developed markets but globally. The keyword trends also point to the important role of chatbots and smart speakers in this paradigm shift where businesses are investing big in automating customer interaction and using AI-powered voice interfaces for smoother, more personalized consumer experiences.

The data also show a balanced focus on the technical side, particularly speech recognition and natural language processing (NLP), as well as business and marketing aspects such as customer satisfaction, sales, and trust. This dual focus suggests that while the technology underlying voice commerce is a major research interest, understanding consumer behavior, trust-building, and improving user experiences are equally important for the future success of voice commerce platforms. Notably, trust and privacy are recurrent topics in the research landscape, reflecting growing concerns about data security in voice-enabled systems. As businesses increasingly collect vast amounts of user data through voice interactions, scholars are starting to explore frameworks and mechanisms to safeguard privacy and mitigate risks, though more work is needed to address these issues fully.

The co-authorship analysis reflects the international nature of voice commerce research. The United States, China, and India are leading contributors, showcasing the global relevance of the

subject. The dominance of these countries suggests that much of the innovation and research leadership in voice commerce is concentrated in regions with strong technological ecosystems. However, the visualization also suggests a need for broader collaboration between the Global North and Global South, especially as voice commerce grows in developing regions where mobile-first technologies, including voice-based interfaces, are crucial due to lower literacy rates and less access to traditional computing platforms. This opens avenues for research focused on how voice commerce can bridge digital divides and increase access to e-commerce for underserved populations.

The Motor Themes identified in the thematic map, such as e-commerce, AI, and machine learning, are not surprising given their centrality in driving innovation in voice commerce. The application of these technologies extends far beyond simple voice commands, as businesses now leverage AI-powered analytics to predict consumer behavior, personalize interactions, and improve decision-making. At the same time, Niche Themes like quality of service (QoS) and telecommunications reflect specialized areas that, while not central to the field's intellectual structure, are critical in ensuring the technological infrastructure that supports voice commerce operates efficiently. For instance, advancements in telecommunications and network reliability are essential for ensuring seamless voice transactions, especially in regions with developing infrastructure.

Further, the emergence of COVID-19 as a trend topic underscores the pandemic's role in accelerating digital transformation across industries, pushing businesses to adopt contactless, voice-driven solutions. The pandemic has reshaped consumer behavior, increasing reliance on voice-activated services for tasks such as shopping, banking, and entertainment, which is reflected in the increasing academic interest in these areas. This shift towards voice commerce as a more dominant channel for conducting transactions in a post-pandemic world presents new research opportunities to understand how consumer habits and trust in such technologies evolve over time.



In terms of publication sources, the analysis highlights the interdisciplinary nature of voice commerce research. Sources such as Lecture Notes in Computer Science, ACM International Conference Proceedings, and Telecommunications Policy suggest a blend of technical and social science approaches, where studies not only focus on technological advancements but also on understanding the implications for business, marketing, and consumer behavior. Journals like the Harvard Business Review indicate that this area is not confined to purely academic interests but has significant practical relevance for business leaders and policymakers looking to capitalize on the latest voice technologies to drive growth and innovation.

Co-citation network analysis reveals the leading thought-leading influence of Benbasat I, Ajzen I, and Davis F.D. in laying foundational work in technology acceptance and user trust in digital systems. Their contributions are important in setting a base on how best to design voice commerce platforms in order to enhance user adoption and satisfaction. The green cluster in the co-citation network depicts the behavioral and psychological aspects of voice commerce, wherein the role of user experience, trust, and TAMs are highlighted. In contrast, the red cluster dominated by such researchers as Liu Y and Chen Y, is focused on technical developments, especially AI, speech recognition, and machine learning. This dichotomy between the behavioral and technological aspects of voice commerce research makes the subject all the more important, since any future success that voice commerce will arguably have is to be based on the merging of these two streams of research in creating systems that are sophisticated, yet user-friendly and reliable.

The co-occurrence of keywords gives further meaning to the interlinked nature of various themes emanating from research on issues related to social media, sentiment analysis, marketing, and NLP. These are indeed the many facets that voice commerce would be said to have, with technological advances needing to go in tune with deep insights on consumer behavior, communication ways, and sales methodologies. The cluster related to sentiment analysis and social media, in the context of voice commerce research, also indicates an interest in how AI-driven voice interfaces can be used with a view to measuring customer satisfaction for influencing purchase decisions, thus showing the future potential of voice technologies in shaping digital marketing and consumer engagement.

In summary, the discussion points to a vibrant and rapidly evolving field with strong technological and commercial implications. However, there remains much to be explored in integrating voice commerce systems with broader societal, ethical, and infrastructural concerns. The interdisciplinary nature of this research means that it will likely continue to grow, with both academic and practical applications shaping its trajectory.

Despite the growing body of work in voice commerce, several research gaps emerge from this analysis. First, there is a lack of focus on the ethical implications of AI-driven technologies in voice commerce, such as issues related to data privacy, security, and user trust. Although trust and security appear in the keyword

analysis, they are not central themes, suggesting that these critical areas require more attention. Additionally, while topics like AI and machine learning are highly researched, the integration of these technologies with emerging innovations, such as blockchain and quantum computing, remains underexplored in the context of voice commerce. The co-authorship analysis also reveals an opportunity for more collaboration between regions, particularly between developed and developing nations, to ensure a more inclusive and diverse understanding of the global voice commerce landscape. Moreover, more work could be done on sustainability, which appears as a niche theme, to better understand how voice commerce could contribute to environmentally sustainable business practices.

## 5. CONCLUSION AND PRACTICAL IMPLICATIONS

This study provides an in-depth bibliometric analysis of voice commerce research, mapping its evolution, key contributors, and emerging trends over nearly six decades. The analysis reveals a steady increase in the volume of publications, particularly in recent years, indicating a growing academic interest in the field. Major themes such as artificial intelligence, e-commerce, and machine learning dominate the discourse, reflecting the technological focus of the research. However, several research gaps remain, particularly regarding ethical concerns, data privacy, and the integration of emerging technologies into voice commerce. The study also underscores the importance of international collaboration, particularly between key regions like North America, Asia, and Europe, in advancing the field. The insights from this study provide valuable guidance for future research and practical applications, encouraging a more nuanced exploration of the potential and challenges of voice commerce in a globalized, digitally driven economy.

The findings from this bibliometric analysis have several practical implications for businesses, policymakers, and researchers. For businesses, understanding the current trends in voice commerce—such as the increasing adoption of AI, chatbots, and voice assistants—can help companies invest in relevant technologies and stay competitive in the evolving market. Policymakers should take note of the growing importance of data privacy and security, ensuring that regulations are updated to address the unique challenges posed by voice-enabled commerce platforms. Researchers can leverage the identified Motor Themes, such as AI and e-commerce, to guide future studies and develop interdisciplinary approaches that integrate these technologies more effectively. The international co-authorship trends also suggest that businesses looking to expand globally should foster partnerships with academic institutions in key regions like China, India, and the United States, where much of the groundbreaking work in voice commerce is being conducted.

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