A systematic literature review on electronic commerce adoption in small enterprises: A bibliometrics with co-citation and keyword network analysis*

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Ⅰ. Introduction

The advent of e-commerce has changed the nature of business for small enterprises. E-commerce is able to provide a variety of benefits internally and externally for small business. E-commerce allows small enterprises to achieve the advantages, including reduce costs, business processes, and efficiency, inside their business. Moreover, small enterprises can externally gain the benefits in terms of the relationships on customers and partners as well as the expansion of market. On the other hand, various difficulties have existed in adopting e-commerce for small enterprises. The difficulties are derived from technological,

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organizational, environmental, and individual aspects. Furthermore, e-commerce adoption in small enterprises can vary in the context of countries. Early adoption of e-commerce has been applied on developed countries such as United States, western Europe, and northeast Asia (Pappas, Kourouthanassis, Giannakos, & Lekakos, 2017), whereas, more recently, e-commerce has been adopted in developing countries. The coexistence of benefits and barriers, as well as various contexts of e-commerce adoption in small business have consequently aroused research interests.

Corresponding these research interests on e-commerce adoption in small business, many studies have been performed on the application of e-commerce in the context of small enterprises within the last two decades. As a continuous phenomenon, it is valuable for academia to regularly review previous related research for gaining insights of intellectual structure of the research domain and for predicting how the domain might advance (De Bakker, Groenewegen, & Den Hond, 2005). Because prior literature review studies on e-commerce adoption about small businesses have had the qualitative and subjective nature (Vaithianathan, 2010), quantitative literature review study can provide a deeper understanding of this field and disclose the focal points of prior research over the two decades and the associations among them (Oorschot, Hofman, & Halman, 2018).

Bibliometrics is an analysis of published articles that offers quantitative insight into the research field (De Bellis, 2009). It is a statistical analysis with citations, authors, keywords, or the institutions and countries information so as to derive insights into the evolution of literature and the flow of knowledge (Van Raan, 2005). To gain the insights, bibliometrics has used a variety of methods depending on which information used in analysis such as citation analysis, co-citation analysis using co-cited articles (Pilkington & Meredith, 2009) and co-word analysis based on keyword network (Madani & Webber, 2016).

Based on bibliometrics, the primary purpose of the study is to provide the insights on the research streams and trends by performing a systematic and quantitative analysis of the literature on e-commerce adoption in small enterprises with the journals in ISI Web of Science electronic database. The study embraces both co-citation analysis and co-word analysis to disclose and visualize the progress of this research domain. The specific goals of the study are as follows: (1) to explore the overall theories used in e-commerce adoption research for small enterprises; (2) to demonstrate the research topics and the growth of the research topics in e-commerce adoption for small businesses over twenty years by co-word analysis; 3) to suggest future directions on e-commerce adoption research in small enterprises.

II. Literature Review

2.1 Small Enterprises E−Commerce Adoption Review Research

The emergence of e-commerce has changed consumer consumption habits of looking for, assessing, choosing, and buying products and services (Albors et al., 2008). Thus, marketers have been presented with new challenges and difficulties in marketing strategies, practices, and tactics in e-commerce era. There was first effort to review small business e-commerce adoption. Teo et al. (2004) simply suggested eight antecedents possible to conduct meta-analysis about e-commerce adoption in small and medium sized enterprises and categorized the antecedents into the three contexts: technological (e.g., relative advantage, compatibility, and complexity), organizational (e.g., knowledge and expertise about e-commerce, management attitude) and environmental (e.g., external change agents, pressure from trading partners, pressure from competitors). In relation to e-commerce, researchers have conducted review studies on electronic business, web site adoption, and a role of social media to e-commerce adoption in small enterprises. Parker and Castleman (2007) reviewed 120 journal articles published between 2003 and 2006, focusing on topic of electronic business adoption in small enterprises including electronic data exchange,

e-mail, e-enabled supply chain, customer relationship management and knowledge management, and identified research trends such as research methods and objectivities, electronic business technologies and application and country studies between 2003 and 2006. Dwivedi et al. (2009) systematically reviewed the most commonly used theories such as resource-based view, Porter's models, technology acceptance model and theory of planned behavior and suggested a need of integrated theoretical framework for explaining electronic business adoption in small enterprises.

Meanwhile, two extensive literature reviews have examined small business adoption in e-commerce environment. Simmons et al. (2008) also conducted extensive literature review on web site adoption in small business and conceptualized of determinants in four contexts: owner/manager context, company context, networking context, industry context. In addition, social media has a significant role in e-commerce adoption. Abed et al. (2015) evaluated 28 studies on theme of e-commerce adoption in small enterprises using social media from 2008 to 2013, categorized seven research themes from literature analysis, and identified factors of small enterprises e-commerce adoption using social media.

2.2 Bibliometrics

Bibliometrics is defined as "the application

of mathematics and statistical methods to books and other media of communication" by Pritchard (1969) who firstly suggested the term bibliometrics. Bibliometrics is based on quantitative studies of literature to reveal the pattern of published studies within a research area. Especially, bibliometrics allows researchers to explore the major topics in their research field by investigating the body of literature in the field (Grant, Cottrell, Cluzeau, & Fawcett, 2000). Bibliometrics encompasses diverse methods relying on various forms of information employed in the study (Van Raan, 2005). The mostly used methods of bibliometrics analysis are co-authorship analysis (Abbasi, Altmann, & Hossain, 2011), keyword based on co-occurrence analysis (Su & Lee, 2010) and or co-word analysis (Ding, Chowdhury, & Foo, 2001), and citation-based analysis such as citation analysis (Grover et al., 2006), co-citation analysis (Culnan, 1987).

Specifically, co-citation analysis is the most important subset of bibliometrics, thus, it is the most commonly adopted bibliometrics technique since Small (1973) firstly introduced the concept. Co-citation analysis is defined as "the frequency with which two items of earlier literature are cited together by the later literature" (Small, 1973). In other words, if pairs of published articles are frequently co-cited by the other studies, it is possible to have something association in common (Benckendorff & Zehrer, 2013). Thus,

co-citation analysis has been applied to find the clusters of co-cited pairs and to detect emerging trends, which offers insights into the cumulative knowledge, intellectual structure, and core concerns of a research field (Culnan, 1986; Shiau et al., 2017). Due to these advantages, co-citation analysis has been widely adopted to discover intellectual structure of various research fields such as management information systems

However, despite the excellence of co-citation in terms of suggesting disciplinary structures rather than other bibliometrics methods, it cannot give a detailed content of the research themes dealt with in the literature (Leung, Sun, & Bai, 2017). To display a detailed content of the research theme, co-word analysis has been mainly employed. Co-word analysis is based on the nature of words, which analyze the frequency of co-occurring keywords in the literature (Whittaker, 1989). Particularly, co-word analysis visually displays the associations and interactions between keywords by reflecting keyword co-occurrence links (Callon, Lip, & Law, 1986). Thus, co-word analysis is a significant tool for deriving the important concepts, ideas and knowledges as well as capturing chronological changes of the research topics from the literature (Van Raan & Tijssen, 1993; Cho, 2014). Nevertheless, co-word analysis also has a problem in stability because keywords in literature change chronologically (Leydesdorff,

1997).

Because each of bibliometric analysis methods simultaneously has the strengths and weaknesses as well as has a unique approach, there has been tried to combine various bibliometric analysis methods to explore research trends in certain research area (Chang, Huang, & Lin, 2015). Braam et al. (1991) has firstly tried to combine and co-word analysis to provide additional and complementary option to link literature compared to co-citation analysis. After the introduction to possibly combine both methods, there has been various attempts to do. For example, Åström (2002) argued, when both methods are merged, which provides easier interpretation of the results. More recently, Leung et al. (2017) tried to combine co-citation and co-word analyses to explore social media research comparing business field and hospitality/tourism field, which is able to disclose more detailed research subjects and trends.

2.3 Bibliometrics in MIS

Bibliometrics has been extensively used as a method for reviewing management information systems (MIS) literature. To overall intellectual structure of MIS research field, basically, co-citation analysis was firstly employed to evaluate the intellectual development of MIS research field from 1972 to 1982 (Culnan, 1986). Adding the first study,

Culnan (1987) reviewed the literature in MIS between 1980 and 1985 and developed mapping of the intellectual structure based on a co-citation analysis. In addition, Walstrom and Leonard (2000) conducted a citation analysis for discovering classic publications in MIS field from 3,752 articles published in top IS journals with 10 years between 1986 to 1995. More recently, Shiau et al. (2015) discussed 13 key issues regarding MIS with 118 journal articles based on a co-citation analysis.

Furthermore, MIS researchers have employed bibliometrics analysis methods to explore specific themes in MIS field. For example, Holsapple et al. (1993) adopted a citation analysis to rank research journal in terms of the business computing systems between 1987 and 1991 with 25,000 citations. Hsiao and Yang (2011) categorized the subfields of technology acceptance model and displayed a visual mapping of intellectual development with a co-citation analysis from 1989 to 2006. Wang et al. (2016) reviewed 214 cloud computing studies in 20 academic journals for 11 years between 2004 and 2014 and identified 41 important studies and the key topics in cloud comping using citation and co-citation analysis. Shiau et al. (2017) summarized seven core themes in relation to social network merging 2,565 articles and 81,316 citations from 1996 to 2014. Although previous studies conducted bibliometrics analysis, there has

been no co-word analysis in the MIS field. As previously discussed, it is needed to capture detail contents of research topics complementing citation-related analyses (e.g., citation or co-citation analysis).

Owing to the environmental changes in e-commerce such as digital platform and globalization (Cenamor, Parida, & Wincent, 2019), small business e-commerce adoption is still the important research topic. Consequently, it is important to update existing literature review studies and to offer insights into theoretical rationale, emerging issues, and future direction of small business e-commerce adoption research. Thus, the study, employing bibliometrics analysis, explores theoretical foundation and major research topics in small business e-commerce adoption dealing with a long-period studies between 1999 and 2023. According to Chang et al. (2015), merging various bibliometrics analysis methods is able to explore research trends in certain disciplines as well as to provide a deeper understanding for scholars of the intellectual development of the research field. Therefore, the study utilizes both co-citation analysis and co-word analysis: the former is adopted to discover theoretical rationales in the research field, whereas the latter is used to understand more detailed research topics and trends of the research field.

Ⅲ. Methods

3.1 Data Collection

The data in the study were collected between 1999 and 2023 from the Science Citation Index (SCI), Science Citation Index Expended (SCIE), Social Science Citation Index (SSCI) and Emerging Sources Citation Index (ESCI) in the ISI Web of Science electronic database, which is frequently utilized by scholars to gain information and data because of the following reasons: (1) it has a great reputation and is leading citation database in the world; (2) the database includes abundant citations from 10,000 high impact journals; (3) it is highly considered and gains great popularity from scholars; (4) it offers a well-organized and objective tool to track related information effectively and efficiently (Hsiao and Yang, 2011). Therefore, many scholars have acquired the core documents in ISI Web of Science database for co-citation or co-word analysis.

The collection targets of the study are the number of citations and cited references for citation and co-citation analysis and article titles, keywords and abstracts for co-word analysis. The study gathered the collection targets and other related information (e.g., author name, publication year, discipline of article) during 2023. To gather the information, the study searched the publications from ISI

Web of Science database and categorized search queries into three. First category is related to enterprise context such as "small business," "SME," "small enterprise," "micro enterprise," second category consisted of e-commerce context such as "electronic commerce," "e-commerce," and last category focused on adoption context such as "adoption," "success," "diffusion." The study initially found 126 articles combining the three categories. Among the gathered articles, some papers that include these keywords queries were excluded from the analyses such as some studies included large firms in unit of analysis or some studies different contexts (e.g., e-mail, electronic data interchange, or e-marketing). As a result, the study selected total 76 published articles in 38 journals between 1999 and 2023 from the electronic database including prominent academic journals such as European Journal of Information Systems, Information Systems Journal, Journal of Strategic Information System, Information & Management, Journal of the Association for Information System, Computers in Human Behavior, Internet Research, Journal of Business Research, Electronic Commerce Research and Applications and Industrial Management & Data Systems, Technovation, International Small Business Journal, Small Business Economics, Electronic Commerce Research. It is possible to draw meaningful conclusions on a basis of approximately 50 or

more publications. Therefore, the data of papers (n=76) are enough to suggest meaningful conclusions (Lehmann, Jackson, & Lautrup, 2006).

3.2 Data Standardizing

Before data analysis, the study standardized the data because some associated terms or concepts are presented by different words or expressions as well as some authors name was differently documented in the database in spite of same author using Python package natural language toolkit (NLTK). These words or expression were standardized by choosing the common terms through synonyms, ambiguity, broad term and narrow term. In addition, the study not only deleted the period or full stop in the name, for example, Rogers E. M. is replaced by Rogers EM but also unified the same authors names differently recorded in the reference, for example, Chin Wynne W is altered by Chin WW. The study also excluded general terms in a co-word analysis (e.g., e-commerce, small business, or findings). Table 1 displays the examples of the data standardization process.

Based on the data standardization, the terms in the dataset, which have a frequency of one or two but have a relevant term, were firstly integrated into more similar or comprehensive terms. Nevertheless, if word frequency is still less than one or two, it did not include the unit

of analysis (Ding et al., 2001), because word frequency less than one or two has a problem to represent the discipline.

Table 1. Examples of the Data Standardization Process

Category	Examples
Synonyms	Organizational factors or organizational characteristics or organizational drivers → organizational factors; TOE framework or technology-organization-environment or TOE → TOE framework
Ambiguity	Diffusion of innovation or Rogers' model of innovation diffusion → DOI
Broad term/narrow term	Mobile devices or mobile phone → mobile devices
Author's name	Chin WW or Chin Wynne W → Chin WW
General term excluded	Findings, hypothesis, practical implication, objective, sample, future research, theory, model, result, purpose

Ⅳ. Results

4.1 Descriptive Analysis

After the advent of e-commerce adoption in small businesses literature in 1999, the articles about e-commerce adoption in small enterprises have been constantly published in various research fields that indicates a continuous interest on the topic since 1999. The study categorized the research domain of the topic. The domain of Information Systems has published the largest number of articles (n=42) in e-commerce adoption in small enterprises, followed by Business/Management (n=32) and Multidisciplinary Psychology (n=2).

The journals with the most published small enterprise e-commerce adoption papers are: European Journal of Information Systems is the journal which has published the most articles on this topic (n=8), followed by Internet Research (n=5), Information & Management, Industrial Management & Data Systems, and Electronic Journal of Information Systems in Developing Countries (n=4). Top five journals, publishing the theme of e-commerce adoption in small businesses, almost have about 33% percentage of the theme. Next, Journal of Computer Information Systems, Journal of Global Information Management, Journal of Business & Industrial Marketing, Information Development has published three papers each.

4.2 Co-citation Analysis

McCain (1990) suggested that a cutoff point can be established to choose the most influential papers. Therefore, the current study chose the citations which had been cited at least 5 times, and thus 77 citations were involved in the co-citation analysis. In order to reveal the structure and theoretical foundations of social media research, the selected

citationswere clustered using the smart local moving (SLM) algorithm as the method of cluster analysis (Waltman & Van Eck, 2013). The co-citation networks of the references in small business e-commerce adoption research are visualized in Figure. The size of the bubble presents the normalized number of citations received by the articles and the articles and the thickness of the lines represents the strength of co-citations ties. The link and proximity between two articles identify the co-citation relationship between the two. The color of the bubble indicates the cluster with which the article is associated. Each bubble was labeled by the first author and publication year of the article. As shown in Figure 4, the co-citation network formed four clusters. The clusters were named based on the majority of references belonging to them.

The first cluster (red cluster) was identified as technology acceptance, which is one of the major theoretical foundation of small business e-commerce adoption research in different industry sectors. The second cluster (yellow cluster) referred to technology-organization-environment (TOE) framework, which is another theoretical concept to explain small business e-commerce adoption research. The third cluster (green cluster) represented motivations and inhibitors on small business e-commerce adoption research. The last cluster presented research methodology (green cluster) in small business e-commerce adoption

research, including structural equation modeling, multivariate data analysis, psychometric methods, and so on. Table 2 summarized the co-citation clusters and representative citations.

Table 2. Clusters of Co-Citation Analysis

Clusters	Representative Paper
Technology acceptance	Davis (1989)
	Grandon & Pearson (2004)
TOE framework	Rogers (1995)
	Iacovou (1995)
Motivation and inhibitors	Cragg & King (1993)
	Poon & Swatman (1999)
Research methodology	Nunnally (1978)
	Fornell and Larcker (1981)

4.3 Keyword Analysis and Co-word Network

In order to explore the changes of research themes in small business e-commerce adoption research from 1999 to 2023, 24 years of the period were broken into two sub-periods: 1999－2009 and 2010－2023 because there were the considerate changes in the environments of e-commerce. For example, the advance of information communication technology, including the change in device from web sites to mobile, has made the changes in adopting e-commerce for small businesses. Also, early adoption of e-commerce has been applied on developed countries such as United States, western Europe, and northeast Asia (Pappas et al., 2017), whereas recent adoption of e-commerce has still occurred in developing
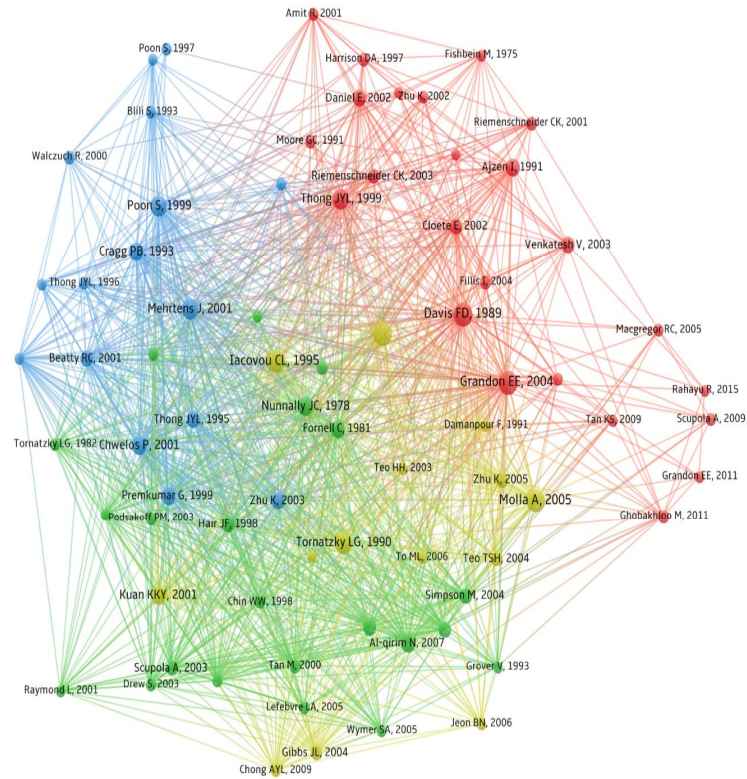
Figure 1. Visualized Co-Citation Network in Small Enterprise E-commerce Research

countries. In other words, there are differences in the period of e-commerce adoption in small enterprises: early stage and recent stage.

The study collected all the keywords from the sample articles to conduct keyword and co-word analysis in two steps. First, visualized co-word networks were made to identify the relationships among the keywords in each research domain during each sub-period. Second, to better understand the evolution of research flow overtime, the study classified those keywords that appeared multiple times into nine topics (Table 3). The nine themes of keywords were identified as Theory, Platform,

Business Sector, Managerial Application, Research Methodology, Organizational Characteristics, Environment Characteristics, Entrepreneurial Characteristics, and Emerging Trend. The topic of Theory is related to the theories supporting small business e-commerce adoption research, such as TOE framework. The topic of Platform refers to different channels/platforms of e-commerce, such as mobile device. The topic of Business Sector consists of the industries or business sectors of the study focus, such as service industry. The topic of Managerial Application explains all the managerial applications or implications

recommended or suggested in the studies, such as marketing. The topic of Methodology describes methods used in the studies, such as structural equation modeling. The topic of Organizational Characteristics depicts the internal factors which affect small business e-commerce adoption inside organizations, such as management attitude. The topic of Environmental Characteristics illustrates the external factors which affect small business e-commerce adoption outside organizations, such as external pressure. The topic of Entrepreneurial Characteristics represents the entrepreneur's individual factors which affect

small business e-commerce adoption, such as CEO IT knowledge. The topic of Emerging Trend reveals the most recent trends of research interests, such as digital entrepreneurship, which only showed up in the second period, 2010 – 2023.

Between 1999 and 2009, 31 articles were found in small business e-commerce adoption research, producing 77 unique keywords, which have a frequency of more than three. While in the period of 2010 – 2023, 42 articles were identified, generating 153 different keywords. The two visualized co-word networks in the two sub-periods display
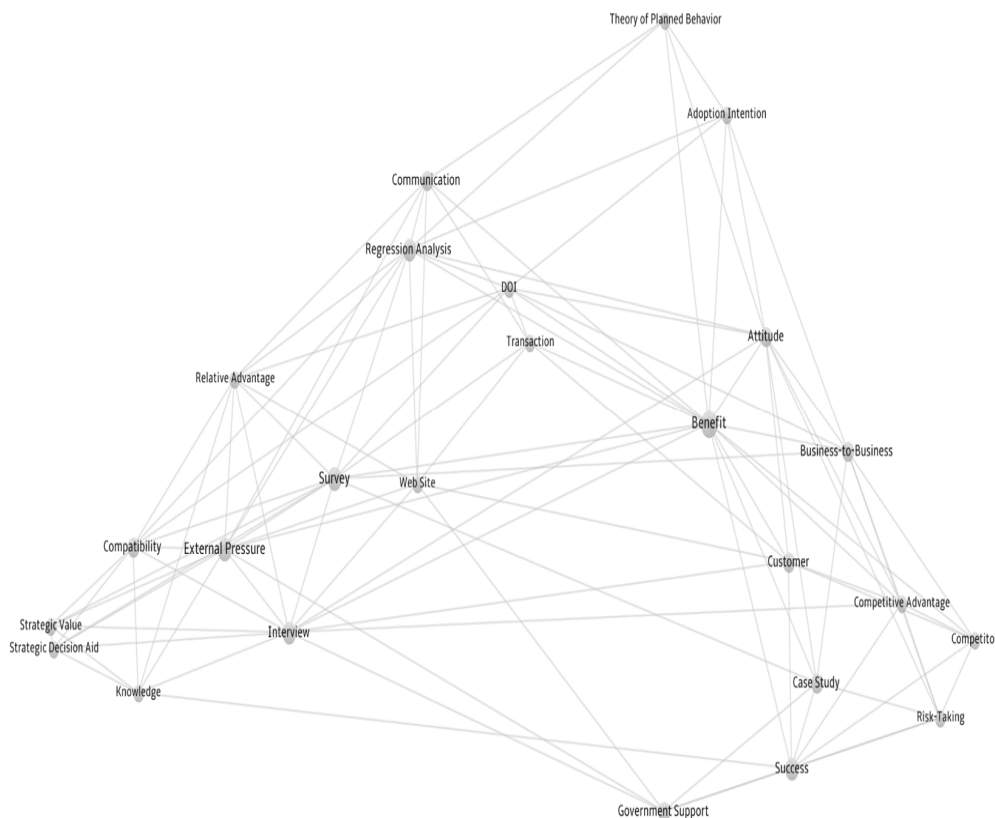

Figure 2. Visualized Keyword Network in Small Enterprise E-commerce Research (1999-2009)

different areas of research interest in this topic (Figure 2 and 3). In the period of 1999－2009, small business e-commerce adoption research consisted of three broad areas of interest. The first was that small business e-commerce adoption research was founded on theory of planned behavior, diffusion of innovation, and strategic value with survey, interview or case study. The second was platform which is based on web site and managerial applications focused on communication, transaction, and B2B. The third was that risk-taking propensity to explain adoption of e-commerce in small entrepreneurs because of the early stage of e-commerce.   In the period of 2010－2023, three different areas of research interest
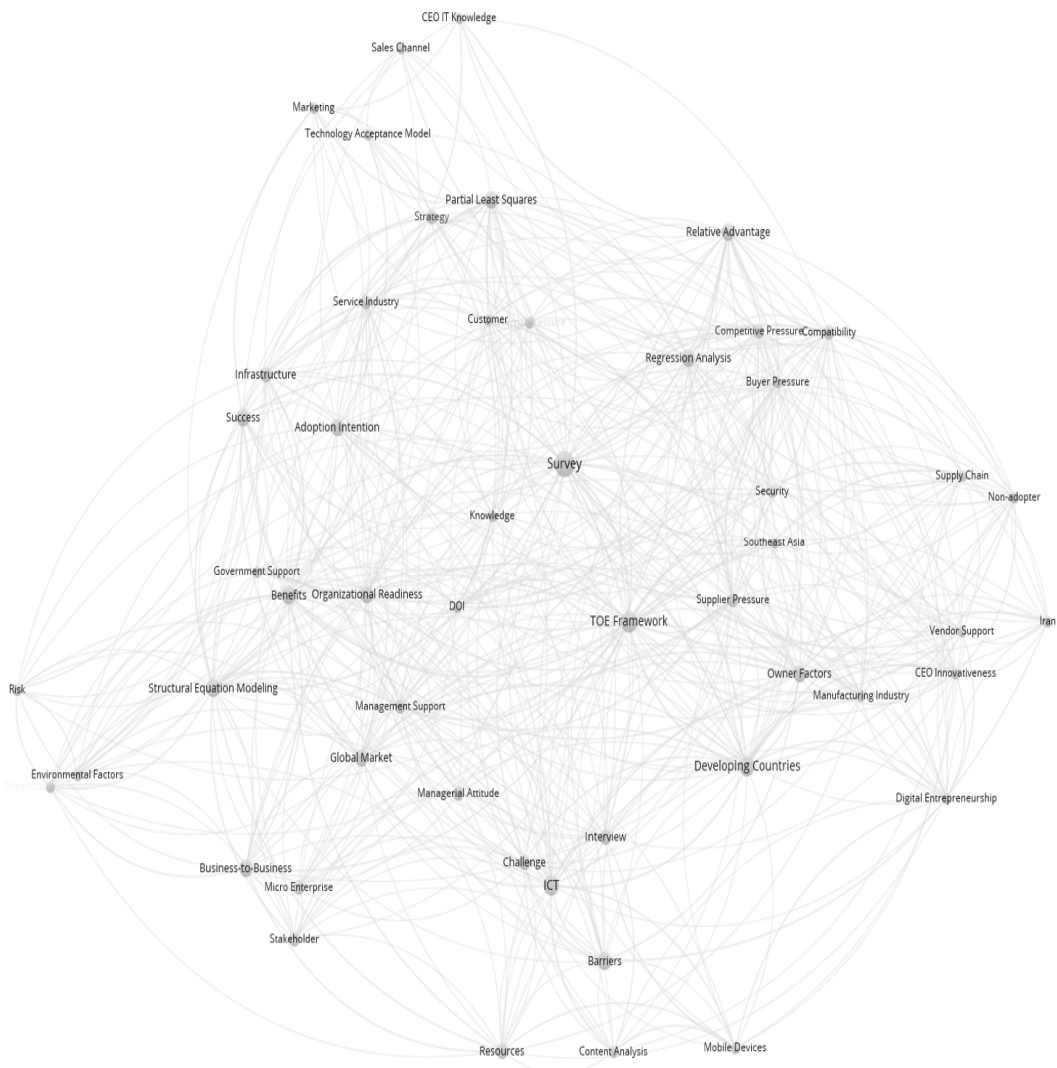

Figure 3.Visualized Keyword Network in Small Enterprise E－commerce Research (2010－2023)

Table 3. Summary of Nine Topics in Small Enterprise E-Commerce Adoption

Topic	Keywords	
	1999–2009	2010–2023
Theory	Theory of Planned Behavior, DOI, Strategic value	TOE framework, DOI, TAM
Platform	Web site	Mobile devices
Business sectors		Service industry, manufacturing industry
Business applications	Communication, transaction, B2B, customer	B2B, security, resources, stakeholder, strategy, marketing, sales channel, customer, global market
Methodology	Survey, regression analysis, interview, case study	Survey, interview, content analysis, structural equation modeling, partial least square, regression analysis
Organizational characteristics	Compatibility, competitive advantage, relative advantage, strategic decision aid	Managerial attitude, relative advantage, compatibility, organizational readiness
Environmental characteristics	Government support, competitor, external pressure	Government support, competitor pressure, buyer pressure, vendor support, supplier pressure, external pressure, infrastructure
Entrepreneurial characteristics	Risk-taking	CEO IT knowledge, CEO innovativeness, owner's factors
Emerging trends		Digital entrepreneurship, micro enterprise, developing countries, barriers/challenges

appeared. The first was the managerial applications of security, resources, strategy, marketing, or global business. The second was a new theory has been adopted to explore small business e-commerce adoption, such as TOE framework. The third was platform has been changed by mobile devices instead of web site. The fourth was more rigorous and various methods were selected such as structural equation modeling, partial least square, and content analysis. Fifth, the various external pressure had research interests as environmental characteristics such as competitor pressure, buyer pressure, vendor support, supplier pressure. The sixth was entrepreneurial characteristics were segmented based on owner's factors such as IT knowledge or innovativeness. Lastly, the remarks of

digital entrepreneurship, micro enterprise, developing countries, barriers/challenges became emerging trends between 2010 and 2023.

Ⅴ. Conclusion

5.1 Summary of Findings

The study reviewed small enterprises' e-commerce adoption research published in ISI Web of Science electronic database (SCI, SCIE, SSCI, ESCI) using multiple bibliometrics analysis methods (citation analysis, co-citation, analysis, co-keyword analysis) between 1999 and 2023. With the analyses, the study explored the theories and thematic evolution of e-commerce adoption in small enterprises

Descriptive analysis results showed the publication trend in the topic. In terms of research category, Information Systems has published the largest number of articles, followed by Business/Management, and Multidiscipline Psychology. Also, in terms of a journal, European Journal of Information Systems has published the largest number of articles, followed by Internet Research, Information & Management, Industrial Management & Data Systems, Electronic Journal of Information Systems in Developing Countries, which had almost 33% of the

publications.

Co-citation analysis identified the four clusters in co-citation networks as the theoretical foundations supporting e-commerce adoption research on small enterprises. The four clusters were verified as technology acceptance model, TOE framework, motivations and inhibitors, and methodology. Researchers in the topic have used technology acceptance model to explain individual-level determinants, while TOE framework has been applied to elucidate environmental-level factors of e-commerce adoption in small enterprises (Awiagah, Kang, & Lim, 2016). Researchers have also considered the inhibitors as well as motivators in the research on e-commerce adoption in small enterprises (Cragg & King, 1993; Poon & Swatman, 1999).

Co-word analysis revealed that the research trend on the topics of e-commerce adoption in small enterprises with nine categories: Theory, Platform, Business Sector, Managerial Application, Methodology, Organizational Characteristics, Environmental Characteristics, Entrepreneurial Characteristics, and Emerging Trends. Between 1999 and 2009, the topics related to Business Sector and Emerging Trends were not discovered any keywords resulting in only seven topics. Also, the comparisons of small business e-commerce adoption research within subperiods highlighted both similarities and differences. The first similarity was the growth of small

business e-commerce adoption research overtime in both the subperiods. The second similarity was that the diffusion of innovation theory to explain small business e-commerce adoption, thus the factors of diffusion of innovation theory presented both subperiods such as relative advantage and compatibility. The third similarity was that government support, competitor pressure and external pressure emerged as a recent study interest in both subperiods. Finally, similar methods of survey, interview, and regression analysis have been used for both subperiods. In contrast, several differences in small business e-commerce adoption research were discovered. First, in terms of theory, theory of planned behavior was used during first subperiod while second subperiod relied more on technology acceptance and TOE framework. Second, in respect of platform, first subperiod often targeted web site to explain small business e-commerce adoption, however, the researchers have focused on mobile devices in second subperiod. Third, between 2010 and 2023, small business e-commerce adoption research has concentrated on the specific business sectors. Fourth, the researchers endeavor to obtain various managerial applications in second subperiod comparing to first subperiod. Finally, a variety of entrepreneurial factors gradually have attracted research interests between 2010 and 2023.

Based on the research findings, this study proposes the following research topics. First, recent research increasingly emphasizes the practical managerial applications of e-commerce in small enterprises, focusing on areas such as security, resource management, strategic planning, and marketing. This shift reflects a growing need for actionable insights that can directly inform management practices and enhance e-commerce implementation. Second, recent research indicates a significant shift from web-based platforms to mobile devices, mirroring technological advancements and evolving consumer behavior within the e-commerce landscape. Since this trend indicates the critical role of mobile technology in facilitating the adoption of e-commerce among small enterprises, it is essential for future studies to explore the specific mechanisms through which mobile platforms enhance e-commerce capabilities and address the unique challenges faced by small enterprises in leveraging mobile technology. Third, The adoption of advanced research methodologies, such as structural equation modeling, partial least squares, and content analysis, has become more prevalent in recent studies. These methodologies enhance the rigor and precision of research findings, contributing to a deeper understanding of e-commerce adoption phenomena. Employing a variety of methodological approaches will provide comprehensive insights into how mobile

technology can best support small enterprise e-commerce adoption. Future research should continue to incorporate and expand upon these advanced methodologies to further explore the multifaceted nature of mobile technology's impact on small enterprise e-commerce adoption. This will not only refine the theoretical frameworks but also offer practical guidelines for small enterprises looking to leverage mobile technology effectively. By addressing the unique challenges and opportunities presented by mobile platforms, future studies can significantly contribute to the evolving landscape of e-commerce adoption. Fourth, entrepreneurial characteristics, particularly the IT knowledge and innovativeness of business owners, play a crucial role in the adoption of e-commerce by small businesses. Recent studies highlight the importance of these individual traits in facilitating successful e-commerce implementation. Given the significant influence of entrepreneurial characteristics, future research should delve deeper into understanding how specific attributes of business owners impact the adoption process. Additionally, future studies should explore interventions and training programs aimed at enhancing these entrepreneurial traits to support e-commerce adoption. By identifying effective strategies to develop IT competence and foster innovation among small business owners, researchers can provide valuable

recommendations for policymakers and educators. Such efforts will be crucial in empowering small businesses to navigate the evolving e-commerce landscape successfully. Lastly, identifying the barriers and challenges to e-commerce adoption remains a key area of interest. Recent research has explored issues such as technological infrastructure, financial constraints, and regulatory hurdles that small enterprises must navigate to adopt e-commerce effectively. Future research should focus on developing a comprehensive framework for overcoming these barriers by investigating the specific ways in which these challenges impact small businesses differently based on their size, industry, and geographical location. Additionally, exploring the role of government policies and support mechanisms in mitigating these obstacles will be critical.

5.2 Implications

The study has several theoretical and practical contributions. The most important theoretical implication of the study is to provide a valuable groundwork for researchers to engage in e-commerce adoption in small enterprises. In other words, the identified key topics will help scholars in keeping well-informed about the major research themes. In this regard, these themes can be applied to start e-commerce adoption research on small enterprises with a theoretical

framework. In addition, the study can be utilized for the industry. For example, a given study can apply the methodologies that have been used previously as well as offer a useful guidance for improving industry practices with the business applications in this study.

Second, the study contributes by revealing the evolution of the topics in small enterprises' e-commerce adoption research over time. Specifically, the study broke the research period from 1999 to 2023 into two sub-periods and suggested visualized networks of co-word that identified the focus of the research field for each sub-period. The first subperiod (1999-2023) focused on the advantages of e-commerce (e.g., competitive advantage and relative advantage) for communication and transaction in web sites. The second subperiod (2010-2023) extended the potential of e-commerce in terms of business applications such as marketing, strategy, and sales channel and subdivided business sectors into manufacturing industry and service industry. Also, emerging trends, including digital entrepreneurship, micro enterprise, developing countries, and a variety of entrepreneurial factors have been focused in the second sub-period.

Third, the study extends the bibliometrics methods into co-citation and co-word network analysis. Prior studies in the e-commerce adoption research on small enterprises have used the traditional methods of bibliometrics

such as citation and keyword analysis (Villa, Ruiz, Valencia, & Picón, 2018), which have been failed to offer a depiction of actual substances and research themes (Ding, Chowdhury & Foo, 2001). The study firstly attempted to use both co-citation and co-word analysis to explore the development of e-commerce adoption research in small enterprises. Since the combination of various bibliometric analyses can assist to disclose the details of research topics (Chang et al., 2015), the study can reveal the comprehensive research themes in a specific research field by combining citation, co-citation, and co-word analysis.

Finally, the study provides the new research opportunities in small enterprises' e-commerce adoption research through filling with the research gap. In other words, future research can identify the under-researched topics to provide the meaningful insights for future e-commerce adoption research in small enterprises. For example, in terms of business sectors, because there have been only two types of industries, future study can perform the research in other industries. Accordingly, the study can be applied to reveal the unexplored research topics in small enterprises' e-commerce adoption research.

5.3 Limitations and Future Research

The study has the following limitations.

First, the data source was biased to only ISI Web of Science Database. Therefore, the findings are difficult to generalize about the research trends in e-commerce adoption in small enterprises. For example, in terms of entrepreneurial perspective, a few studies have considered the gender effect in adopting e-commerce for small businesses (Orser & Riding, 2018), because there are the differences between male and female owners. Future research should include more database such as SCOPUS for the generalizability. Second, the study has a limitation of a lack of a theoretical basis for supporting the criteria. Specifically, the criteria for the classification of co-word analysis were biased. Similarly, the definition of the clusters in co-citation analysis was biased because of the limitation of bibliometrics analysis itself. Thus, future research can consider the theoretical basis for the classifications and definitions with the advanced classification scheme. Third, the period division could be a limitation of this study. Particularly, since artificial intelligence (AI) technology has been rapidly advancing since 2016, future research could consider analyzing by distinguishing periods based on the advent of AI. This approach could enhance our understanding of the adoption of e-commerce by small enterprises. Finally, the study didn't consider various types of e-commerce. For example, In the early stage of e-commerce, electronic data exchange was a typical type of e-commerce. Thus, future research may include various types of e-commerce to better understanding of e-commerce in small enterprises.

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<Abstract>

A systematic literature review on electronic commerce adoption in small enterprises: A bibliometrics with co-citation and keyword network analysis

Park, Jong Hwa

Purpose

The purposes of the study are to explore the overall theories used in e-commerce adoption research for small enterprises, to demonstrate the research topics and the growth of the research topics in e-commerce adoption for small businesses over twenty years by co-word analysis and to suggest future directions on e-commerce adoption research in small enterprises.

Design/methodology/approach

This study used bibliometrics approach to systematically review electronic commerce adoption in small enterprises. More specifically, the study used co-citation to reveal the structure and theoretical foundations and keyword network analysis to understand the changes of research themes in small business e-commerce adoption research from 1999 to 2023.

Findings

According to the bibliometrics analysis result, this study revealed the nine research topics in small enterprise e-commerce adoption. In addition, this study can be applied to start e-commerce adoption research on small enterprises with a theoretical framework.

Keyword: Small Enterprise, E-commerce Adoption, Systematic Review, Bibliometrics