

Technology Adoption in Small and Medium Enterprises (SMEs)

Current Issues and Future Research Avenues

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ABSTRACT

Small and medium enterprises (SMEs) gives enormous contribution across economics. Therefore, technology adoption becomes a must to help SMEs grow. The purpose of this study is to provide an existing literature review on technology adoption in SMEs. This study identified and evaluated peer-reviewed journal publications (systematic review) focusing on technology adoption in SMEs based on research articles published within the 2011-2021 period. The literature review shows valuable progress in the area under discussion. The study prompts insightful avenues academic for future studies of technology adoption in SMEs and practitioners communities to use and encourage others to use technology.

Keywords: *Systematic review, Small business, Small-and medium-sized enterprises (SMEs), Technology adoption.*

1. INTRODUCTION

The SMEs existence is crucial for economic development in various countries [1]–[3]. However, globalization, intense competition, and the knowledge and information revolution have become part of the environment [4].

SMEs are often grouped based on ownership structure, high labour intensity, unbalanced development, and balanced dominant areas. SMEs are also sensitive and flexible to environmental changes [1]. SMEs are also less bureaucratic, more flexible in decision making, take more significant risks, and usually have expertise in specific areas [5]. SMEs' flexibility is an essential feature that enables them to develop and be creative within limitations [6].

The diffusion of new technologies can significantly impact the country's sectors, including economic growth and development [7]. SMEs also need to involve technology in their business operations. Technology can be interpreted as an investment in a business to achieve a competitive edge [8]. The adoption of technology can give enterprises a competitive advantage over their competitors [9]. However, not many studies have focused on the SMEs technology adoption.

This study aims to review the existing literature on technology adoption in SMEs and suggest future research possibilities.

2. METHODS

The method of this study is a systematic review by surveying empirical research from a diversity of academic journals using a peer-review process. The review is restricted to technology adoption research in SMEs, streamlined on papers published over ten years, and limited to articles published in the English language.

The online database used for the review is Google Scholar, which integrates with Emerald, Sage, Elsevier, EBSCOhost, JSTOR, and Springer. The articles are accessed using an institutional login account. Expressly, the search is limited to some keywords/phrases: all in the title: "technology adoption" AND "SMEs", all in the title: "technology adoption" AND "small business", all in the title: "technology adoption" AND "small enterprises", all in the title: "technology adoption" AND "MSMEs", and all in the title: "technology adoption" AND "MSEs".

Based on keywords/phrases and period restricted used, more than 200 search hits include academic journal, conference proceeding, thesis/dissertation, and research report. Only articles published in the academic journals were selected as inclusion criteria for the review. This research identified 50 empirical research from 44 peer-review journals: a journal indexed by World of Science (WoS), eight journals indexed by Scopus, and 16 journals indexed by both Scopus and WoS.

Therefore, the paper created a working list of relevant studies as the basis of the review. The empirical research

sources used in this study and publication years is available in Table 1.

Table 1. Empirical research sources and publication years distribution

Peer-reviewed journal name	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total
Academy of Entrepreneurship Journal	x											1
Advanced Science Letters							x					1
African Journal of Science, Technology, Innovation and Development								x			x	2
Australian Journal of Business and Management Research		x										1
Cogent Business & Management								x				1
Finance, Accounting and Business Analysis										x		1
Gadjah Mada International Journal of Business				x								1
Humanities and Social Sciences Communications											x	1
Humanities & Social Sciences Reviews									x			1
Information Development						x						1
Information Technology for Development									x		x	2
International Journal of Academic Research in Business and Social Science						x			x			2
International Journal of Academic Research in Economics and Management Sciences			x									1
International Journal of Accounting, Finance and Business								x				1
International Journal of Business and Management				x								1
International Journal of Business and Management Studies						x						1
International Journal of E-Entrepreneurship and Innovation								x				1
International Journal of Engineering Research and Applications		x										1
International Journal of Indian Culture and Business Management			x									1
International Journal of Innovative Science and Research Technology									x			1
International Journal of Internet Marketing and Advertising		x										1

Peer-reviewed journal name	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total
International Journal of Management and Decision Making		x										1
International Journal of Management Practice									x			1
International Journal of Small and Medium Enterprises									x			1
International Journal on Advanced Science, Engineering and Information Technology										x		1
International Research Journal of Engineering and Technology								x				1
Journal of Business & Industrial Marketing											x	1
Journal of Electronic Commerce in Organizations	x											1
Journal of Enterprise Information Management		x		x				x				3
Journal of Environmental Management and Tourism									x			1
Journal of Global Information Management			x									1
Journal of High Technology Management Research				x								1
Journal of Intelligence Studies in Business			x									1
Journal of Management in Engineering										x		1
Journal of Modelling in Management											x	1
Jurnal Perspektif Pembiayaan dan Pembangunan Daerah									x			1
Jurnal Pilar Nusa Mandiri										x		1
Management Research Review	x											1
Review of Integrative Business and Economics Research									x			1
Review of Managerial Science						x						1
Review of Public Administration and Management				x								1
South African Journal of Entrepreneurship and Small Business Management										x		1
South African Journal of Information Management				x						x		2
Sustainability										x		1
Total	3	5	4	6	0	4	1	6	9	7	5	50

3. FINDINGS

The classified article is a systematic classification scheme formulated according to the review and produce six segments, which are: (1) variable involved; (2) underpinning theories; (3) methodological approach; (4) type of technology; (5) geographical settings; (6) business settings, as in the subsequent subsections.

3.1. Theoretical Frameworks of SMEs Technology Adoption Research

Some studies were conducted based on the technology acceptance model (TAM) [8], [10]–[16]. TAM is used to describe technology adoption by individuals. TAM has two primary theoretical constructs: perceived usefulness and perceived ease of use [17]. Some others followed Ajzen's theory of planned behaviour (TPB) [18]–[20]. The TPB was used as a fundamental theory to test and predict decisions which are involved three variables: attitude, subjective norms, and perceived control [21]. Another study used the TOE framework to understand the factors that impact the adoption of new technology innovation. The TOE framework consists of three constructs: the technological context, the organisational context and the environmental context of the firm [3], [13], [22]–[25]. Furthermore, previous studies also used Innovation Diffusion Theory [8], [26]–[28]. The other theory which becomes a basis in previous studies is Actor-network theory (ANT). ANT refers to an actor as someone who contributes to making a change or a difference [11], [29]. Another theory used is Dynamic Capabilities Theory [30], [31]. In the dynamic capabilities viewpoint, a firm can improve, adapt, adjust, reconfigure, refresh, and renew a business process better than the competitors [32]. An extended unified theory of acceptance and use of technology adoption for enterprises (UTAUT2) was also adopted in previous research. This model consists of four determinants of IT objectives and uses performance expectancy, effort expectancy, social influence, and facilitating conditions [1], [33]. Andaregie and Astatkie use the modern theory of the development of MSE in their research with three characteristics (flexible specialization, high level of competitive innovation, and high level of cooperation) developed in the 1980s [9].

There are also some other theories adopted in previous research, namely, Upper Echelon Theory (UET) [34], incorporating organizational learning culture (OLC) [18], The Communications-for-Development (C4D) framework [35], management theory and the technological determination theory [36], Technology Readiness theory [37], behavioural and information technology adoption framework [38], and theories of innovation and the organizational foundations [7]. Some research also use more than a theory to develop their frameworks, such as Vu and Nguyen, who used three

strands of views on innovation persistence, including the accumulative knowledge theory, the sunk cost theory, and the success-breeds-success theory, are relevant [39]

3.2. Variable Involved in SMEs Technology Adoption Research

Previous research has categorized characteristic or context that influences technology adoption: technological context, environment context, organizational context, and individual context adopted from TOE framework. The technological context consists of relative advantage, compatibility, complexity, trialability, and observability. The environmental context consists of government/regulatory support, competitive pressure, external support, image, pollution, and industry. Organizational contexts consist of top management support, financial resources, ICT knowledge, ICT resources, organizational size, information, competitive advantage, organizational innovation culture, organizational culture. Individual/management context consist of owner/manager innovativeness, owner/manager ICT knowledge, attitude, innovation, age, gender, education [3], [20], [22], [23], [40].

Perceived usefulness and perceived ease of use are also often used as technology adoption predictors based on TAM [8], [10]–[14], [16]. Furthermore, barriers to adopt technology are also become a factor which influences technology adoption [1], [13], [26], [28], [36]. Chouki et al. split barrier to lack of planning and strategy, firm size, organizational barriers, and external barriers [41]. Some research also uses some variables based on TPB: attitude toward behaviour, subjective norm, and perceived behavioural control [18], [19].

Some research includes optimism, innovativeness, discomfort, and insecurity which influence technology adoption [4], [10], [13], [37]. Sani et al. mentioned this construct as technology readiness [4]. Other research also adds similar factors, namely self-efficacy, complexity and security, and pressure from competitors as technology adoption predictors [10], [13]. Some other research involved demographic factors of SMEs' actors, which are experience, age, education, gender, as one of the antecedents of technology adoption [9], [10], [29], [33], [34], [42]. Furthermore, some studies included demographic factors, attitude, innovation, and ICT skills as management/owner characteristics. [3], [11], [20].

Personality are also get the attention of researchers [1], [43], as well as location [18], [34], [38]. Previous research not only focuses on the antecedent of technology adoption but also the consequence, which are SMEs' performance [12], [30], [33], [39], [44]. Therefore, we can conclude that extensive variables have been identified as factors contributing to the technology adoption among SMEs.

3.3. Methodological Approach

Methods underpinning the previous research are both quantitative and qualitative. The majority of study uses quantitative approach as shown by Table 2. Figure 1 shows the analysis tools used in the quantitative approach. Most quantitative research analyses data using Structural Equation Modelling and Multiple Regression. Furthermore, some studies are conceptual [45]–[49].

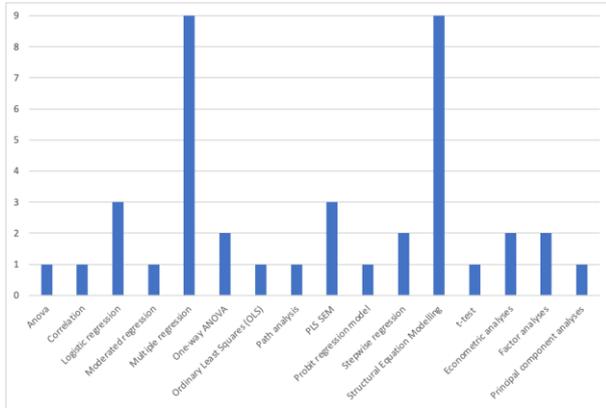


Figure 1 The summary of quantitative approach

3.4. Type of Technology

The review identified some types of technology studied within SMEs' settings. Information and communication technology (ICT) is the most researched in a technology adoption study. However, unlike many pieces of research on ICT using various methods, research related to other technologies has not received much attention from researchers. Table 2 shows the types of technology adoption studied in the last ten years.

Table 2. Mapping of adopted technology type and methodological approaches

Type of Adopted Technology	Qualitative Method	Quantitative Method	Mix Method	Descriptive: no defined methodological approach
Mobile marketing	[34]	[27]		
Green technology/ environmentally conscious technology	[1]	[42], [50]		
Information and communication technology	[2], [11], [31]	[3], [4], [7]–[9], [12], [18], [22]–[24], [26], [30], [33], [40], [44], [51]–[57]	[35]	[15], [38]
Cryptocurrency payments		[10]		
Technology in general: no specific technology		[43], [58]		[36]
Accounting-based financial management technology		[19]		
E-commerce/ e-business		[14], [19], [28], [37]		
Social media marketing		[13]		
Supply-chain technology	[41]			
Root and tuber composite flour (RTCF) technology			[29]	
Automobile technology		[27]		
Customer relationship management (CRM) technology		[20]		
Social networks marketing		[16]		
Cloud technology	[59]			

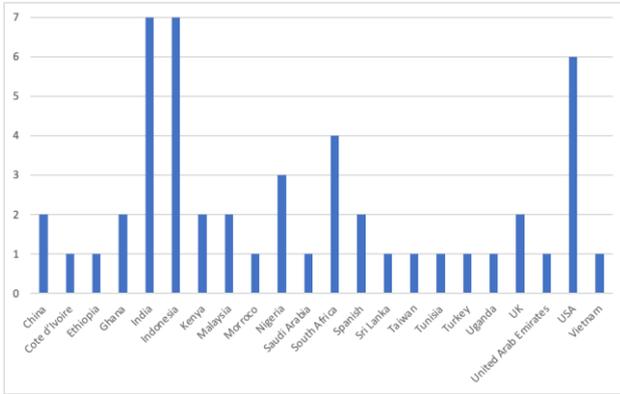


Figure 2. The number of research per country

3.5. Geographical Settings

Based on the topographical distribution of current work in SMEs technology adoption, as shown in Table 3, most extant studies are concentrated in Asia and Africa. The less-represented regions are the Americas and Europe. Furthermore, Figure 2 shows a significant amount of research conducted in Indonesia, India, and the USA.

3.6. Business Settings

Many research uses various types of business based on business settings in their study, as shown by Table 3. Meanwhile, research that focuses on certain types of business is scarce.

Table 3. Mapping of business and geographical settings

Type of Business	Africa	America	Asia	Europe
Services	[34]			[2], [31]
No specific business type		[60]	[1], [59]	
Various types	[8], [9], [11], [15], [22], [35], [36], [41], [52], [53], [56]	[16], [20], [28], [42], [58]	[3], [4], [18], [23], [24], [26], [33], [37]–[40], [50], [54], [55], [61], [62]	[38], [43]
Tourism and hospitality			[10], [13]	
Trade/ commerce/ retail	[14]		[19]	
Creative industry			[12]	
Manufacture			[30], [51]	
Bakery	[29]			
Electrical and electronic industry	[7]			
Travel industry				[44]
Auto ancillaries			[57]	

5. DISCUSSION

Generally, most of the research make calls for additional variables and indicators for evaluating technology adoption [18], [23], [34], [58]. Many theories have become the basis of existing research, and many variables have been included in previous research. Further research can map these variables in a framework so that the complete picture of the evaluation of technology adoption in SMEs can be more elaborated. Furthermore, the adoption of previously emerging technologies is also interesting to be involved in adopting newer technologies. Moreover, there is a general lack of research of how organizations constantly keep up and get advantages continuously with technology [31].

Furthermore, one of the critical methodological concerns is the lack of qualitative and mixed-method approaches in technology adoption in SME studies.

Qualitative research can help determine the detailed process of consumers in learning and using technology and how they share technical knowledge with the people around them. Thus, researchers can further deepen the discussion of technology adoption. Of course, mixed methods can help guide the selection of cases in qualitative studies [63]. It also will be worth examining technology adoption in SMEs using longitudinal study [3]. This research method would enable to observe any changes from pre-adoption, during-adoption and post-adoption concerning the business performance, such as monetary and non-monetary gains.

Again, a call for studies that investigate a specific type of adopted technology in SMEs is urgently required [36]. As most previous research focused on ICT, this opens up opportunities to involve other technologies in future research. It is also suspected that SMEs in the fields that involve technology are easier to adopt different

technologies. Further research is also interesting to group the SMEs studied based on the technology used.

Reinforce further calls for investigations comparing the performance effect of technology adoption in multiple sectors, economic, and culture is also an opportunity [26]. Previous studies were conducted in one country or even one city. It is crucial to involve countries with similar characteristics to determine whether SMEs use the same pattern in adopting technology. Further research is also essential to be a lesson for countries whose SMEs have lower technology adoption to accelerate technology adoption and accelerate business and economic growth of the country. It is worth noting that researchers should also explore the technology adoption in the current Covid-19 pandemic among SMEs. Many SMEs are willing to adopt technology applications, primarily social media, as part of their marketing strategy to sustain their businesses and engage with customers.

5. CONCLUSIONS

Although there is a significant amount of research on adopted technology in SMEs, further research is needed considering the results show that previous studies have only focused on ICT and quantitative approaches. This review only involves publishing peer-reviewed journals in the last ten years by limiting keywords to the article's title. Subsequent studies can deepen the survey by also referring to article keywords and abstracts. The analysis in this study was done manually with the help of Microsoft Excel. Further research can involve systematic literature review tools to get more in-depth analysis results.

AUTHORS' CONTRIBUTIONS

All authors have made equal contributions to the development of the present research. The authors has discussed and covered all stages of the development of the article.

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