Bibliometric analysis by exploring digital adoption in small and medium-sized enterprises (SMEs): A global review

Ira Syazwani Mohamad Marzuki[1], Kamaruddin Othman[2], Hafizah Hammad Ahmad Khan[3]

[1]Arshad Ayub Graduate Business School (AAGBS), Universiti Teknologi MARA Cawangan Kedah, 08400 Merbok, Kedah, Malaysia
[2,3]Faculty of Business Management, Universiti Teknologi MARA Cawangan Kedah, 08400 Merbok, Kedah, Malaysia

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ABSTRACT

The objective of this study was to examine peer-reviewed literature on the adoption of digital technologies among Small and Medium-Sized Enterprises (SMEs) on a global scale. A bibliometric analysis methodology was used. For the study period spanning from 1995 to 2022, documents from peer-reviewed journals focusing on the adoption of digital technologies among Small and Medium-Sized Enterprises (SMEs) were retrieved using the Scopus database. A total of 267 documents were retrieved. The most productive authors and institutions in this subject area are in the United States, the United Kingdom, Australia, and Malaysia. The application of keyword clustering analysis revealed that the primary areas of research within the field of digital transformation encompass information and communication technology, as well as Small and Medium Enterprises. The study acknowledges the constraints pertaining to the scope of motivations investigated and the extent to which the sample is representative. To address these limitations, further research is recommended to explore different motives and verify the findings through the use of diverse samples. This study contributes to the existing body of knowledge by offering empirical evidence on the adoption of digital technologies in Small and Medium-Sized Enterprises (SMEs), thereby deepening the understanding of the extent of digital adoption.

INTRODUCTION

The impact of technological innovation on company performance, particularly in small and medium companies (SMEs), has been substantial (Shahadat et al., 2023). Small and medium-sized enterprises (SMEs) play a significant part in the economic development of the country, notably in the manufacturing sector (Ramayah, Jantan, Roslin & Siron, 2003). The Department of Statistics (2016) reports that 98.5% (907,065) of all business establishments in Malaysia are small and medium-sized enterprises (SMEs), which play a crucial role in the nation's economic development. According to Jamali et al. (2017), the

literature also presents SMEs as a crucial component of robust economic growth and vitality due to their youthful entrepreneurial aptitude and innovative endeavours. In the contemporary era, the integration of digital technologies within organisations assumes a pivotal position in driving economic transformation and serves as a significant determinant of competitive advantage (Nekmahmud & Rahman, 2018). The concept of digital transformation has gained significant recognition as a major technological revolution that is bringing in a new economic paradigm, impacting industry structure, customer demand interactions, and competition rules (Reischauer, 2018).

Digital technology, specifically the adoption of information and communication technologies (ICT), can enhance the ability of small and medium-sized enterprises (SMEs) to share information, reduce operational costs, and improve quality to obtain a competitive advantage (Tarutė & Gatautis, 2014). According to Bayo-Moriones et al. (2013), the allocation of resources towards ICT has the potential to strengthen an organisation's capacity and exert a substantial influence on both internal and external communication processes. Several scholars have posited that information technology (IT) significantly contributes to the achievement of corporate objectives (MacGregor and Vrazalic, 2005). Ghobakhloo et al. (2012) add that SME must acquire the benefits of IT investment, which can provide a competitive advantage, boost productivity, and integrate inter-organisational and partner-based functions. Nevertheless, despite the advantages of IT and the significant role that small and medium-sized enterprises (SMEs) play in contributing to the gross domestic product (GDP) and generating employment opportunities, various studies conducted in different nations have consistently demonstrated that SMEs exhibit a lower propensity to embrace IT compared to larger firms. This reluctance towards IT adoption poses a notable challenge for SMEs (Southern and Tilley, 2000). Thus, the primary aim of this research is to analyse scholarly literature pertaining to the implementation of digital technologies within Small and Medium Sized Enterprises (SMEs) at a global level. Furthermore, the utilisation of bibliometric methodologies allows for the identification of new research trends and important subjects across a wide range of academic disciplines.

LITERATURE REVIEW

The implementation of IT in businesses, with a special emphasis on small businesses, is important. While the integration of IT has been widely accepted by large corporations for a considerable period, small businesses have exhibited a slower pace in adopting this technological advancement. According to Thong and Yap (1995), there is a larger likelihood of small businesses embracing IT when their chief executive officers (CEOs) exhibit elevated levels of innovativeness, positive attitudes towards IT adoption, and possess a stronger understanding of IT. Lee

(2004) asserts that small business entrepreneurs have considerable hurdles in adopting IT in comparison to larger organisations that possess greater resources. Ghobakhloo et al. (2012) emphasise the significance of IT adoption in small and SMEs. Given the numerous benefits associated with information technology, SMEs endeavour to integrate IT applications into their business operations. However, the adoption of IT in small and SMEs differs from that of larger organisations due to unique characteristics such as resource constraints. According to Barba-Sánchez et al. (2007), the significance ICTs for SMEs is evident in the context of today's knowledge-based society.

The role of entrepreneurs and their orientation towards innovation are examined as key factors influencing the adoption process. Since SMEs play a role of increasing importance in the economy (especially when we consider their contribution to the generation of jobs as well as the social-economic development of the community where they are located), it is then desirable that SMEs are stimulated into adopting new technologies more rapidly and creating innovative products more competitively. It requires that SMEs have the right environment to prosper, form a skilled workforce, and drive economic growth. Colombo et al. (2013) focus on the impact of broadband Internet technology adoption on the productivity performance of SMEs. The econometric estimates reveal that the adoption of basic broadband applications

has a minimal or even negative impact on SMEs' productivity. However, the study finds that SMEs can benefit from the adoption of specific advanced broadband applications depending on several factors: (i) the industry in which they operate (services vs. manufacturing); (ii) the relevance of the specific broadband software applications to the industry; and (iii) the implementation of complementary strategic and organisational changes.

The study by Papadopoulos et al. (2020) emphasises the significance of digital technologies (DT) in improving productivity and performance in SMEs. However, there is a lack of evidence regarding the use of DT to address the challenges posed by extreme events like COVID-19. According to Matthews (2007), ICT is widely recognised for its significant role in the growth of enterprises, contributing directly to profitability and providing a foundation for operational evolution from a micro to a medium level. Successful deployment of ICT for growth involves a complex system influenced by environmental, technical, and human factors. Riemenschneider et al. (2003) used a combination of the theory of planned behaviour (TPB) and the technology acceptance model (TAM) to examine the IT adoption decisions of small business executives regarding a website. They employed a series of integrated models, ranging from loosely integrated to tightly integrated, and applied structural equation modelling (SEM) techniques to analyse the data. Peltier et al. (2012) developed and tested an integrative model for technology adoption in small businesses, incorporating consumer and organisational behaviour theories. The research contributed to the field by introducing the Small Business Technology Adoption Model (SBTAM), emphasising the importance of examining the interrelationships between independent variables. Mutula and Van Brakel (2007) revealed a global shortage of highly skilled personnel for driving the digital economy in both developed and developing countries, including Botswana. There was also a significant skill gap among certified specialists capable of developing the advanced applications required for the digital economy. Ritz et al. (2019) focus on examining small businesses' participation in digital marketing and integrating the do-it-yourself (DIY) behaviour model and the technology acceptance model (TAM) to explore motivations and expected outcomes.

METHODS

Bibliometrics was defined by Pritchard (1969) as the application of mathematical and statistical methods to books and other media of communication. In addition, some new bibliometric methods have been developed and used as effective tools to assess research patterns in different scientific fields. Two different types of bibliometric methods can typically be used to explore a research field: performance analysis and science mapping analysis (SMA) (Gutiérrez-Salcedo et al., 2018). Performance analysis is used to evaluate different scientific actors, such as researchers, institutions, countries, etc., based on publications and citation data (Narin & Hamilton, 1996). By employing this analysis, it facilitates the identification of the most productive topics (measured by the number of published papers) and the most impactful ones (assessed based on received citations). In essence, performance analysis accounts for the contributions of research constituents, whereas science mapping focuses on the relationships between research constituents.

Scopus bibliometric tools and Microsoft Excel were used for basic statistical analyses and the visualisation of bibliometric results. The VOSviewer software was used to construct and analyse networks of different items (documents, authors, sources, references) connected by citation, co-citation, co-authorship, or co-occurrence links and for creating, visualising, and exploring bibliographic maps (Van Eck & Waltman, 2009). Science mapping analysis in the digital adoption area was conducted following the flow diagram of the search strategy by Zakaria, Ahmi, Ahmad & Othman (2021)., as shown in Figure 1. The premier sources of research papers used in this research were accessed from the Scopus database. Scopus is the largest abstract and citation database of peer-reviewed literature and consists of articles from leading publishers. Keyword search is an appropriate way to find out which article is relevant for the purpose of the study (Almeida, 2018).

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┌──────────────┐         ┌──────────────────────┐
│    Topic     │─────────│   Digital Adoption    │
└──────────────┘         └──────────────────────┘
        │
        ▼
┌──────────────┐   ┌────────────────────────────────────────────┐
│              │   │ Database: Scopus                            │
│              │   │ Search Field: Article Title                 │
│   Scope &    │───│ Time Frame: All                             │
│  Coverage    │   │ Language: English                           │
│              │   │ Source Type: Journal, Conference Proceedings,│
│              │   │ Books, Book Series                          │
│              │   │ Document Type: Article, Conference Paper,    │
│              │   │ Book Chapter, Review, Editorial, Book        │
└──────────────┘   └────────────────────────────────────────────┘
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Topic, Scope & Eligibility

Keywords & Search String — (TITLE("Digital Adoption" OR "Digital Transformation" OR "Technology Adoption" OR " Technology Acceptance" OR "Digital Technology" OR "ICT" OR "IT Adoption" AND "SME" OR "Small and Medium Enterprise" OR "Small and Medium-Sized Enterprise" OR "Small Business") AND PUBYEAR > 1994 AND PUBYEAR < 2023 AND (EXCLUDE (LANGUAGE,"Spanish") OR EXCLUDE (LANGUAGE,"French") OR EXCLUDE (

Screening

Date Extracted — 13 May 2023

Record Identified & Screened — n = 267

Included

Record Removed — n = 28

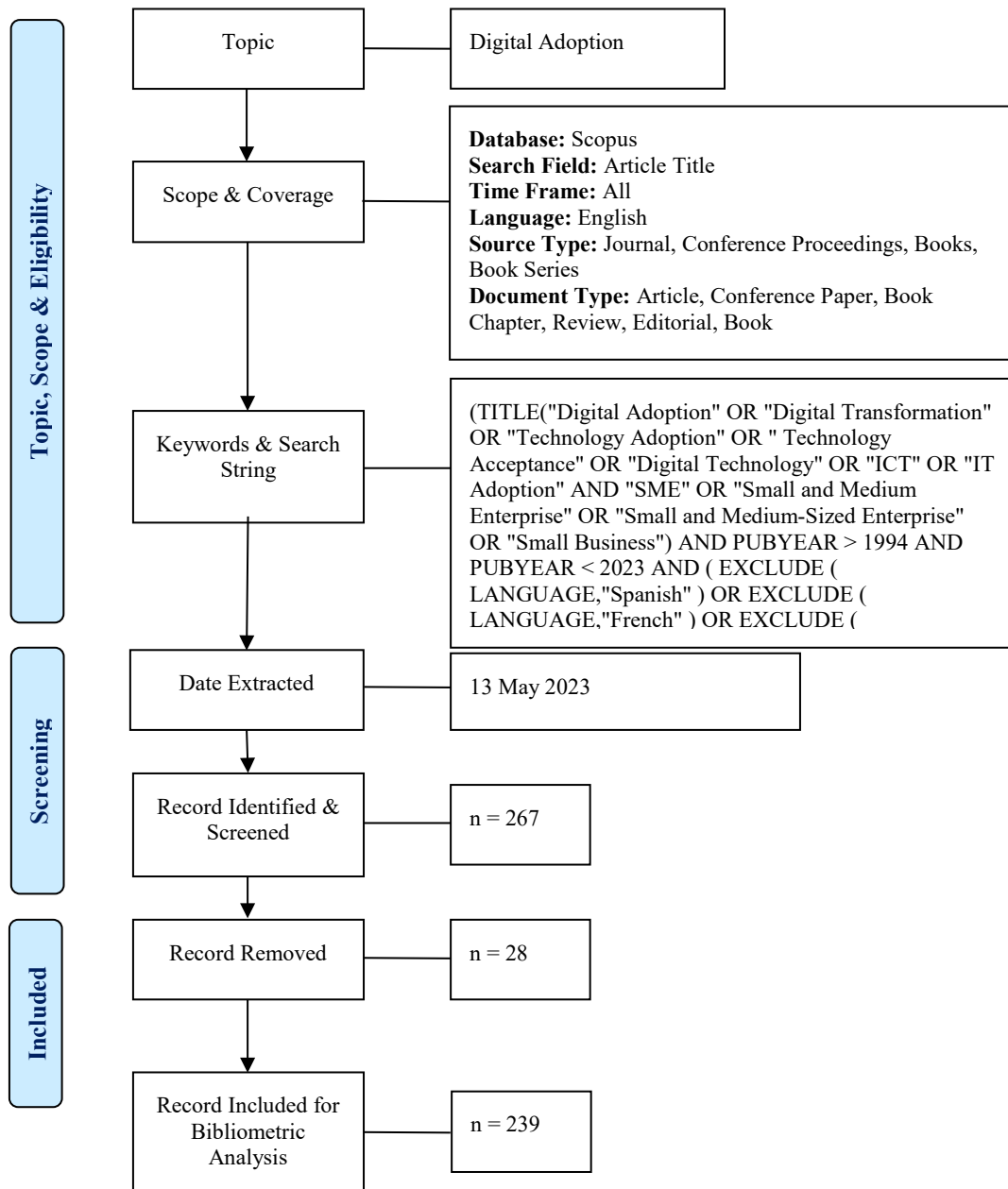Record Included for Bibliometric Analysis — n = 239

Figure 1: Flow diagram of the search strategy

Source of Figure 1: Zakaria et al. (2020)

Accordingly, the search strategy developed is:

(TITLE ("Digital Adoption" OR "Digital Transformation" OR "Technology Adoption" OR " Technology Acceptance" OR "Digital Technology" OR "ICT" OR "IT Adoption" AND "SME" OR "Small and Medium Enterprise" OR "Small and Medium-Sized Enterprise" OR "Small Business") AND (EXCLUDE

(LANGUAGE,"Spanish")   OR   EXCLUDE   (LANGUAGE,"French")   OR   EXCLUDE (LANGUAGE,"German")   OR   EXCLUDE   (LANGUAGE,   "Czech")   OR   EXCLUDE (LANGUAGE,"Korean") OR EXCLUDE (LANGUAGE,"Italian")))

The search operator "OR" has been used because this conjunction includes all items specifically related to the searched items without exclusion of important and related papers, which would be the case if using the "AND" operator, which may incorporate irrelevant documents in the search results and in turn affect the accuracy and precision of the results. The search string used in the Scopus — Article title database was a search to generate the most relevant study in this research area. The clustering technique is precise in determining the relationships between publications based on direct citation relationships. Bibliographic data was fed into VOSviewer for obtaining the network maps showing keyword cooccurrences, country co-authorships, and author co-authorships.

RESULTS

The data for the study was derived from a total of 267 publications that were obtained on May 13, 2023. Following an initial round of cross-validation, a total of 37 papers were deemed ineligible for inclusion. In addition, analyses conducted in languages other than English, including Spanish, French, German, Czech, Korean, and Italian, were excluded.

Document and Source Types

Among the papers included in Table 1, a total of 132 papers, accounting for 51.76% of the overall distribution, were classified as articles. Articles are commonly regarded as comprehensive research papers that provide novel discoveries, approaches, and analyses. The abundance of papers suggests a significant focus on empirical research and intellectual contributions in comprehending the process of digital adoption among SMEs. The number of conference papers included in the publications amounts to 84, which corresponds to 32.94% of the overall total. Conference papers are generally characterised by their brief and focussed nature, as they serve the purpose of disseminating research outcomes within the context of academic conferences. The notable prevalence of conference papers indicates that scholars in this discipline regularly engage in conferences to exchange and distribute their research findings. The book chapters account for a total of 29 publications, or approximately 11.37% of the overall publication count. Book chapters serve as intellectual contributions within edited books, providing professionals with the opportunity to explore and examine specific themes in depth. The inclusion of book chapters indicates a deliberate effort to provide a comprehensive examination of the digital adoption phenomenon among SMEs within a wider framework. The reviews include seven (7) publications, or 2.75 percent of the total quantity. Reviews provide evaluative analyses and concise summaries of existing scholarly works on a particular topic. Existence of review articles indicates the need to consolidate and summarise existing research on this topic.

Review articles serve as valuable tools for knowledgeable readers to stay updated with the current literature (Ketcham & Crawford, 2007), whereas journal editorials assist readers in selecting meritorious contributions in literature and endorsing procedures and approaches approved by an authority in that field. Editorial pieces provide two (2) publications, accounting for 0.78% of total. Editorials are commonly regarded as opinion articles authored by individuals who possess expertise in a certain field or by the editors of scholarly magazines. These sources offer valuable insights, opinions, or perspectives regarding the present state of research within the respective topic. The small number of editorials suggests that opinion-based articles are comparatively less prominent in this topic. Books constitute a single publication, representing a mere 0.39% of the whole total. Books provide extensive and thorough coverage of a certain topic area, typically produced by those who possess expertise in the respective discipline. The existence of a book signifies a comprehensive examination of the adoption of digital technologies among SMEs from a holistic standpoint. The analysis indicates that most publications in digital adoption among SMEs are

articles and conference papers, suggesting a significant focus on empirical research and sharing of findings. However, contributions in the form of book chapters, reviews, editorials, and books indicate a desire for comprehensive coverage, critical analysis, and broader perspectives on this topic.

Table 1. Document type

Document Type	Total Publications (TP)	Percentage (%)
Article	132	51.76
Conference Paper	84	32.94
Book Chapter	29	11.37
Review	7	2.75
Editorial	2	0.78
Book	1	0.39
Total	255	**100.00**

Source of Table 1: Author's own work using Ms Excel

Table 2 displays the results of an analysis of document sources used to identify the 142 (55.69%) primary journals in the digital adoption research field. Journals are scholarly publications that endure a rigorous peer-review procedure to ensure the quality and dependability of the research they publish. Conference proceedings account for 64 publications, or 25.10 % of the total. Proceedings of academic conferences are compilations of papers presented at those conferences. The prevalence of conference proceedings suggests that researchers actively present their research on the digital adoption of SMEs at conferences. This type of source enables timely dissemination of findings and facilitates scholarly dialogue within a field.

26 publications are books, representing 10.20% of the total. Books provide extensive coverage and in-depth analysis of a particular topic. Books presumably provide holistic perspectives, theoretical frameworks, and practical insights in the context of digital adoption among SMEs. The inclusion of books indicates a desire to present a comprehensive comprehension of the subject, possibly aimed at a broader audience than the academic community. Book series are responsible for 23 publications, or 9.02% of the total. A book series consists of multiple volumes or editions, frequently centred on a specific theme or topic. The prevalence of book series indicates an ongoing interest in exploring various facets of SME digital adoption across multiple publications. This form of source permits an in-depth examination of the topic from various perspectives or contexts. The analysis reveals a wide variety of source categories that contribute to the academic literature on digital adoption among SMEs. Journals and conference proceedings dominate the landscape, emphasising the significance of rigorous research and active scholarly participation. Books and book series provide comprehensive coverage and in-depth analysis, presumably targeting both academic and non-academic audiences with an interest in the topic.

Table 2. Source type

Source Type	Total Publications (TP)	Percentage (%)
Journals	142	55.69
Conference Proceedings	64	25.10
Books	26	10.20
Book Series	23	9.02
Total	**255**	**100.00**

Source of Table 2: Author's own work using Ms Excel

Year of Publications/Evolution of Published Studies

Table 3 and Figure 2 illustrate the annual growth of digital adoption-related publications from 1995 to 2022.

Table 3. Year of publications

Year	Total Publications	Percentage (%)	Cumulative Percent
2022	41	16.08	22.35
2021	29	11.37	33.73
2020	29	11.37	45.10
2019	12	4.71	49.80
2018	10	3.92	53.73
2017	10	3.92	57.65
2016	11	4.31	61.96
2015	8	3.14	65.10
2014	8	3.14	68.24
2013	8	3.14	71.37
2012	9	3.53	74.90
2011	7	2.75	77.65
2010	15	5.88	83.53
2009	6	2.35	85.88
2008	6	2.35	88.24
2007	11	4.31	92.55
2006	3	1.18	93.73
2005	1	0.39	94.12
2004	3	1.18	95.29
2003	3	1.18	96.47
2002	2	0.78	97.25
2000	2	0.78	98.04
1999	3	1.18	99.22
1996	1	0.39	99.61
1995	1	0.39	100.00
Total	255	100.00	

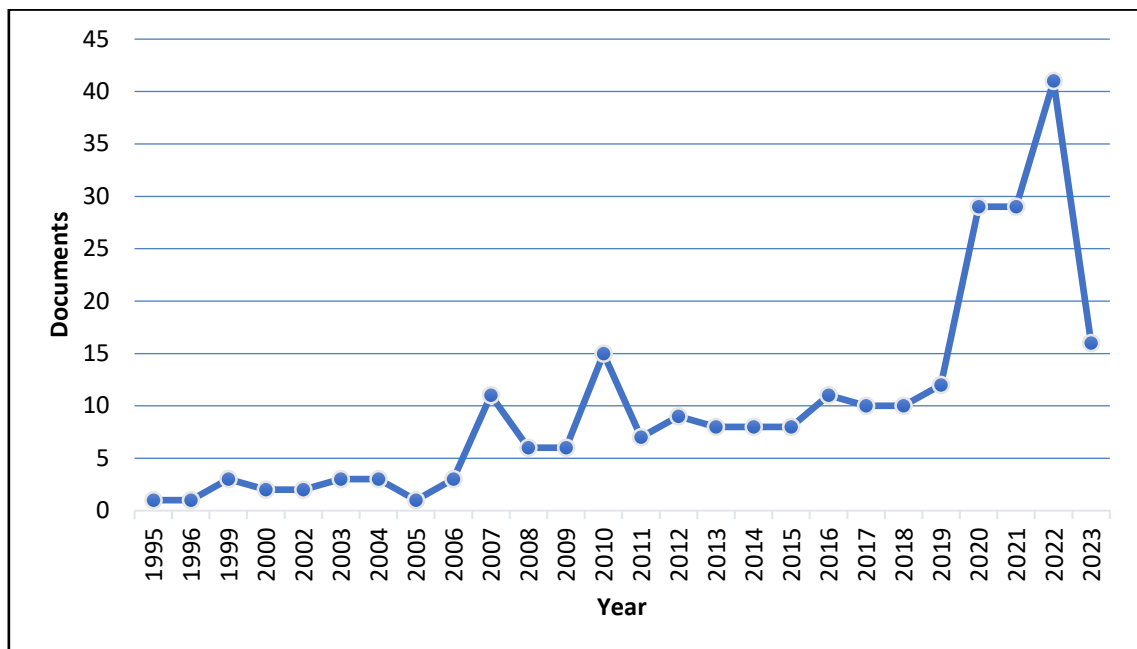Source of Table 3: Author's own work using Ms Excel

Figure 2: Document by year

Source of Figure 2: Author's own work using Ms Excel

The distribution of publications across various years can be used to analyse the trend of publications on the topic of digital adoption among SMEs. The data shows a significant concentration of publications in recent years. This indicates a recent increase in interest and focus on the subject. It suggests that digital adoption among SMEs is a contemporary relevant topic that researchers are actively investigating. The number of publications has increased consistently from earlier years (e.g., 1995) to the present, with some fluctuations. This indicates a continuous and growing interest in researching the landscape of digital adoption among SMEs over the years. The year 2022 has the greatest number of publications (41) when compared to all other years considered. The cumulative percentage column indicates the proportion of total publications that have accumulated over time. The graph shows that more than half of the articles (about 74.90%) are focused in the last five years (2019-2022). This reinforces the notion that the research field of digital adoption among SMEs is dynamic and evolving field of research.

Languages of Documents

Collaborations were fostered by the same language group. The research is centred on the publication of academic content in the English language. According to Escamilla-Fajardo et al. (2020), academic publications predominantly employ the English language.

Table 4. Languages used for publications

Language	Total Publications*	Percentage (%)
English	255	100.00
Total	**255**	**100.00**

Source of the Table 4: Author's own work using Ms Excel

Subject Area

According to the data presented in Table 5, the articles pertaining to the fields of business, management, and accounting exhibit the highest frequency of publications, amounting to a cumulative total of 114. This demonstrates a strong research emphasis on business, management, and accounting-related topics, highlighting the importance of these fields in academia and the business world. With a total of 101 publications, the subject of computer science has emerged as another major area of research. The high number of publications is indicative of a growing interest in computer science topics, which can be attributed to technological advancements and the expanding role of computing in numerous SME industries. In the context of digital adoption, the emphasis on social sciences in 67 publications suggests a recognition of the significance of understanding human behaviour, society, and social dynamics in relation to digital adoption among various stakeholders.

The social sciences disciplines of sociology, psychology, anthropology, and political science provide vital insights into how individuals, organisations, and communities engage with and respond to digital technologies. The subject of engineering has witnessed considerable research activity, as evidenced by the publication of 55 scholarly works. This body of work reflects a notable emphasis on technological developments, innovation, and the practical implementation of digital technologies. Engineering research often places a strong emphasis on the utilisation of data analytics, machine learning, and optimisation approaches in order to effectively leverage the capabilities of digital technology within small and medium-sized enterprises (SMEs). This may entail the creation of algorithms and models to facilitate data-driven decision-making, predictive maintenance, inventory optimisation, and supply chain management. The presence of 42 articles in the domain of decision sciences suggests a substantial emphasis on investigating decision-making procedures, operations management, and optimisation tactics that can enhance the successful use of digital technologies.

Publications in this area explore the creation of decision-making frameworks that are particularly tailored for SME digital adoption. These frameworks have the potential to integrate several elements, including cost-benefit analysis, risk assessment, and evaluation of diverse digital solutions, in order to

provide guidance for decision-making procedures. The presence of 42 scholarly articles in the domains of Economics, Econometrics, and Finance suggests a notable emphasis on comprehending the economic consequences, policy evaluation, financial decision-making, and predictive analysis associated with the integration of digital technologies by SMEs. The research in the fields of Economics, Econometrics, and Finance has the potential to provide valuable insights into the dynamics of markets and the competitive environment, particularly in relation to the impact of digital adoption. This entails conducting research on the influence of digital technologies on the organisational framework of markets, customer actions, supply chain operations, and pricing tactics, specifically focusing on SMEs.

The data provides insights into the prominence of these subject areas based on the number of publications. It highlights the active research areas within business, computer science, social sciences, engineering, decision sciences, and economics. These findings can assist researchers, academic institutions, and policymakers in understanding the current trends and areas of focus within these disciplines.

Table 5. Subject area

Subject Area	Total Publications	Percentage (%)
Business, Management and Accounting	114	23.75
Computer Science	101	21.04
Social Sciences	67	13.96
Engineering	55	11.46
Decision Sciences	42	8.75
Economics, Econometrics and Finance	42	8.75
Environmental Science	19	3.96
Energy	10	2.08
Mathematics	8	1.67
Arts and Humanities	6	1.25
Agricultural and Biological Sciences	3	0.63
Psychology	3	0.63
Earth and Planetary Sciences	2	0.42
Multidisciplinary	2	0.42
Physics and Astronomy	2	0.42
Biochemistry, Genetics and Molecular Biology	1	0.21
Chemical Engineering	1	0.21
Chemistry	1	0.21

Source of Table 5: Author's own work using Ms Excel

Most Active Source Titles

Table 6 shows a diverse range of sources from the 20 most active sources, including conference proceedings, journals, and specific publications focused on SMEs. This indicates that researchers are drawing information from various platforms to contribute to the literature on digital adoption in SMEs. The top five preferred journals for publications in the field of digital adoption were IFIP Advances in Information and Communication Technology, which has 5 (2.40%) papers, followed by ACM International Conference Proceeding Series, which has 4 (1.92%) papers, Sustainability Switzerland, which has 4 (1.92%) papers, Information Technology for Development is, which has 3 (1.44%) and Information Technology for Development, which has 3 (1.44%).

Table 6. Most active source titles

Source Titles	Total Publications	Percentage (%)
IFIP Advances in Information and Communication Technology	5	2.40
ACM International Conference Proceeding Series	4	1.92
Sustainability Switzerland	4	1.92
Information Technology for Development	3	1.44
International Journal of Information Management	3	1.44
Proceedings of the Annual Hawaii International Conference on System Sciences	3	1.44
Small And Medium Enterprises Concepts Methodologies Tools and Applications	3	1.44
19th Americas Conference on Information Systems Amcis 2013 Hyperconnected World Anything Anywhere Anytime	2	0.96
Advances In Intelligent Systems and Computing	2	0.96
Anthropologist	2	0.96
Ceur Workshop Proceedings	2	0.96
E3s Web of Conferences	2	0.96
Electronic Journal of Information Systems in Developing Countries	2	0.96
Entrepreneurship And Regional Development	2	0.96
Information Economics and Policy	2	0.96
Information Switzerland	2	0.96
International Journal of Advanced Computer Science and Applications	2	0.96
International Journal of Engineering and Advanced Technology	2	0.96
International Journal of Entrepreneurship	2	0.96
International Journal of Management and Enterprise Development	2	0.96

Source of Table 6: Author's own work using Ms Excel

Keywords Analysis

The author keyword visualisation map revealed that the most commonly encountered author keywords were Digital Transformation, SMEs, Small and Medium Enterprise Information Technology, and SME.

The list of leading keywords displayed in Table 7 and Figure 3 for the field of digital adoption among SMEs offers valuable insight into the research focus and areas of interest associated with this topic. With 49 publications, digital transformation is the most prevalent keyword. This reflects the growing interest in understanding how SMEs implement and leverage digital technologies to drive substantial changes in their business processes, models, and strategies. As anticipated, SMEs themselves are a central keyword in 35 publications. This emphasises the focus on examining the digital adoption challenges and opportunities that small and medium-sized businesses encounter. The occurrence of the Small and Medium Enterprise (SME) keyword in 31 publications emphasises the unique characteristics and requirements of SMEs in the context of digital adoption. It acknowledges that digitalisation strategies must be tailored to the unique needs of small and medium-sized businesses. The prevalence of the keyword "Information Technology" in 28 publications demonstrates an emphasis on the role and impact of IT in the digital adoption process of SMEs. This may involve analysing the IT infrastructure, software, and hardware within SMEs, as well as the integration of IT systems. SME and Small and Medium-Sized Enterprise (SME) appear in 27 publications, highlighting the significance of SMEs in digital adoption research. They reflect the recognition of the unique challenges and opportunities posed by the adoption of digital technologies by small and medium-sized enterprises.

ICT and Information and Communication Technologies keywords found in 21 publications each emphasise the emphasis on the broader landscape of information and communication technologies in the context of SME digital adoption. Innovation refers to the investigation of various technologies and their incorporation into SME operations and strategies. With 19 publications, innovation emerges as a central factor in the study of digital adoption among SMEs. This indicates a desire to comprehend how digital technologies can foster innovation processes and practises in the SME sector. The occurrence of the keyword Small Business in 19 publications demonstrates a concentration on analysing the digital adoption dynamics within the small business sector, possibly including micro-businesses and startups. With 16 publications, the term "Information Systems" denotes an emphasis on examining the function and effects

of information systems, such as software programmes, databases, and networks, in facilitating SMEs in adopting digital technology. Keywords related to Competition and Industry appear in 15 publications, indicating that the competitive landscape and industry-specific factors influencing digital adoption among SMEs are widely recognised. This indicates a desire to comprehend how small and medium-sized enterprises navigate competition and industry dynamics during their digital transformation voyage. The leading keywords reveal a multidisciplinary approach to investigating the digital adoption of SMEs, encompassing technology, management, innovation, and economic factors. This list identifies the most important areas of inquiry and provides directions for future research in this field.
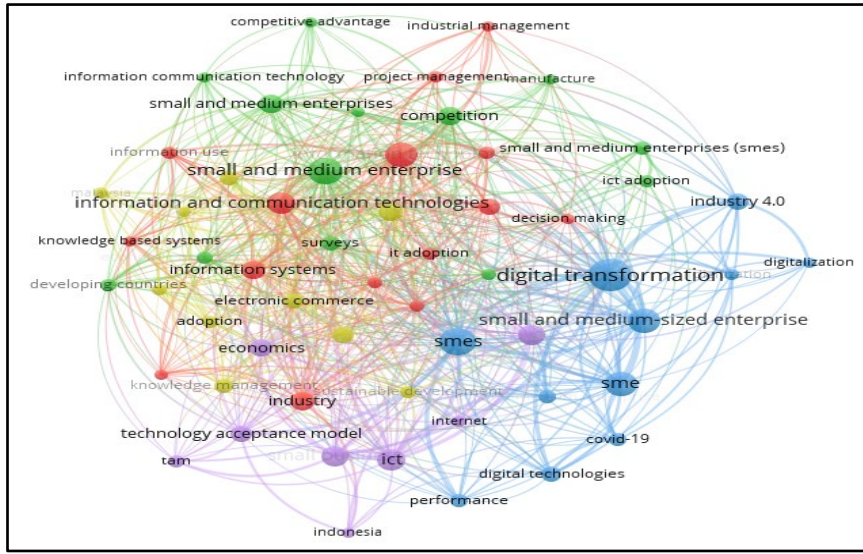

Figure 3: Network visualization map of the author keywords

Source of Figure 3: Author's own work using VoS viewer

Table 7. Top keywords

Author Keywords	Total Publications	Percentage (%)
Digital Transformation	49	5.10
SMEs	35	3.64
Small And Medium Enterprise	31	3.23
Information Technology	28	2.91
SME	27	2.81
Small And Medium-sized Enterprise	27	2.81
ICT	21	2.19
Information And Communication Technologies	21	2.19
Innovation	19	1.98
Small Business	19	1.98
Information Systems	16	1.66
Competition	15	1.56
Industry	15	1.56
Small And Medium Enterprises	15	1.56
Technology Adoption	15	1.56
Economics	14	1.46
Industry 4.0	13	1.35
Information And Communication Technology	13	1.35
Technology Acceptance Model	13	1.35
Information Technology Adoption	12	1.25

Source of Table 7: Author's own work using Ms Excel

Geographical Distribution of Publications - Most Influential Countries

Table 8 presents the contribution percentages of the top 20 countries in terms of digital adoption. This data confirms that the United States has the highest number of total publications, with 30 articles accounting for 9.17% of the total. United Kingdom ranks in second place with 26 publications, accounting for 7.95% of the total. Australia appears in third place with 21 publications, or 6.42 % of the total. Malaysia and Indonesia have 20 and 19 publications, accounting for 6.12% and 5.81% of the total, respectively. Italy, Germany, India, and China each have 14 publications, contributing 4.28 %, 3.98 %, 3.98 %, and 3.6%, respectively. South Africa and Spain have 9 publications in common, accounting for 2.75% of the total. France comes in second with eight (8) publications, or 2.45% of the total. Iran has seven (7) publications, representing 2.14 % of the total. Switzerland, Bangladesh, Latvia, Morocco, Netherlands, Portugal, and Romania each have four (4) publications, contributing 1.53 %, 1.22 %, 1.22 %, 1.22 %, 1.22 %, and 1.22 %, respectively. The data provides an overview of the publication distribution across various nations, indicating the research output of each country. The United States and the United Kingdom are the leading contributors, followed by Australia, Malaysia, and Indonesia. It is significant to note that 30 of the countries on the co-authorship map of countries in Figure 4 meet the requirement of co-authorship on at least three documents.

Table 8. Top 20 countries contributed to the publications

Country	Total Publications	Percentage (%)
United States	30	9.17
United Kingdom	26	7.95
Australia	21	6.42
Malaysia	20	6.12
Indonesia	19	5.81
Italy	14	4.28
Germany	13	3.98
India	13	3.98
China	12	3.67
South Africa	9	2.75
Spain	9	2.75
France	8	2.45
Iran	7	2.14
Nigeria	6	1.83
Pakistan	6	1.83
Switzerland	5	1.53
Bangladesh	4	1.22
Latvia	4	1.22
Morocco	4	1.22
Netherlands	4	1.22
Portugal	4	1.22
Romania	4	1.22

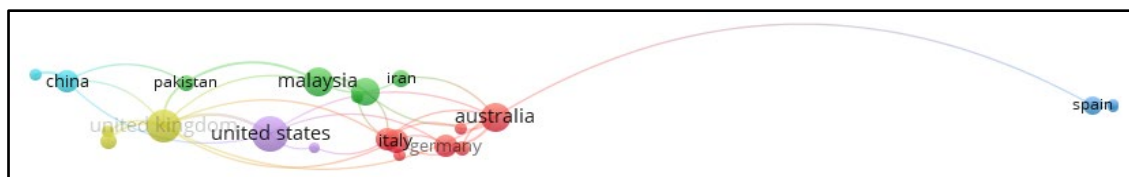Source of Table 8: Author's own work using Ms Excel

Figure 4: Network visualization map of the co-authorship

Notes: The method used is full counting with the number of documents of a country is 3 and minimum number of citations of a country equals to 5.

Source of Figure 4: Author's own work using VoS viewer

Authorship

Table 9 features 20 authors who have published two (2) or more papers in the field of digital adoption. Mukherjee (2010) defines author productivity as the number of papers an author has published within a particular time period. With four (4) documents, Burgess, S. dominates the table, followed by Ahmad, S., Bayaga, A., Bingley, S., Chouki, M., Jaganathan, M., Okar, C., Qureshi, S., and Talea, M., each with three (3) documents. Other active authors have published between two (2) and three (3) works. The list consists authors with diverse names and affiliations, indicating a global representation of scholars who study digital adoption in SMEs. This global perspective contributes to a comprehensive understanding of the topic by examining diverse regional contexts, challenges, and solutions.

Table 9. Most productive authors

Author's Name	No. of Documents	Percentage (%)
Burgess, S.	4	1.79
Ahmad, S.	3	1.34
Bayaga, A.	3	1.34
Bingley, S.	3	1.34
Chouki, M.	3	1.34
Jaganathan, M.	3	1.34
Okar, C.	3	1.34
Qureshi, S.	3	1.34
Talea, M.	3	1.34
Alves Junior, P.N.	2	0.89
Ashrafi, R.	2	0.89
Bandur, A.	2	0.89
Bello, A.O.	2	0.89
Berrah, L.	2	0.89
Chooprayoon, V.	2	0.89
Chroqui, R.	2	0.89
Clear, F.	2	0.89
Dewan, A.M.	2	0.89
Dickson, K.	2	0.89
Dinter, B.	2	0.89

Source of Table 9: Author's own work using Ms Excel

Most Influential Institutions

Table 10 shows the top institutions affiliated with digital adoption with authors contributing at least four articles to the journal. The digital adoption' authors affiliated with Universiti Utara Malaysia, Victoria University, and Monash University contributed the highest count of articles (4). These three institutions have the same number of publications and share the top spot. It indicates their active involvement and research output in the field of digital adoption among SMEs. Universiti Kebangsaan Malaysia, University of Fort Hare, Technische Universität Chemnitz, and Fachhochschule Nordwestschweiz FHNW institutions have also made notable contributions with three publications each. Their involvement suggests a diverse geographic representation, including institutions from Malaysia, South Africa, Germany, and Switzerland. The University of Nebraska Omaha, Brunel University London, Universiti Teknologi Malaysia, Faculté des Sciences Ben M'Sick, Politecnico di Milano, Hassan II University of Casablanca, Université Hassan 1er, and Bina Nusantara University institutions have contributed with three publications each, highlighting their engagement and research activities in the field. ITCC SA, Università degli Studi di Padova, California State University, Fullerton, Charles Sturt University, and Pennsylvania State University institutions have made a moderate impact with two publications each. Although their presence is not as extensive as that of the institutions mentioned earlier, their contributions indicate their involvement in the research on digital adoption among SMEs. The list showcases a global representation of institutions, indicating the worldwide interest and research efforts in understanding the digital adoption dynamics within the SME context. These institutions' contributions suggest the existence of a diverse network of researchers, collaborations, and

knowledge sharing in exploring the topic. Further collaboration and cross-institutional research endeavours could contribute to a deeper understanding of digital adoption and its implications for SMEs.

Table 10. Most influential institutions with minimum of four publications

Institution	Total Publications	Percentage (%)
Universiti Utara Malaysia	4	1.66
Victoria University	4	1.66
Monash University	4	1.66
Universiti Kebangsaan Malaysia	3	1.24
University of Fort Hare	3	1.24
Technische Universität Chemnitz	3	1.24
Fachhochschule Nordwestschweiz FHNW	3	1.24
University of Nebraska Omaha	3	1.24
Brunel University London	3	1.24
Universiti Teknologi Malaysia	3	1.24
Faculté des Sciences Ben M'Sick	3	1.24
Politecnico di Milano	3	1.24
Hassan II University of Casablanca	3	1.24
Université Hassan 1er	3	1.24
Bina Nusantara University	3	1.24
ITCC SA	2	0.83
Università degli Studi di Padova	2	0.83
California State University, Fullerton	2	0.83
Charles Sturt University	2	0.83
Pennsylvania State University	2	0.83

Source of Table 10: Author's own work using Ms Excel

Citation Analysis

The significance of an item of research is its usefulness to other researchers (Shadbolt et al., 2006). The citation metrics of the 255 documents from 1995 to 2022 are presented in Table 11. The total number of citations over the course of 28 years is 4387, resulting in 156.68 citations per year and 17.20 citations per document. Citations are meant to indicate that a publication has utilised the contents of multiple other publications (in the form of others' ideas, research results, etc.). Thus, the number of citations incorporated in assessment serves as a measure of the research's impact (Bornmann et al., 2008).

Table 11. Citations metrics

Metrics	Data
Publication years	1995-2022
Citation years	27 (1995-2022)
Papers	255
Citations	4387
Citations/year	156.68
Citations/paper	17.20
Papers/author	2.84
h-index	28
g-index	62

Source of Table 11: Author's analyse using Harzing's Publish or Perish

Tsay (2009) reports that citations are one sign of influence. Table 12 displays a list of publications with the maximum influence from digital adoption from 1995 to 2022. J.Y.L. Thong, C.S. Yap mentioned that small businesses are more likely to adopt IT when the CEOs are more innovative, have a positive attitude towards IT adoption, and possess greater IT knowledge. L. Li, F. Su, W. Zhang, J.-Y. Mao study the digital transformation to cross-border e-commerce undergone by 7 SMEs on the Alibaba digital platform and derive a process model that aims to describe and explain how SME entrepreneurs, with support from the digital platform service provider, drive digital transformation through managerial cognition renewal, managerial social capital development, business team building, and organisational capability building. C.K. Riemenschneider, D.A. Harrison, P.P. Mykytyn Jr. reviewed the theory of planned

behaviour (TPB) and the technology acceptance model (TAM) and applied a series of loosely to tightly integrated models to the IT adoption decisions of small businesses.

Table 12. Highly cited articles

No.	Authors	Title	Year	Cites	Cites per Year
1	J.Y.L. Thong, C.S. Yap	CEO characteristics, organizational characteristics and information technology adoption in small businesses	1995	543	19.39
2	L. Li, F. Su, W. Zhang, J.-Y. Mao	Digital transformation by SME entrepreneurs: A capability perspective	2018	387	77.40
3	C.K. Riemenschneider, D.A. Harrison, P.P. Mykytyn Jr.	Understanding it adoption decisions in small business: Integrating current theories	2003	363	18.15
4	T. Papadopoulos, K.N. Baltas, M.E. Balta	The use of digital technologies by small and medium enterprises during COVID-19: Implications for theory and practice	2020	272	90.67
5	S. Kurnia, J. Choudrie, R.M. Mahbubur, B. Alzougool	E-commerce technology adoption: A Malaysian grocery SME retail sector study	2015	173	21.63
6	T.H. Nguyen, M. Newby, M.J. Macaulay	Information technology adoption in small business: Confirmation of a proposed framework	2015	149	18.63
7	J. Lee	Discriminant analysis of technology adoption behavior: A case of Internet technologies in small businesses	2004	139	7.32
8	M. Ghobakhloo, T.S. Hong, M.S. Sabouri, N. Zulkifli	Strategies for successful information technology adoption in small and medium-sized enterprises	2012	131	11.91
9	V. Barba-Sánchez, M.D.P. Martínez-Ruiz, A.I. Jiménez-Zarco	Drivers, benefits and challenges of ICT adoption by small and medium sized enterprises (SMEs): A literature review	2007	126	7.88
10	D. Goerzig, T. Bauernhansl	Enterprise Architectures for the Digital Transformation in Small and Medium-sized Enterprises	2018	105	21.00
11	M.G. Colombo, A. Croce, L. Grilli	ICT services and small businesses' productivity gains: An analysis of the adoption of broadband Internet technology	2013	85	8.50
12	A. Morgan, D. Colebourne, B. Thomas	The development of ICT advisors for SME businesses: An innovative approach	2006	82	4.82
13	H. Matlay, M. Addis	Adoption of ICT and e-commerce in small businesses: An HEI-based consultancy perspective	2003	65	3.25
14	P. Matthews	ICT assimilation and SME expansion	2007	64	4.00
15	J.W. Peltier, Y. Zhao, J.A. Schibrowsky	Technology adoption by small businesses: An exploratory study of the interrelationships of owner and environmental factors	2012	62	5.64
16	M. Indriastuti, K. Fuad	Impact of covid-19 on digital transformation and sustainability in small and medium enterprises (smes): a conceptual framework	2021	61	30.50
17	L.A. Lefcbvre, E. Lefcbvre, J. Harvey	Intangible assets as determinants of advanced manufacturing technology adoption in sme's: toward an evolutionary model	1996	55	2.04
18	K. Antlová	Motivation and barriers of ict adoption in small and medium-sized enterprises	2009	53	3.79
19	S.M. Mutula, P. Van Brakel	ICT skills readiness for the emerging global digital economy among small businesses in developing countries: Case study of Botswana	2007	52	3.25
20	W. Ritz, M. Wolf, S. McQuitty	Digital marketing adoption and success for small businesses: The application of the do-it-yourself and technology acceptance models	2019	42	10.50

Source of Table 12: Author's own work using Ms Excel

DISCUSSION

In the current digital era, digital adoption among SMEs has become increasingly crucial. Regarding the adoption of digital technologies, SMEs confront unique challenges and opportunities. Digitalization enables new value creation opportunities and the expansion of value chains, but the rate and scope of transformation are contingent on global and local economic conditions (Dredge et al., 2019). In addition, digital financial services (DFS) are vital to digitalisation and necessitate policies that foster innovation while mitigating risks. Not only that, banks must develop expertise in evaluating digital projects, but governments can create an enabling environment by ensuring that regulatory constraints that impede innovation and investments in payment infrastructures are addressed by reforms (Lukonga, 2020). Technological innovation had a significant impact on the performance of businesses, particularly SMEs, in which they may play an essential role in the economic development of nations, particularly in the manufacturing sector. The adoption of digital technology, particularly ICT, is acknowledged as a way for SMEs to improve their information flow, reduce operational costs, and obtain competitive advantages. The analysis identifies a variety of source types that contribute to the literature on digital adoption among SMEs, with journals and conference proceedings dominating and emphasising rigorous research and scholarly engagement, while books and book series offer comprehensive coverage and in-depth analysis, possibly targeting both academic and non-academic audiences.

CONCLUSION

In conclusion, the incorporation of digital technology within the context of SMEs carries substantial significance within today's business setting. SMEs that actively utilise digital technologies can attain a competitive edge, better their operational efficiency, and enrich the experiences of their customers. Prior studies have highlighted the significance of individual and organisational attributes in influencing the extent to which SMEs adopt digital technologies. Various factors have been recognised as influential in promoting digital adoption, including the innovativeness of CEOs, their attitude towards IT adoption, and their level of IT competence. Additionally, certain organisational features such as firm size, the competitiveness of the environment, and the level of information intensity have also been found to have a significant role in digital adoption. Furthermore, studies have found certain factors that contribute to the successful adoption of digital technologies. These factors encompass a supportive organisational culture, the availability of training and technical support, and effective engagement with digital platform service providers. Numerous studies investigations have explored the underlying factors that motivate SMEs to embrace digital technologies. Research has examined the strategies employed by SMEs during the digital adoption process within certain timeframes and with samples of SMEs. Comparative research can shed light on the effects of contextual factors on the digital adoption journeys of SMEs by comparing digital adoption practises and results across various cultural contexts, regions, or nations. These studies have the potential to contribute to the identification of optimal strategies, cross-cultural discrepancies, and policy considerations in promoting the adoption of digital technologies among SMEs on a worldwide scale.

CONFLICT OF INTEREST STATEMENT

The authors declare that there are no conflicts of interest in conducting this research and no financial support was received for this study.

AUTHORS' CONTRIBUTIONS

Ira Syazwani conducted an extensive database search, designed the research methodology, and presented the findings. Kamarudin Othman shaped the research objectives and addressed key study-related issues. Finally, Hafizah Hammad Ahmad Khan was responsible for the literature review and the conclusion section.

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