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## DIGITAL TECHNOLOGY POLICY FOR SMEs: A BIBLIOMETRIC ANALYSIS

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**ABSTRACT.** This study aims to analyze digital technology policies, especially for SMEs publication trends regarding time, author, journal, affiliation, and institution; research areas that are prominent and influential on digital technology policies, especially for SMEs, as well as opportunities and limitations for future researchers to explore. This study uses Scientometrics analysis through bibliometric analysis. Data analysis was carried out in two parts through inductive analysis where the first was bibliometric analysis and in the second part, network mapping. Data were extracted from the Scopus database, in November 2021 during the period 2003-2021. The results of the study show that the highest publications were in 2020 as many as 19 documents; the most relevant source is Telecommunications Policy, the most cited authors are Depaoli, Paolo and the most relevant affiliate is Loughborough University. The results of the study have implications that in the future Digital Technology Policy for SMEs research will focus on studies on Digital Technologies barriers, innovation-diffusion, SME innovation and E-Business.

**Keywords:** bibliometric analysis; data visualization; digital technology policies; SMEs

## KEBIJAKAN TEKNOLOGI DIGITAL UNTUK UKM: ANALISIS BIBLIOMETRIK

**ABSTRAK.** Penelitian ini bertujuan untuk menganalisis tren publikasi kebijakan teknologi digital, khususnya untuk UKM terkait waktu, penulis, jurnal, afiliasi, dan institusi; area penelitian yang menonjol dan berpengaruh terhadap kebijakan teknologi digital, khususnya untuk UKM, serta peluang dan keterbatasan yang dapat dieksplorasi oleh para peneliti di masa depan. Penelitian ini menggunakan analisis Scientometrics melalui analisis bibliometrik. Analisis data dilakukan dalam dua bagian melalui analisis induktif di mana yang pertama adalah analisis bibliometrik dan pada bagian kedua, pemetaan jaringan. Data diekstrak dari database Scopus, pada bulan November 2021 selama periode 2003-2021. Hasil penelitian menunjukkan bahwa publikasi tertinggi pada tahun 2020 sebanyak 19 dokumen, sumber yang paling relevan adalah Telecommunications Policy, penulis yang paling banyak disitir adalah Depaoli, Paolo dan afiliasi yang paling relevan adalah Loughborough University. Hasil penelitian tersebut memiliki implikasi bahwa kedepannya penelitian Digital Technology Policy For SMEs akan fokus pada kajian tentang hambatan Teknologi Digital, difusi- inovasi, inovasi UKM dan E-Business.

**Kata kunci:** analisis bibliometrik; kebijakan teknologi digital; UKM; visualisasi data

### INTRODUCTION

SMEs play a role in the economic growth of a country by providing new jobs, increasing tax potential for the State, and being a driver of innovation (Katua, 2014). SMEs can increase competition and entrepreneurship so that it can be useful for increasing economic efficiency, innovation, and productivity. SMEs are also the main drivers for new entrepreneurs who are starting to get into business (Surya, B., Menne, F., Sabhan, H., Suriani, S., Abubakar, H., & Idris, M. (2021). SMEs also absorb a large number of workers in the Asian region (Sun, J., Makosa, L., Yang, J., Yin, F., Jachi, M., & Garikai Bonga, W. (2021). SMEs in Asian countries can absorb an average of 62 percent of the total workforce (Abisuga-Oyekunle, O. A., Patra, S. K., & Muchie, M., 2020). In Malaysia, for example, in 2015 it could absorb 65.5 percent of the total workforce there (Rusly, F. H., Talib, Y. Y. A., & Salleh, D, 2017). SMEs in Singapore can absorb

67 percent of the total workforce (Hamdan, 2021). Not only in Asia, in Europe, the United States, and Japan, SMEs play a role in absorbing labor in the range of 55 percent to 80 percent (Katua, 2014).

The role of SMEs also does not stop at their ability to absorb a large number of workers but also to improve the welfare of the community. The income obtained by the community, it can increase their purchasing power. This increase in purchasing power will encourage an increase in products and services. In meeting this increasing demand from society, more production activities are needed so that indirectly the economic productivity in a country will increase.

In recent years, the use of information and communication technology (ICT) by business people globally continues to increase. Online messaging applications such as WhatsApp, LINE, and BBM are estimated to be used by around 97 percent of smartphone users (Odeyemi, T. I., & Mosunmola, O. O, 2015). This increase in the

use of information technology is supported by several factors, including low costs, an increasing number of smartphone users, new online data storage models (cloud computing), and the increasing number of digital services available with Software as a Service (SaaS) (Cesaroni and Consoli, 2015). Among the various types of information technology, social media applications are the choice for business people. Social media opens up opportunities for business people to increase innovation by sharing, collaboration, and co-creation (Androutsos, A., & Brinia, V, 2019).

One of the challenges faced by SMEs today is their ability to compete with larger companies in terms of sales access to a wider market, financial access, and the use of information technology that has not been maximized (Asian Development Bank Institute, 2016; Machmud et, 2020). One of the obstacles experienced by SMEs is regarding marketing which is still limited due to problems in quality standards. For this reason, a special strategy is needed to increase competitiveness by utilizing information and communication technology, which is needed by local SME actors to face increasingly fierce business competition. One of the strategies that can be carried out cannot be separated from the policies adopted by the government.

Digital technology policy is a series of decisions, regulations and guidelines implemented by governments, organizations, or institutions to regulate, manage and optimize the use of digital technology in society (Farida, I., et al, 2020; Mahardhani, A. J. (2023). This policy is designed to achieve various goals, including supporting innovation, increasing accessibility, protecting data security and privacy, and ensuring fair and sustainable use of digital technology. Digital technology policy involves various aspects, including cybersecurity, data privacy, internet access, digital literacy, e-commerce, and more (Bhatia, N. L., et.al, 2021). Digital technology policy aims to create a conducive environment for developing digital technology while protecting the interests of society and the economy ((Farida, I., et al, 2020; Mahardhani, A. J. (2023). About SME digital technology, the digital technology policy for Small and Medium Enterprises (SMEs) aims to support the growth and development of SMEs in the digital era (Matt, D. T., et.al, 2020). This policy is essential in the digital age because it can help MSMEs take advantage of digital opportunities, increase operational efficiency, expand market reach, and

create an ecosystem supporting local and national economic growth. SMEs Digital Technology Policies can include Improving Internet Access, Digital Financing, Building E-commerce Platforms, Data Protection and Security:

Starting from the phenomenon above, to contribute to digital technology policy research for SMEs in the future, it is necessary to explore the trend of these topics. By conducting a review of digital technology policies for SMEs, the government and related institutions can identify the concrete steps needed to support SMEs in maximizing the potential of digital technology, create an ecosystem that promotes business growth, and increase the competitiveness of SMEs in an increasingly digital global economy. To achieve this goal, the researcher uses bibliometric analysis developed by previous researchers (Kulakli & Osmanaj 2020). Bibliometrics is a systematic method used to analyze scientific journals and other written and unwritten (digital) publications (Harande 2001; Herlinawati et al, 2020). Bibliometrics is the oldest study in library science and includes quantitative studies (Glanzel 2003). Bibliometrics involves the quantitative analysis of certain characteristics of a publication or document, including author, subject, publication information, cited sources, etc. Bibliometric analysis can investigate how scientific the communication process occurs (Güzeller and Elikler, 2018). Bibliometric studies allow the identification of trends in a particular field by measuring the literature in this area (Kasemodel et al. 2016).

Several studies on bibliometrics carried out using almost the same method have been carried out in various fields, including agriculture (Santana et al. 2021), economics (León-Gómez et al. 2021), social (Liu et al. 2021), and education. (Drajati et al., 2021). From this study, there has been no bibliometric study in the field of digital technology policy, especially focusing on SMEs. Within the scope of the research, we tried to review all the works on digital technology policy for SMEs published in the Scopus database between the period 2003-2021. Next, analyze the core authors/co-authors, research institutes, cited articles, and keywords about digital technology policy.

## METHOD

This study uses a quantitative method with five scientific stages adopted from Firdaus et al, 2019. The five stages are as follows: Stage 1 is

designing the study, creating research questions, keywords, and database selection. Stage 2, collecting data with the shortlisting technique. Stage 3, bibliometric analysis is done using biblioshiny, this is to help interpret the data (Jones and Gatrel 2014). Stage 4, analyzing the results and interpreting them along with predictions for future research. Stage 5, identifying research gaps that can be used as recommendations for synthesizing existing studies. More clearly these stages are shown in Figure 1.

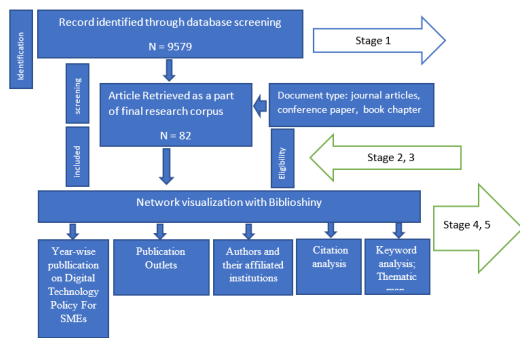


Figure 1. Process of data screening and visualization

**Database, Keywords and Inclusion Criteria**

Data were extracted from the Scopus database, in November 2021 to reach the relevant information in this study. Scopus is best suited for bibliometric analysis and includes publications from top journals (Korom 2019). The data analyzed in the period 2003-2021 regarding Digital Technology Policy for SMEs. To facilitate a suitable search, the search term

“DIGITAL TECHNOLOGY POLICY” is used to search for keywords, abstracts and titles so that initial results are obtained as many as 9579 documents (string TITLE-ABS-KEY (digital AND technology AND policy). This research is limited to research only related to the DIGITAL TECHNOLOGY POLICY FOR SMES which produced 82 documents (TITLE-ABS-KEY ( ‘digital AND technology AND policy AND for AND messages), then articles focusing on Digital Technology Policy for SMEs were selected for the final analysis.

**Bibliometrics Analysis**

Bibliometric statistics initiate the analysis in this study. There are two analyzes in this regard, namely, first, a performance analysis that assesses different parameters (author, affiliation, country, etc.) through a bibliographic index that is built based on data citations and authors related to the data. Second, it includes a science mapping analysis that takes data from mapping social structures and research cognitive networks (Aria M, Cuccurullo C,2017, Salinas-Ríos, K. (2022). For this activity use a workflow as shown in Figure 2. Data analysis was carried out in two parts through inductive analysis (Seuring and Müller 2008) where the first was bibliometric analysis and in the second part, network mapping. Package R is statistical software that assimilates well between bibliometric analysis and graphical analysis through an integrated data visualization tool using *Biblioshiny*.

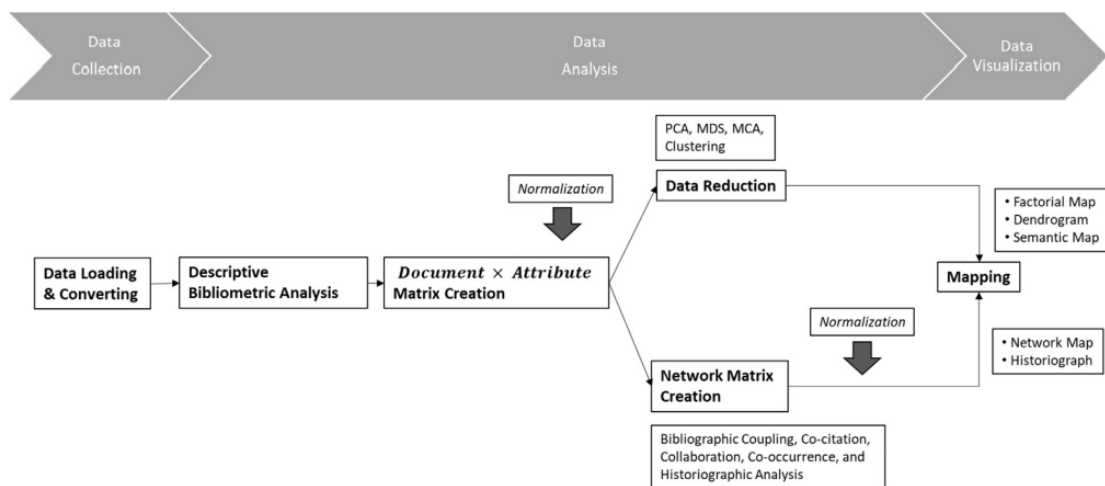


Figure 2. Main methodology’s phases-adapted from Aria and Cuccurullo (2017) and Firdaus et al. (2019).

**RESULTS AND DISCUSSION**

The main bibliometric statistical descriptions in this study include the author, indication, information, and country of the study. Each category has been thoroughly analyzed using the following techniques: (1) Year-wise

publication on Digital Technology Policy For SMEs, (2) Publication Outlets, (3) Authors and their affiliated institutions; (4) Citation analysis, (5) Keyword analysis; Thematic map, Trend topics, and Thematic categorization. Further analysis is presented in the following subsection.

### Year-wise Publication on Digital Technology Policy for SMEs

Related to the Digital Policy for SMEs has increased with an average growth of 7.14 percent per year. Increase the number of articles published on Digital Technology Policy for SMEs from just 1 article in 2003 to 19 articles in 2020, and allow for a similar increase in 2021

Several reasons that may occur are that most researchers in the world have understood that the Digital Technology Policy for SMEs study has a broad scope and has a very large impact on the sustainability of SMEs. Another possible reason is realizing the large role of SMEs in a country's economy, while the problems faced by SMEs in the world are almost the same apart from being related to capital, the quality of human resources, but also dealing with marketing problems. Digital technology is a must for SMEs.

Descriptive analysis of the headlines shows that the average is 5.802, while the average citations per year per doc is 1.826, and the total number of authors is 217. This shows that the analysis focuses on information related to citations and authors.

### Publication Outlets

The list of the most important or relevant journals published about Digital Technology Policy For SMEs, the top 10 journals are contributing 19.75% of the total articles. Telecommunications Policy is the best-known source which published 3 articles. The IEEE Global Engineering Education Conference Educon, Lecture Notes In Information Systems And Organisation, Lecture Notes In Networks and Systems, and The Routledge Companion To The Cultural Industries each published 2 articles. This study of Digital Technology Policy For SMEs is mostly found in high-quality journals. Then, the majority of publications, studies on Digital Technology Policy For SMEs are widely published in conference proceedings compared to journals.

### Authors and Their Affiliated Institutions

ABDULNOUR G is in the highest order occupying the top author position with an h-index 1. The G-index is calculated based on the distribution of citations received by a researcher. The G-index is the only numeric indicator with at least a lower limit of 2. ABDULNOUR G has a G-index of 1 which means the author has published at least 1 article which in combination received a citation. Habibi has a G-index of 5 which means the author has published at least 5 articles which in combination received 28 citations.

The top institutions affiliated with the authors who published articles or papers in the field of Digital Technology Policy For Smes, with the top three being Murdoch University and Zew-Leibniz Center For European Economic Research (5 Papers), Cersi - Luiss Guido Carli University, Higher Colleges Of Technology, Loughborough University, North-Caucasus Federal University, Tallinn University, University Of Southern Denmark, University Of Technology, And State University, Denmark, And State University Documents. This shows that research in the field of Digital Technology Policy For SMEs is focused on universities, which are mostly engaged in technology. This indicates that most of the research has been carried out at these three institutions and more studies can be conducted at other institutions. Institutions engaged in technology have realized the importance of Digital Technology Policy For SMEs as a future asset and are slowly being studied.

### Citation Analysis

The number of citations determines the number of citations received by a researcher. Articles that are frequently cited are considered more productive than those that are less quoted. The best way to assess the value of a research article is to use citation analysis. An article that has many local citations is considered productive in the field of Digital Technology Policy For SMEs. Observable gaps in local and global citations indicate that Digital Technology Policy For SMEs has been in great demand from other disciplines.

Table 1 shows a list of authors of the widely cited Digital Technology Policy For SMEs locally and globally from 2003 to 2021. Global citations indicate the frequency of reports, including areas of research, and are mentioned throughout the database. The frequency with which articles are cited in other publications of articles is indicated in local citations. Dutta, G., Kumar, R., Sindhwani, R., Singh, R.K. (2020) topped the list with 3 citations in 2020. This shows that Dutta, G., Kumar, R., Sindhwani, R., Singh, R.K. has the most influential articles with relevant research for research in the field of Digital Technology Policy For SMEs.

They studied functional areas that could potentially leverage Industry 4.0 technology and help Indian manufacturing companies transform. This study takes its context from a review of relevant literature intended to examine academic articles published up to the end of September 2018, followed by a maturity





From 2003-2019 several studies were carried out in the field of SMEs, and Digital Transformation. In 2020-2021 several studies examine the internet of things and industry 4.0. Figure 6 shows the words used in journals related to Digital Technology Policy For SMEs and related issues. The frequency of distribution of words that show an increase from 2003-2021 is Digital Economy and Industry 4.0. This shows that studies on Digital Technology Policy For SMEs continue to be carried out in connection with the demands of the industrial revolution 4.0 and global economic challenges that require SMEs to use the role of technology.

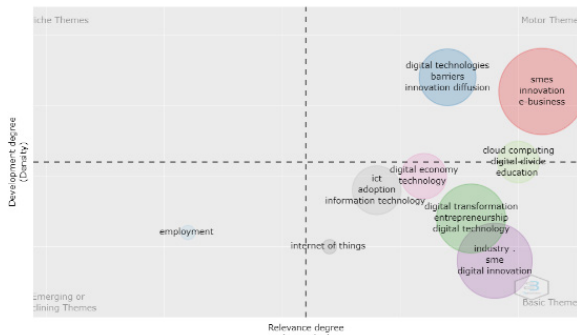


Figure 5. Word cloud of digital technology policy for SMEs

Figure 7 shows the growth of words from 2015 when information technology progresses rapidly, Digital Technology Policy For SMEs is a source of studies in the SME's field, especially in improving SME's performance. The word treemap highlights possible combinations of keywords that represent the digital economy, digital innovation, digital technologies, digital transformation, entrepreneurship, ICT, Industry 4.0, Innovation and SMEs.

**Trend topics**

Over the years in 2015-2019 a study that examined the Digital Technology Policy for SMEs related to Innovation and SMEs. Furthermore, in 2019-2021, the topic trend that examines Digital Technology Policy For SMEs is related to digital transformation, Industry 4.0, digital technology, and SMEs (Fig. 8). These four topics are still predicted to exist in future research and are widely associated with the development of Digital Technology Policy For SMEs globally.

Co-citation analysis is defined as citing a new research paper together. This technique is used to find the most important material and to understand the intellectual structure of research publications in bibliometric analysis.



Figure 6. Word Tree Map of digital technology policy for SMEs literature

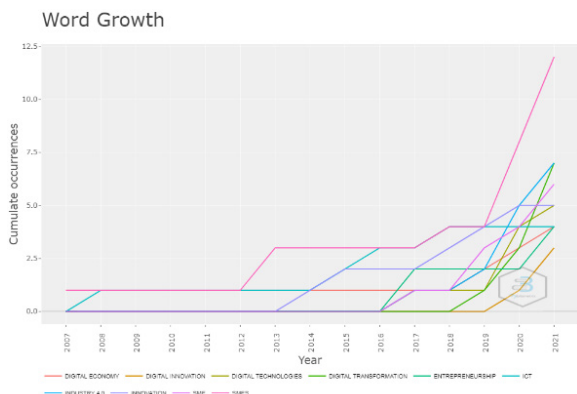


Figure 7. Word Growth of digital technology policy for SMEs literature

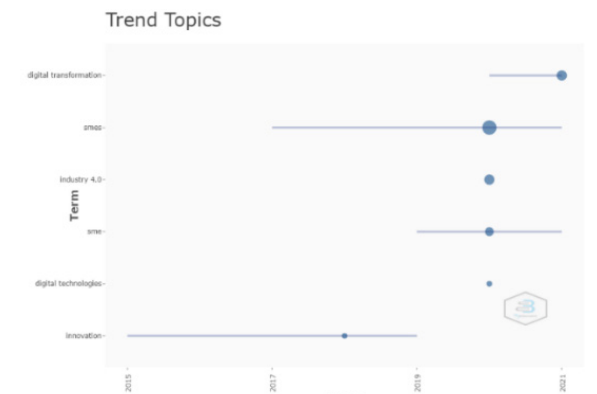
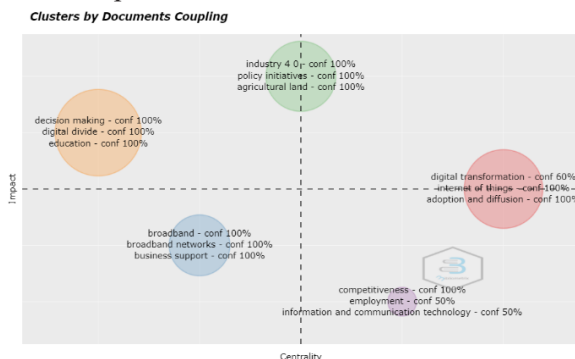


Figure 8. Trend Topics of digital technology policy for SMEs

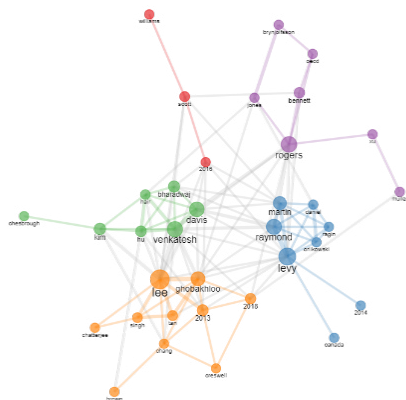
**Thematic categorization**

Clustering In the diagram, studies can be separated into different groups. This study is grouped in the same cluster, has the same problem, and is distinguished from items in other clusters. The formation of clusters helps to evaluate the co-citation network theme analysis. Figure 9, shows that the studies discussed have a considerable impact on the concept of Digital Technology Policy For SMEs, such as digital transformation has an impact of 60% and internet of things 100%. From this, it can be understood that the constructs built-in Digital Technology Policy For SMEs can be internal or external.

Figure 10 shows that the most influential co-citation network is Raymond. Raymond is the person most cited in explaining the concept of Digital Technology Policy For SMEs through his research results “The Assimilation of E-business in Manufacturing SMEs: Determinants and Effects on Growth and Internationalization”. In summary, the results of the study explain that to become a ‘world class’ company, manufacturing SMEs must at least be able to invest in technology, especially the internet as infrastructure in e-business applications. E-business can significantly affect a company’s business processes.



**Figure 9. Clusters by Documents Coupling of digital technology policy for SMEs**



**Figure 10. Documents Coupling of digital technology policy for SMEs**

**CONCLUSION**

According to the results of the study, it shows that Telecommunications Policy is the best-known source that published 3 articles. The most relevant affiliate regarding the publication of Digital Technology Policy For SMEs is Murdoch University. Duta G is the top and most cited author with 3 scientific publications published related to Digital Technology Policy For SMEs. It is also known that the United Kingdom collaborates the most with China regarding research publications, namely 2 times.

The research that can still be developed (research is rarely done) related to Digital Technology Policy For SMEs research is digital transformation. Industry 4.0, digital technology, and SMEs. Furthermore, the most existing (influential) co-citation network is Raymond.

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