



Information Technology Strategy for Micro, Small, and Medium Enterprises in the Era of Industry 4.0

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ABSTRACT

During the industrial revolution 4.0, business and industry competitiveness expanded. Because of circumstances like these, competition between firms or micro, small, and medium enterprises (MSMEs) is also increasing. To create and maintain a competitive advantage, a business must be able to dominate the market by enhancing its strategy. The ability of companies to expand market segments by introducing distribution channels and innovations by employing technical advancements is one of the company's development tactics. To identify potential and difficulties for further study, this article aims to evaluate information technology solutions for empowering Micro, Small, and Medium Enterprises. The Biblioshiny tool was used to conduct the literature review for this article. Results Scientific publications investigate opportunities and obstacles to determine the function that strategic information technology supports in the case study of Micro, Small, and Medium Enterprises.

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1. Introduction

Digitalization and automation are beginning to have an impact on numerous areas in the era of the Industrial Revolution 4.0. Robotics and modern machinery have improved the efficiency of several tasks [1]–[4]. Overall, this situation will substantially impact economic development at the local and national levels if properly implemented and maintained. The difficulties of the Industrial Revolution 4.0 period are worth discussing because they directly affect stakeholders in the MSMEs sector (Micro Small and Medium Enterprises) and are homework for the government [5], [6].

MSMEs are even hailed as a pillar of the Indonesian economy in their home country, where they play a crucial role and contribute significantly to the national economy. MSMEs made up 8.573.9 trillion IDR of Indonesia's gross domestic product (GDP) in 2018. Since Indonesia's GDP is 14,838.3 trillion rupiahs and this calculation uses current prices, it can be said that MSMEs are responsible for 57.8% of Indonesia's GDP this year. MSMEs, which have the support of more than 90% of business owners, can be considered the foundation of the Indonesian economy. Even though they provide a sizable and substantial contribution, Indonesian SMEs nevertheless have poor levels of competitiveness, necessitating additional government support [7]. The G20 Digital Economy Working Group is still bringing up the need for digital technology adoption in many businesses in media conversations.

Given that society is going digital, there are many obstacles, and there are also more and more hazards to digital security; the role of digital platforms in establishing digital trust or user confidence in digital interactions and transactions is vital. Whether they like it or not, MSMEs need an IT plan to survive in the digital age. Information Technology Strategy, Technology Strategy, Information and Communication Strategy (ICT), or Information Systems Strategy (IS) are just a few of the many titles for T strategy [2], [8], [9]. Whatever the name, it refers to a strategy for generating lasting value by making the most use of IT resources and capabilities. In a nutshell, IT strategy establishes a framework for long-term value generation through IT.

To address issues with competitiveness in the 4.0 industrial era and the emergence of new opportunities and difficulties for MSMEs in reacting to these changes, the goal of this paper is to perform a literature analysis on information technology strategies for MSMEs in Indonesia.

2. Materials and Methods

2.1. Literature Study

This article uses a literature study to seek information from international and national sources. The tools used in this article are Biblioshiny. The main information from the review conducted can be seen in Figure 1.



Figure 1 Main information in the review results

Figure 1 describes research on information technology strategies for MSMEs from 1992 to 2023, and there are 406 studies from 246 different sources. The results of the review are divided from various places of journal publication, and the number of citations to the journal is shown in Figure 2.

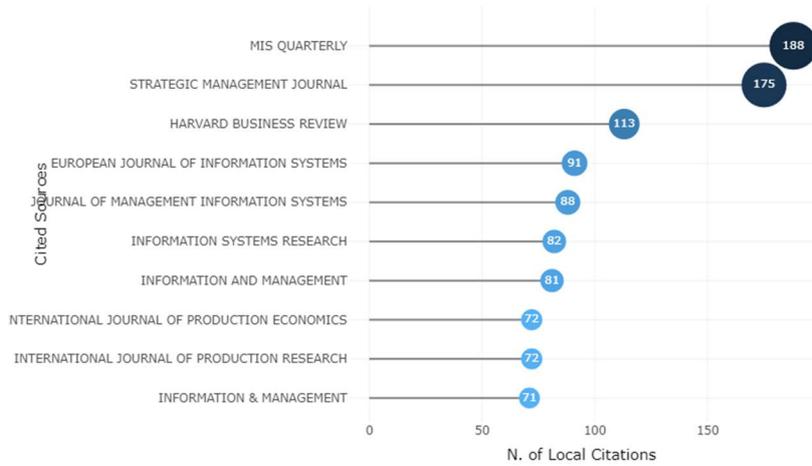


Figure 2 Most Local Cited Source

From Figure 2, the MIS Quarterly has a lot of citations, with a total of 188 citations. Furthermore, the results of a review of the many words searched for are in Figure 3.

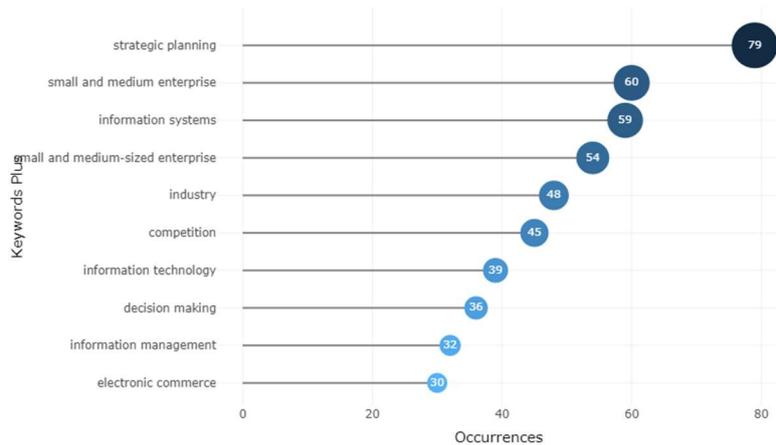


Figure 3 Most Local Cited Source

From Figure 3, it can be concluded that the keywords most searched for are strategic planning and small and medium enterprises.

2.2. IS/IT Strategy

In its most basic and straightforward definition, strategy is a management (planning) concept described as a sophisticated and systematic long-term plan of action created to realize fundamental long-term objectives or particular objectives of an organization or business. It is a design or strategy that unifies an organization's primary goals, guiding principles, and course of action into a unified whole [8], [10], [11]. IS strategy primarily focuses on matching IS development to business requirements and attempting to obtain strategic advantages through effective IT utilization in businesses [12]–[14]. A business strategy, IS, and IT are interrelated in several conceptual frameworks created by various academics and researchers in industry and IS/IT. Figure 4 shows the three domains that comprise

the Michael J. Earl-created three-level IS/IT strategy framework: IS strategy, IT strategy, and Management Information (IM). Each discipline has its components. This model shows a varied balance between the IS function and general management in each field, making it substantially more explicit about the duties for each domain [15]–[17].

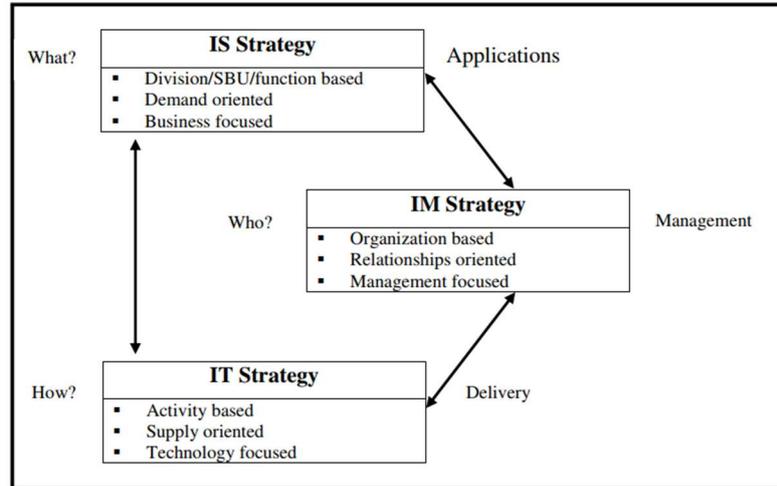


Figure 4 Three levels of strategy in IS/IT [12].

The framework for information systems strategy created by Robert D. Galliers [18] offers a summary, and a clear grasp of an IS strategy's main linked elements, including the idea of change management, a crucial topic in business and IT. Understanding the organizational hierarchy of interrelated IS strategy components and their relationship to business strategy has shown to be helpful with a framework made up of interacting parts combined to form an IS strategy. Information strategy, IT strategy, information management strategy, and change management/implementation strategy all represent these elements, as seen in Figure 5.

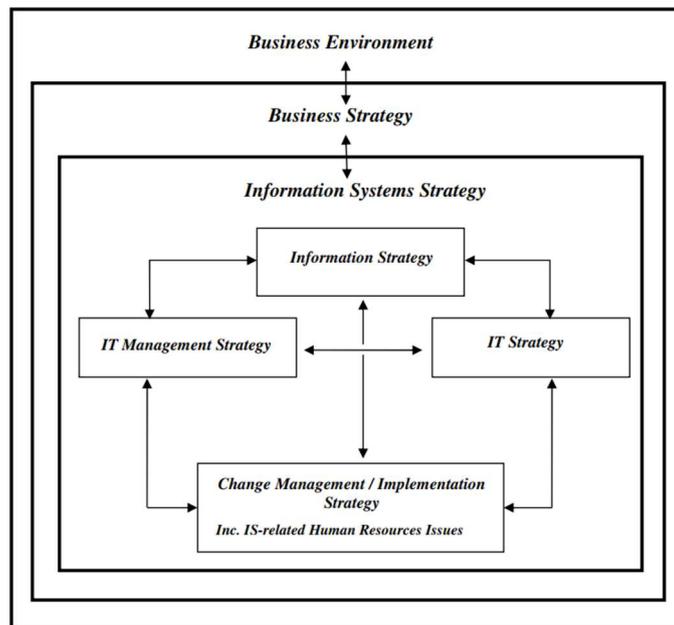


Figure 5. Information System Strategy Components [18]

It should be noted that, in Galliers' opinion, the core business strategy is more important than the technical issues, which are dealt with by the IT strategy, and the infrastructure issues, it is also handled by the IT Management strategy as shown in Figure 5 of his conceptual framework of IS strategy. Different planning strategies are required when this dual nature is recognized [18][19].

The main focus of IT strategy is technology policy, which describes how the organization's need for information and systems will be met through technology. It primarily addresses "Supply IT" [12]. It manages the supply of IT capabilities, resources, and services, such as IT operations, systems development, and user support (including hardware, software, and telecommunications) [20]. In essence, IT strategy focuses on preferred approaches, security levels, required systems, applications, platforms, and real-world information delivery realities [12]. As a result, it focuses on the technology infrastructure needed to achieve information strategy goals. It offers the framework within which IT application developers can sell their products and users can access them [12], [21], [22].

As part of the "MIT90s" project, which Michael Scott-Morton ran at the Center for Information Systems Research (CISR) at MIT, strategic IT research initially appeared in the late 1980s. Ten (later increased to 12) of the largest or most notable IT users in Europe and the United States participated in this multi-year experiment, which ran from 1984 to 1992. (Arthur Young & Co., British Petroleum, BellSouth, Cigna, Digital Equipment Corp., Kodak, GM, ICL, MCI, US IRS, and US Army). The MIT90 framework [23] is a model that explains a set of linkages between five fundamental constructs: strategy, structure, technology, people, and management processes. It was born out of these initiatives. The classic Strategic Alignment Model was derived from MIT90 framework components that examined the interaction between corporate strategy, IT, structure, and management processes. The MIT90 framework aimed to explore IT-led organizational transformation [24].

2.3. MSMEs

According to the standards outlined by Law No. 20 of 2008, a productive economic enterprise operated by entrepreneurs or individuals is referred to as an MSME [25], [26]. Learning from fundamental breakthroughs in India and the Burro Battery in Ghana can be an alternative strategy to boost the sustainability of MSMEs. The country's case studies demonstrate that high-level policymakers' recognition of social innovation as a significant force for resolving social issues and fostering sustainable economic growth is a crucial success element in managing innovation. For instance, the National Innovation Foundation (NIF)-India, a government organization in India, and the Honey Bee Network, a socially innovative commercial company, are looking for open innovation. The Ghanaian government is also responsible for keeping an eye on large corporations and MSMEs. Nonprofit organizations like Burro can survive thanks to government intervention. At the same time, the government has developed tools designed to support the private sector that businesses can use [27].

As a method of collaboration between business, government, science, and society to achieve sustainability in the Industry 4.0 industrial era, Yun and Liu [28] also suggest the quadruple helix concept. However, a flexible, dynamic, and open platform is necessary for a collaborative ecosystem [29]. Learning from other nations that, provided the players involved in the collaboration share the same ideals, collaboration or partnerships between the state and the private sector in social tasks boost the capacity and sustainability of MSMEs to fulfill their goals. Cooperation between state and non-state actors also means that each cooperating

actor takes responsibility for political outcomes, according to Ansell and Gash [28], which necessitates the direct involvement of stakeholders in decision-making and production processes. Because of the absence of trust between various actors, it will be challenging to develop Indonesian MSME policies that uphold the shared values of all actors, as demonstrated by Burro, who wishes to address rural difficulties. It is more lucid in places removed from the bureaucracy of major cities. In other words, Burro prefers to have a minimum connection with the government as a private corporation [27].

3. Result and Discussion

Based on a review of several existing papers, MSMEs must be able to identify themselves, where they are currently, and where they are going, then determine how IT fits into the model being built. The strategy development phase is essential in the strategic management process. The strategy formulation phase is the research, analysis, and decision-making process that enables SMEs to achieve goals with the organization's competitive advantage. This includes identifying competitive advantages, establishing a mission and achievable and probable goals, and formulating policies. Table 1 is the SWOT Matrix for MSME Empowerment in Indonesia.

Table 1 SWOT Matrix For MSME Empowerment in The Industrial Revolution Era 4.0

EFAS \ IFAS	Strength (S)	Weakness (W)
Opportunities (O)	Strategy S-O	
	1. With the assistance of the government and big businesses, increasing HR training in terms of digitization in the sales and marketing process	Strategy W-O 1. Best use of government support infrastructure 2. A request for corporate social responsibility from large businesses 3. Making use of government assistance to improve MSME actors' understanding 4. Improving IT soft skills for actors in MSME 5. Internet usage is distributed equally; 6. Product quality is maintained to keep customers.
	2. Government help combined with business assistance	
	3. Capitalization of money derived from different sources	
	4. Development of current businesses	
	5. Advice on how to keep service and product quality high so that customers continue to buy our items with loyalty	
	6. Better training Making use of social media and other technology to run advertisements on Facebook or Instagram	
7. The adoption of innovative technology in the financial sector		
Threat (T)	Strategy S-T	
	1. Increasing the variety of small and micro businesses.	Strategy W-T 1. Examine influential businesspeople who provide money without conditions. 2. Speak with an accessible business professional 3. Request for government support 4. Attend training sessions offered by organizations that assist MSMEs. 5. Continue digital sales and marketing's digitalization approach to develop IT soft skills.
	2. Improving collaboration between small and micro companies.	
	3. Technical Competence of MSME Actors in Management and Marketing	
	4. Create product improvements that are distinct from competitors to reduce the threat of having many competitors.	
	5. Always broaden your knowledge of technical developments to avoid falling behind other businesses.	
6. Encourage customers to trust the security of online transactions		

1. Some general implications may be taken from the study findings and analysis of the empowerment findings in Table 1 using SWOT analysis, internal factor

- analysis summary (EFAS), and external factor analysis summary (IFAS) [30]–[33].
2. MSMEs have unique qualities, such as a high business turnover (turnover) that is not susceptible to lending rates and keeps growing even during an economic and financial crisis. The range of trading options is also quite broad.
 3. The Covid-19 epidemic has also impacted MSMEs in Indonesia. Sales, revenue, and profits all fell as a result of this. Therefore, comprehensive and inclusive coordination and cooperation activities are required for these MSMEs to continue to operate, exist, and contribute to the Indonesian economy.
 4. MSMEs are crucial to the development and support of the Indonesian economy. Therefore, if MSMEs do not function well, Indonesia will suffer. The main effect is a recession in the economy, which can then result in social unrest.
 5. Based on the study performed using the SWOT analysis approach, critical, urgent issues were identified among several significant problems, and prompt answers were required. The point is that many MSMEs still do not use information technology extensively, especially in product management, sales, and marketing.
 6. The analysis shows that the best way to support micro and small enterprises is to exploit their strengths to seize long-term possibilities through the Technical Competence of MSME Actors in Management and Marketing
 7. Six methods for empowering MSMEs have been determined based on this research. The six tactics include:
 - a. Increasing the variety of small and micro businesses
 - b. Improving collaboration between small and micro businesses
 - c. Technical Competence of MSME Actors in Management and Marketing
 - d. Create product improvements that are distinct from competitors to reduce the threat of having many competitors.
 - e. Always broaden your knowledge of technical developments to avoid falling behind other businesses.
 - f. Encourage customers to trust the security of online transactions.

In addition, for further research, a comprehensive program is made based on these six strategies. From this program, it is necessary to arrange appropriate activities according to the needs. If so, it facilitates the development of success indicators. IT strategy planning for MSMEs is in line with regulations relating to the implementation of Presidential Regulation (PERPRES) Number 95 of 2018 concerning electronic-based government systems, which must be implemented in all agencies, both ministries and agencies, including local governments. At the local government level, the unit that plays a role in MSME management, along with the unit responsible for IT management in the local government, coordinates and synchronizes programs that support the transformation of MSMEs towards Industry 4.0.

4. Conclusions

Focusing on MSMEs, Prospects, and Challenges discusses the excellent opportunities for MSMEs to transform their businesses through digitalization successfully. MSMEs should be able to boost their competitiveness and compete effectively and efficiently by understanding and utilizing digitization. MSMEs can benefit from the possibilities provided by digitization in straightforward ways, such

as by actively using social media sites like Twitter, Facebook, and Instagram as business accounts to promote firm advertising initiatives. Another choice is to use a marketplace, namely online marketplaces, and develop a blog that supports your company online, for instance, utilizing a free blog. When economic players cannot adjust their businesses, another choice is to use a marketplace and develop a blog that promotes your company online, for instance, utilizing a free blog. Of course, this possibility becomes a threat, and the problem for the business world becomes even more remarkable when economic actors cannot achieve business improvements by leveraging digital platforms as one of their company strategies.

Bibliography

- [1] L. F. Baptista and J. Barata, "Piloting industry 4.0 in SMEs with RAMI 4.0: An enterprise architecture approach," *Procedia Computer Science*, vol. 192, pp. 2826–2835, 2021, doi: 10.1016/j.procs.2021.09.053.
- [2] S. Bouchard, G. Abdulnour, and S. Gamache, "Agility and Industry 4.0 Implementation Strategy in a Quebec Manufacturing SME," *Sustainability (Switzerland)*, vol. 14, no. 13. MDPI, 2022. doi: 10.3390/su14137884.
- [3] I. Ahmed, G. Jeon, and F. Piccialli, "From Artificial Intelligence to Explainable Artificial Intelligence in Industry 4.0: A Survey on What, How, and Where," *IEEE Transactions on Industrial Informatics*, vol. 18, no. 8, pp. 5031–5042, Aug. 2022, doi: 10.1109/TII.2022.3146552.
- [4] A. Andreoni and H.-J. Chang, "The political economy of industrial policy: Structural interdependencies, policy alignment and conflict management," *Structural Change and Economic Dynamics*, vol. 48, pp. 136–150, Mar. 2019, doi: 10.1016/j.strueco.2018.10.007.
- [5] V. A. Alexandru *et al.*, "Knowledge management approaches of small and medium-sized firms: a cluster analysis," *Kybernetes*, vol. 49, no. 1. Emerald Group Holdings Ltd., pp. 73–87, 2020. doi: 10.1108/K-03-2019-0211.
- [6] M. E. Ahmed and M. Latif, "Exploiting simulation for product returns in SMEs," *WCE 2010 - World Congress on Engineering 2010*, vol. 3. pp. 2363–2368, 2010. [Online]. Available: <https://www.scopus.com/inward/record.uri?eid=2-s2.0-79959833879&partnerID=40&md5=41055984b56e9878506041d74630b9f6>
- [7] L. Anatan, "Sosialisasi Strategi Bersaing Era Revolusi Industri 4.0 Pada Pelaku Usaha Mikro Kecil dan Menengah (UMKM) di Bandung," in *Prosiding Seminar Nasional Pengabdian Kepada Masyarakat*, 2020, pp. SNPPM2020EK-25.
- [8] J. E. Gerow, V. Grover, J. Thatcher, and P. L. Roth, "Looking Toward the Future of IT–Business Strategic Alignment through the Past: A Meta-Analysis," *MIS Quarterly*, vol. 38, no. 4, pp. 1159–1186, 2014.
- [9] E. Bellini, "Which collaboration strategy for the networked enterprise in wine industry? Technological and organizational challenges," *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, vol. 7200 LNCS. pp. 17–30, 2012. doi: 10.1007/978-3-642-31739-2_3.
- [10] M. A. Gagnon, K. J. Jansen, and J. H. Michael, "Employee Alignment with Strategic Change: A Study of Strategy-supportive Behavior among Blue-collar Employees," *Journal of Managerial Issues*, vol. 20, no. 4, pp. 425–443, 2008.
- [11] M. Bloemen-Bekx, A. Van Gils, F. Lambrechts, and P. Sharma, "Nurturing offspring's affective commitment through informal family governance mechanisms," *Journal of Family Business Strategy*, vol. 12, no. 2, p. 100309, Jun. 2021, doi: 10.1016/j.jfbs.2019.100309.
- [12] M. J. Earl, "Management Strategies for Information Technology. PrenticeHall," *Inc., Upper Saddle River, NJ, USA*, 1989.
- [13] F. Kitsios, M. K.-B. P. M. Journal, and undefined 2019, "Business strategy modelling based on enterprise architecture: A state of the art review," *emerald.com*, vol. 25, no. 4, pp. 606–624, Jun. 2019, doi: 10.1108/BPMJ-05-2017-0122/full/html.
- [14] B. Berg and A. C. Stylianou, "Factors considered when outsourcing an IS system: An empirical examination of the impacts of organizational size, strategy and the object of a decision," *European Journal of Information Systems*, vol. 18, no. 3. Palgrave Macmillan Ltd., pp. 235–248, 2009. doi: 10.1057/ejis.2009.18.

- [15] A. Al-Surmi, G. Cao, and Y. Duan, "The impact of aligning business, IT, and marketing strategies on firm performance," *Industrial Marketing Management*, vol. 84, pp. 39–49, Jan. 2020, doi: 10.1016/j.indmarman.2019.04.002.
- [16] C. Gellweiler, "IT architects and IT-business alignment: a theoretical review," *Procedia Computer Science*, vol. 196, pp. 13–20, Jan. 2022, doi: 10.1016/j.procs.2021.11.067.
- [17] V. Dutot, F. Bergeron, and L. Raymond, "Information management for the internationalization of SMEs: An exploratory study based on a strategic alignment perspective," *International Journal of Information Management*, vol. 34, no. 5, pp. 672–681, Oct. 2014, doi: 10.1016/j.ijinfomgt.2014.06.006.
- [18] R. D. Galliers, "Towards a flexible information architecture: integrating business strategies, information systems strategies and business process redesign," *Information Systems Journal*, vol. 3, no. 3, pp. 199–213, 1993.
- [19] W. Robson, "Strategic management and information systems," 1997.
- [20] J. Ward, P. M. Griffiths, and P. Whitmore, *Strategic planning for information systems*, vol. 3. Wiley Chichester, 2002.
- [21] D. Allen, "Information systems strategy formation in higher education institutions," *Information research*, vol. 1, no. 1, pp. 1–1, 1995.
- [22] A. Joshi, L. Bollen, H. Hassink, S. De Haes, and W. Van Grembergen, "Explaining IT governance disclosure through the constructs of IT governance maturity and IT strategic role," *Information & Management*, vol. 55, no. 3, pp. 368–380, Apr. 2018, doi: 10.1016/j.im.2017.09.003.
- [23] "Corporation of the 1990s | Guide books." <https://dl.acm.org/doi/abs/10.5555/575049> (accessed Dec. 04, 2022).
- [24] T. Coltman, P. Tallon, R. Sharma, and M. Queiroz, "Strategic IT alignment: twenty-five years on," *J Inf Technol*, vol. 30, no. 2, pp. 91–100, Jun. 2015, doi: 10.1057/jit.2014.35.
- [25] W. Febriantoro, "Kajian dan strategi pendukung perkembangan e-commerce bagi UMKM Di Indonesia," *Jurnal Manajerial*, vol. 17, no. 2, p. 184, 2018.
- [26] T. Tambunan, "UMKM Indonesia," *Buku Dosen-2014*, 2012.
- [27] J. J. Yun, A. A. Egbetoku, and X. Zhao, "How Does a Social Open Innovation Succeed? Learning from Burro Battery and Grassroots Innovation Festival of India," *Science, Technology and Society*, vol. 24, no. 1, pp. 122–143, Mar. 2019, doi: 10.1177/0971721818806101.
- [28] J. J. Yun and Z. Liu, "Micro-and macro-dynamics of open innovation with a quadruple-helix model," *Sustainability*, vol. 11, no. 12, MDPI, p. 3301, 2019.
- [29] C. Ansell and A. Gash, "Collaborative governance in theory and practice," *Journal of public administration research and theory*, vol. 18, no. 4, pp. 543–571, 2008.
- [30] M. M. Helms and J. Nixon, "Exploring SWOT analysis—where are we now? A review of academic research from the last decade," *Journal of strategy and management*, 2010.
- [31] H. W. Oetomo and L. Ardini, "SWOT analysis in strategic management: a case study at Purabaya bus station," *Journal of Economics, Business, & Accountancy Ventura*, vol. 15, no. 2, pp. 171–186, 2012.
- [32] D. W. Pickton and S. Wright, "What's swot in strategic analysis?," *Strategic change*, vol. 7, no. 2, pp. 101–109, 1998.
- [33] D. Leigh, "SWOT analysis," *Handbook of Improving Performance in the Workplace: Volumes 1-3*, pp. 115–140, 2009.