

Technology Adoption Issues and Challenges for Micro, Small and Medium Enterprises: A Case Study of the Food and Beverage Sub-Sector in Indonesia*

Nika PRANATA¹, Muhammad SOEKARNI², Erla MYCHELISDA³, Rio NOVANDRA⁴, Agus Eko NUGROHO⁵,
Bahtiar RIFAI⁶, Pihri BUHAERAH⁷, Muhammad ZULHAMDANI⁸, Retno Rizki Dini YULIANA⁹

Received: November 30, 2021 Revised: February 08, 2022 Accepted: February 15, 2022

Abstract

MSMEs in the food and beverage industry play a critical role in the Indonesian economy since they account for the majority of the manufacturing sector's GDP. Despite its importance, it is unable to compete on a worldwide scale due to a lack of technological adoption. As a result, the purpose of this study is to look into the concerns and challenges that F&B MSMEs have when it comes to technology adoption. An online survey of 626 MSMEs and in-depth interviews as well as focus groups with diverse stakeholders from four provinces, namely West Java, East Java, South Sulawesi, and North Sumatera, provided the data for this study. To be thorough, the approach used in the study is based on the Technology, Organization, and Environment (TOE) framework. According to the findings, the majority of MSMEs use technology for marketing and sales, mainly through e-commerce. Meanwhile, for a variety of reasons, most of them continue to rely on traditional and semi-automatic technologies for production. According to the TOE framework, MSMEs lack those three parts of the technology adoption framework, particularly the environmental aspect, which is mostly due to a lack of cooperation among stakeholders. Finally, as a policy proposal, we offer a comprehensive technology adoption strategy based on the findings through an integrated MSMEs development information system including many important stakeholders.

Keywords: MSME, Technology Adoption, Food, and Beverage Sub-Sector, Manufacturing

JEL Classification Code: O32, O33, O38

1. Introduction

MSMEs play an important role in determining Indonesia's economic growth and development. They account for 99.9%

of all businesses/enterprises in the country, providing 94.21 percent of employment, nearly half of the country's GDP, and 14–15 percent of total direct exports. The food and beverage (F&B) sub-sector of MSMEs is one of the most important actors in Indonesia's MSME landscape. By 2020, the sub-sector will be the manufacturing sector's largest

*Acknowledgements:

The authors gratefully acknowledge The Indonesia Endowment Funds for Education (LPDP) and Ministry of Research and Technology/National Research and Innovation Agency (BRIN) for their generous grant in supporting this research through Contract No. 203/E1/PRN/2020.

¹First Author and Corresponding Author. Researcher, Economic Research Center, National Research and Innovation Agency (BRIN), Indonesia. ORCID ID: 0000-0002-2766-8970. [Postal Address: Gd. Widya Graha Lt.5, Jl. Jenderal Gatot Subroto No.10, Jakarta Selatan, 12710, Indonesia] Email: nika.pranata@gmail.com

²Researcher, Economic Research Center, National Research and Innovation Agency (BRIN), Indonesia.

³Researcher, Economic Research Center, National Research and Innovation Agency (BRIN), Indonesia.

⁴Researcher, Economic Research Center, National Research and Innovation Agency (BRIN), Indonesia.

⁵Researcher, Economic Research Center, National Research and Innovation Agency (BRIN), Indonesia.

⁶Researcher, Economic Research Center, National Research and Innovation Agency (BRIN), Indonesia.

⁷Researcher, Economic Research Center, National Research and Innovation Agency (BRIN), Indonesia.

⁸Researcher, Economic Research Center, National Research and Innovation Agency (BRIN), Indonesia.

⁹Researcher, Economic Research Center, National Research and Innovation Agency (BRIN), Indonesia.

© Copyright: The Author(s)

This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<https://creativecommons.org/licenses/by-nc/4.0/>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

contributor to GDP (excluding oil and gas). It accounts for 38.3% of the manufacturing GDP (Statistics Indonesia, 2021). The Ministry of Industry (2019) also acknowledges that MSMEs' food and beverage production accounts for 24% of export and 33% of manufacturing employment.

In addition, despite the manufacturing sector recording -2.2% of GDP growth in 2020 because of the COVID-19 pandemic, the F&B sub-sector was able to achieve 1.66% of growth (Rahayu, 2021). Such significant contribution is supported by abundant natural resources and high domestic demand, considering that Indonesia is the fourth largest country in population with more than 270 million citizens. By these considerations, the F&B production has been selected as one of the five most priority sectors in the well-known government program of "Making Indonesia 4.0". This program is led by the Ministry of Industry aiming to promote the adoption of Industry 4.0 technology to manufacturing firms to improve their competitiveness. Nonetheless, through in-depth interviews and field observation, we find that this program is not well transmitted to both local governments and industries. Almost all of our resource persons representing both stakeholders are not well informed about the objectives, the specific actions of the program, their role, what they should do, and how to achieve it.

Furthermore, the majority of MSMEs in the food and beverage industry are finding it difficult to compete in both global and regional markets. According to government data, Indonesia had a global trade deficit of more than USD 1 billion in processed and semi-processed food goods in 2018. Similarly, the gap in Southeast Asia's regional markets reached around USD 110 million. This statistic demonstrates Indonesia's low competitiveness in the global food and beverage sector, owing to a lack of technological capabilities in the manufacture of processed and semi-processed foods. In light of this, the Indonesian government is working to change the country from a raw material exporter to an industrial goods exporter by embracing technology and generating greater value-added (Ministry of Communication and Informatics, 2021).

Furthermore, according to a report from the US Department of Agriculture, Indonesian production of textured vegetable protein or soy protein is essentially non-existent. This is due to such works' technological limitations (Yuningsih, 2019), and to integrate technology, the company needs to understand its own character. Furthermore, technological adoption will spur innovation and boost competitiveness. Company competitiveness is influenced in the long run by technological capability, research and development, and innovation, as well as the size of the domestic market.

Using a qualitative and quantitative methodology, this research explores difficulties, obstacles, and determinants

affecting technology adoption of Indonesia's MSMEs, notably in the F&B manufacturing sector. Then, based on our findings, we present a model and policy recommendations for encouraging MSMEs in the F&B sub-sector to use technology to improve their competitiveness. Furthermore, to our knowledge, no single study has attempted to explore and discuss the technology adoption of Indonesian food and beverage SMEs using primary data. In terms of policy, the study will help to boost Indonesian MSMEs' competitiveness by encouraging them to adopt new technologies.

2. Literature Review

2.1. Technology Adoption

Mastery of specific resources, such as technology, people, and marketing abilities, is required for technological adoption. As a result, the ability of a corporation to absorb useful knowledge from external sources will decide how quickly it adopts technology at the firm level. In this context, technology adoption refers to a concept that connects technological and digital innovation capabilities.

Many theories regarding the technology adoption process have been developed for the individual as well as organizational level. The most frequently used theories of technology for the individual level are: 1) TPB (Theory of Planned Behaviour) (Ajzen, 1991); UTAUT (Unified Theory of Acceptance and Use of Technology) (Venkatesh et al., 2003); Diffusion of Innovation Theory (DOI) (Rogers, 1983), the Technology-Organization-Environment (TOE) framework (Tornatzky et al., 1990), and Institutional Theory (IT) (Scott, 1995).

TOE (Technology, Organization, Environment) is deemed more relevant for organizations and in conformity with the realities of an open business among several existing theories of technology adoption. In the TOE framework, the internal and external parts of the organization can influence what and how digital technology is adopted. In 1990, Tornatzky et al. (1990) proposed the TOE framework, which consists of three constructs that determine how businesses accept and implement technical breakthroughs (see Figure 1).

These three factors work together to affect technology adoption decisions. First, there are technological considerations, which comprise the qualities of available technology and the likelihood of it being adopted by the organization, as well as the business's existing technology (material/equipment or immaterial/method). Second, there's the organizational context, which includes things like organizational structure, numerous mechanisms that support innovation like informal communication and top management's strategic behavior, accessible resources, and organizational size. Third, the environmental context is made

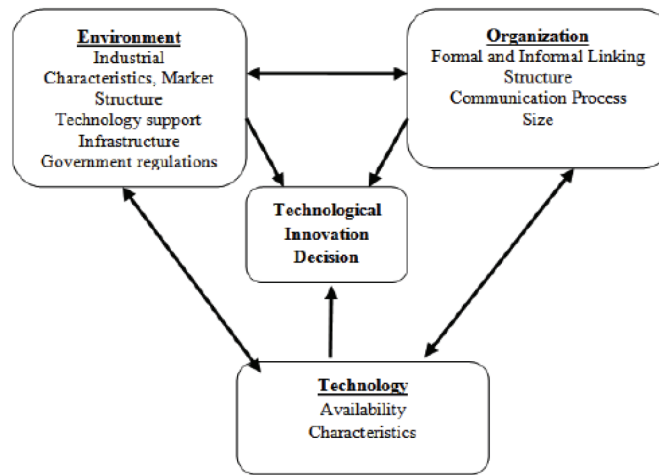


Figure 1: Technology, Organization, and Environment (TOE) Framework in the Adoption of Technological Innovation

Source: Tornatzky, Fleischer, and Chakrabarti (1990)

up of a variety of factors such as market structure, external support for new technology adoption, and government laws.

2.2. Previous Studies

Several studies on technology adoption have been carried out. Yoon and George (2013) used the TOE framework to examine factors influencing the pace of organizational adoption of virtual worlds in their study. The explanation for the poor adoption rate of 3D technology in US-based enterprises is explored in this study. It's worth noting that environmental variables, such as competitive pressure, are the most important motivators for a business to embrace. In addition, organizational readiness (financial and technological capabilities) is a crucial determinant of adoption. In the meantime, technological factors have little impact.

Similarly, Nugroho et al. (2017) investigated the factors influencing SME willingness to embrace information technology in Yogyakarta. External factors, such as customer pressure, are a primary determining force on a company's preparedness to adopt IT, according to the findings of the study. Aside from that, financial and technological factors (need and convenience of use) influence the decision to adopt. The financial aspect is the most important factor influencing adoption intentions. Human resources, such as limited experience and low technological capabilities, as well as organizational elements such as hereditary business features, business scale, and simple financial management, are all factors that hinder technology adoption (Hillmer, 2009). SME's in Indonesia are mostly family-owned and operate with basic technology.

3. Data and Methodology

3.1. Data

This study uses qualitative analysis to collect primary data from F&B MSMEs using focus group discussions (FGDs), field observation, in-depth interviews, and an online survey. Four Indonesian provinces are involved: West Java (Bandung and Bogor Regencies), East Java (Sidoarjo Regency), South Sulawesi (Makassar City and Maros Regency), North Sumatra (Medan City and Deli Serdang Regency), and East Java (Sidoarjo Regency) (Sidoarjo Regency). West Java, East Java, and North Sumatra were chosen to symbolize the western half of Indonesia, which has a large number of MSMEs in the manufacturing industry and is technologically advanced. Meanwhile, South Sulawesi was picked to represent Indonesia's central and eastern regions, which include manufacturing industry MSMEs that are still trailing in terms of both number and advanced digital technology adoption. We used two stages to acquire the data. The research team conducted focus groups with relevant government officials at the province and district levels in the earliest stages to acquire a sense of the state of MSMEs' readiness to deploy technology and foster innovation. The study team next conducted in-depth interviews and observed the technology (machines and equipment) employed by selected MSMEs in the second step.

We also performed field observations in four provinces, 15 focus groups, and 38 in-depth interviews with various resource individuals from all tiers of important stakeholders in the second stage. In terms of the survey, we used purposive sampling methods to collect 626 rows of data from F&B

MSMEs in four provinces (West Java, East Java, South Sulawesi, and North Sumatera) via an online platform.

3.2. Methodology

We received feedback from 626 MSMEs in the food and beverage industry during the online survey. West Java, East Java, South Sulawesi, and North Sumatra are the four provinces covered by the survey. Table 1 shows the survey data summary in greater detail.

4. Results and Discussion

4.1. Results

We received feedback from 626 MSMEs in the food and beverage industry during the online survey. West Java, East Java, South Sulawesi, and North Sumatra are the four provinces covered by the survey. Table 1 shows the survey data summary in greater detail.

Microbusinesses account for over 90% of the MSMEs surveyed, whereas small businesses account for only 8.47 percent and medium businesses account for 1.12 percent.

Table 1: Online Survey Data Summary

Geographical Area	No of Observation	Proportion
West Java		
Bogor District	113	18.05%
Bogor City	87	13.90%
Bandung District	191	30.51%
Bandung City	59	9.42%
East Java		
Sidoarjo	50	7.99%
South Sulawesi		
Maros	36	5.75%
Makassar	25	3.99%
North Sumatera		
Deli Serdang	46	7.35%
Medan	19	3.04%
Firm-Level		
Micro	566	90.42%
Small	53	8.47%
Medium	7	1.12%
Production System		
Fully manual	208	33.23%
Using technology	418	66.77%

The usage of technology in manufacturing is an important variable in this poll. According to the survey, 208 businesses still create their goods by hand, whereas 418 businesses have used technology to varying degrees, regardless of the technology's complexity.

Furthermore, the bulk of MSMEs continues to use domestic machines and equipment. The cost of employing local sources is quite inexpensive, and the quality of the outcomes is nearly identical to that of imported products. Observations and interviews with MSMEs in the field, however, revealed that several MSMEs combine local and imported machines/equipment. Purchasing directly from the market/supplier, purchasing through course providers, seeking aid from the government and state-owned companies, and a mix of government assistance and self-purchase are among the techniques utilized by F&B MSMEs to procure new machines/equipment.

Similarly, the ability to access or use the internet, as well as the usage of e-commerce, influences technology adoption; the greater their skills, the larger their proportion of technology use. Finally, in terms of geographic location, all provinces have a technology adoption rate of above 77 percent, with South Sulawesi having the highest percentage, followed by North Sumatra and East Java.

4.2. Discussion

4.2.1. Technology Aspect

The ability to adopt advanced technology for MSMEs in Indonesia's food and beverage sector is still very limited. The survey results show that more than half of the respondents only use machines/equipment with semi-automatic technology. The rest use a combination of semi-automatic and manual, as well as fully manual. Meanwhile, F&B MSMEs that have utilized automated and fully digital machines/equipment in their production process is still less than 1 percent. These results do not show a significant difference in the six survey locations.

Moreover, the majority of MSMEs still rely on domestic machines/equipment. The reason for using local sources is that the price is relatively low, and the quality of the results is almost similar compared to import products. However, the results of observations and interviews with MSMEs in the field also found several MSMEs that combine local and imported machines/equipment. Meanwhile, the mechanisms used by F&B MSMEs to procure new machines/equipment include purchasing directly from the market/supplier, purchasing through course providers, obtaining assistance from the government and state-owned enterprises, and a combination of government assistance and self-purchase.

Furthermore, universities and research institutions have a central role in producing the technology needed

Table 2: Cross Tabulations of Technology Adoption Key Variables

Variables	Fully manual	%	Using Technology	%
Firm-Level				
Micro	202	35.7%	364	64.3%
Small	5	9.4%	48	90.6%
Medium	1	14.3%	6	85.7%
Training Participation				
Participated in Training	168	33.0%	341	67.0%
Never get any Training	40	34.2%	77	65.8%
Ability to Access Internet				
Unable to operate	11	55.0%	9	45.0%
With assistance	97	37.3%	163	62.7%
Able without assistance	57	31.8%	122	68.2%
Advanced	43	25.7%	124	74.3%
Utilization of E-Commerce				
Yes	123	29.4%	295	70.6%
No	85	40.9%	123	59.1%
Geographical Location				
West Java	160	35.6%	290	64.4%
East Java	17	34.0%	33	66.0%
South Sulawesi	14	23.0%	47	77.0%
North Sumatera	17	26.2%	48	73.8%

by the business world. The results of FGDs and in-depth interviews with academics from various leading universities in the research locations show that the role of technology development has already been running. This is shown by new machines and equipment to help increase the productivity and efficiency of MSMEs. However, this new technology has not been widely used by MSMEs. Only a few MSMEs involved in research and pilot projects can freely access these outputs. Therefore, many MSMEs still face difficulties obtaining new technology to increase production quantity and/or quality according to market demand.

There are several obstacles in the dissemination of machine/equipment products of universities and research institutes. First, the attention of lecturers and researchers, especially from universities and government research institutions, is more focused on producing licenses, patents, and scientific publications. Second, universities and research institutions face limited resources (budget, human resources, and facilities) to produce technology in large quantities. Third, universities and research institutes do not collaborate with the business sector to generate and promote research products to end-users, particularly MSMEs.

The delay in the technology transfer process from technology producers to the business world as end-users has caused businesses, especially MSMEs in the manufacturing sector, still, be left behind in applying advanced technology. Based on the results of FGDs and in-depth interviews with officials from the Industry and Trade office, associations of entrepreneurs, and MSMEs in all research locations, there are three main factors causing the majority of MSMEs still use manual and semi-automatic machines/equipment. First, they do not believe advanced technology is required because their current production is being done on a small scale with limited marketing reach. As a result, they believe that using manual or semi-automatic machinery is still more profitable. MSMEs' products are typically limited in number and quality and do not require complex technology. Furthermore, customer orders are prone to fluctuation, making the usage of digital devices less adaptable because they frequently necessitate adjustments.

Second, several MSMEs lack sufficient knowledge of the types and specifications of innovative machines/equipment to employ in their manufacturing and business growth operations. Furthermore, many MSMEs are unaware of the

possibility of increased profits from sophisticated technology implementation.

Finally, some MSMEs are well-informed, possess sufficient knowledge of advanced machinery, and recognize the need of improving technology to boost production or cut costs to meet rising market demand. However, due to the following constraints, these MSMEs have not yet decided to implement more advanced technology: (a) Expecting government aid with machinery/equipment; (b) a lack of cash for investment; (c) not being able to find specific machines/equipment that meets their requirements, and (d) a lack of human resources with the knowledge/skills to operate complicated machines/equipment.

4.2.2. Organization Aspect

In general, MSMEs in the F&B sub-sector in all research locations still use simple production technology and face many internal obstacles to adopting more advanced technology. Regarding organizational aspects, this is partly due to four main obstacles, i.e. relatively large investment costs, limited marketing coverage, lack of workforce capabilities, and low motivation to move forward. The use of more advanced technology requires a significant investment in purchases, machinery, equipment, and other business facilities. In reality, the F&B MSMEs studied, generally do not have funds for this investment. Although their business is quite profitable, most MSMEs are classified as unbankable due to the lack of banks' collateral and legal requirements. As a result, they have to work on their own capital.

Based on the survey results, most MSMEs in the research location purchased the production machines using their own capital. In addition to that, several MSMEs also received machine/equipment assistance from the government and universities/research institutes. MSMEs access to assistance from the government is indeed quite large compared to assistance from universities/R&D agencies, as well as from companies. This is because the aid agenda from the government is usually routine, with simple requirements and a relatively easy process. Meanwhile, CSR from companies and universities or R&D institutions is often not routine, and MSMEs' access to information is relatively restricted.

Furthermore, if MSMEs need to upgrade technology (buy new machinery) in the future, they will use different financial sources. In all four research areas, the majority of respondents intend to use their own money as a source of funds. Furthermore, most MSMEs, particularly those with limited capital, will seek assistance from third parties such as the government, universities, and large corporations. This large number also indicates that many MSMEs continue to rely on government and other agencies for financial assistance in upgrading their technology. Then, some MSMEs also plan to cooperate with business partners, apply for credit

from banks, make loans to cooperatives/ pawnshops/ PNM/ BMT, as well as to family/relatives. Interestingly, only a few respondents choose to make online loans (pinjol). Based on the interview results, the MSMEs are afraid of the lending platform's intimidation, contributing a bad image to the business. This is in line with the previous study from (Sunardi et al., 2022), which concludes that customers' perceived risk can influence willingness to adopt P2P lending.

Furthermore, from several interviews with MSMEs business actors, many of them are reluctant to replace the machines or production equipment used with more advanced technology because it has been in accordance with production capacity. By upgrading technology, MSMEs face the risk of a mismatch between significant investments and concerns that their supply is not absorbed into the market due to limited marketing reach. MSMEs, on the other hand, have limited purchasing power in their present product target market, which is usually close to their home or manufacturing facility. In other words, because of their limited purchasing power, updating technology does not guarantee that their product sales performance will improve (even with greater product quality). Furthermore, with limited market purchasing power, MSMEs find it difficult to increase their selling prices after updating manufacturing technology (as production costs). Meanwhile, because not all MSMEs are located in metropolitan regions, market development with increasing purchasing power necessitates significant marketing expenditures due to limited infrastructure (transportation and communication).

Then there's the fact that MSME human resources are still severely scarce. It is demonstrated, for example, by the findings of an online poll, which indicated that many business actors are still unable to access the internet on their own. The fact that they have completed such a low level of education has a significant impact on this. MSMEs participate in a variety of training organized by the Industry and Trade Agency, the MSME agency, private enterprises, and other connected institutions to develop their business abilities. MSMEs in the Bogor area, for example, are trained by the agency with the help of the district or provincial MSME forum association. The program is designed to provide MSMEs with information, skills, and opportunities to grow their businesses by teaching them new techniques and/or technologies. However, many MSMEs reported that the training results did not deliver optimal advantages owing to a variety of difficulties, including a training field that did not match the needs, insufficient training, and a lack of post-training follow-up.

In addition to the ability to use the internet, which is still minimal, MSMEs' understanding of digital technology is also limited (Molinillo & Japutra, 2017). This can be seen based on the survey results. To measure the understanding of MSME technology, researchers ask questions that present

answer choices for types of digital technology, including six types of technology: Artificial Intelligence (AI), Automation, Big Data Analytics, Cloud Computing, Internet of Things (IoT), and E-commerce. To avoid MSMEs choosing answers only by guessing, we added two wrong answer choices in the questionnaire questions, namely electrification and steam engine. According to the results of the survey, the majority of respondents only know one (one) form of digital technology, while those who know all (six) types of digital technology account for just approximately 2% of the total respondents. Then there are roughly 10% of those that choose the incorrect technology. Meanwhile, roughly 16% of respondents said they had no idea what form of digital technology was being used. Furthermore, the majority of respondents believe that e-commerce is the most familiar digital technology to them. This is because, in comparison to other digital technologies, e-commerce, especially MSMEs, has a significant penetration in Indonesia. IoT, Cloud Computing, Big Data Analytics, Automation, and AI are the other digital technologies that respondents are familiar with in order.

Finally, the delayed adoption of technology is influenced by a lack of incentive for company development. New machines, equipment, and other technological devices for business development have not been an option for many MSMEs because they are satisfied with their current output. Despite the fact that top management support, in this example, from the firm owner, is a critical component in MSMEs' decision to use technology (Qalati et al., 2020). The majority of them are solely concerned with earning money to support their families' fundamental requirements, and they lack defined business development goals for the future. This MSME group is apprehensive about investing in and creating more complex technology-based firms. This is because the investment costs are high with a long return on investment, while MSMEs want quick returns. The lack of courage of MSMEs in taking risks can also be seen from the survey conducted. More than 50 percent of business actors choose a small failure risk with low profits, compared to daring to take a considerable risk but with a high return or profit.

4.2.3. Environment Aspect

MSMEs have always become a government priority. There are about 18 (eighteen) government ministries and institutions with programs on MSMEs development, including technology adoption programs (Sitorus, 2019). In addition, each local government at the provincial and district level has a similar program. Hence, from the government side, there are three layers/levels of the program, which are: central government, provincial-level government, and district-level government. At the government level, most

related offices have their own programs such as the office of industrial and trade, office of cooperatives and MSMEs, office of agricultures, office of society empowerment, and other related offices or institutions. Even more, there are similar programs from other parties, including central bank regional provinces, state-owned enterprises, local government owned-enterprises, private companies, foreign agencies, and other institutions.

Furthermore, we map relevant major stakeholders and their roles concerning MSMEs into four roles. The first is central government, actors involved including Ministry of Industry, Ministry of Trade, Ministry of Cooperatives and SMEs, and Ministry of Communication and Informatics. Their role is organizing and operating MSMEs development programs such as training, capacity buildings, marketing, etc., at the national level. One of the essential institutions is the Ministry of Industry, considering that they have "Making Indonesia 4.0", a program aiming to transform manufacturing firms to industry 4.0 technology adoption. However, based on our interviews, the issue is that most firms were not informed well regarding the plan, actions, benefits, and aims of the program.

Second is local government, almost all local government departments have MSMEs development programs, including Departments of Industry, Departments of Trade, Departments of Cooperatives and SMEs, Departments of Agriculture, etc. Their roles are designing and implementing in local (provincial and city level) that mostly related to licensing as well as organizing and operating MSMEs development programs such as training, capacity buildings, marketing, etc., at the local level. However, mostly they do not coordinate with each other hence the programs' contents and beneficiaries often intersect or duplicate.

The third is research institutes and universities. Their roles are producing/inventing applied technology that helps the production process to be more efficient, disseminating produced technology for MSMEs, and facilitating and mapping MSMEs' requirements of technology. Universities and research institutions have researched applied industrial technology, but most of the outcomes are not in accordance with the needs of the industry, hence only a few of them that can be implemented by firms. Some researchers have produced applied technology that can be applied by industry; however, some face issues related to bureaucracy and licensing that hinder those technologies to be produced on a mass scale.

Fourth is business associations, their main role is facilitating and advocating the firm's development by collaborating with other stakeholders, including government and other institutions. The association of industrial entrepreneurs in collaboration with the Ministry of Industry advocates strategies for accelerating digital technology, including implementing policies, encouraging collaboration

between industries, developing an integrated database, supporting restrictions on imported goods in protecting domestic industries, etc.

The last is financing institutions, its primary role is distributing and allocating financial resources to firms to expand their business which in this case is to adopt the technology. It acts as an alternative source of financing. Most MSMEs still rely on self-financing and from relatives instead of formal financing institutions like banks, venture capitals, etc. Some bankable companies use banks to fund their technology adoption. Only a small percentage of MSMEs, however, can afford this. Microfinance institutions, such as cooperatives and village-owned businesses, are also viable options for financing. Furthermore, despite the abundance of MSMEs help and development programs from a range of stakeholders, there are several challenges with them. To begin with, each of these programs operates independently of the others. They execute similar steps, rules, programs, and recipients instead of partnering and focusing on each area.

Some of them overlap and are aimed at the same small businesses. As a result, the resources allotted become inefficient. Second, the program's beneficiaries have a limited reach. Rather than focusing on untapped MSMEs, program administrators choose to choose MSMEs that are already familiar with the programs. It's because they're already familiar with how the program operates, how to deal with administrative and bureaucratic issues, and other relevant issues. As a result, in certain circumstances, a single company receives many donations and help. Another effect is that the recipient's level/profile does not correspond to the program's requirements. For example, a mature and export-oriented firm may attend training on how to launch a business from a legal standpoint. Finally, the majority of the programs are poorly constructed. It lacks distinct step-by-step capacity-building initiatives based on level. Ideally, the programs should be built in such a way that they adjust at each level (ultra-micro, micro, small, and medium level enterprises). Another example of a poorly designed program is when offered equipment is insufficient; as a result, the recipient does not use it. This research indicates that government authorities are unwilling to help SMEs upgrade their technology. Meanwhile, a study by Enhancing technology adoption and digitalization is inextricably linked to bettering the support of enterprises and government agencies. Fourth, the majority of the programs are not monitored or evaluated. Therefore, it cannot be determined whether the programs, supports, and assistance have a positive impact and are suitable for the firms' development.

5. Conclusion and Policy Recommendations

Strengthening the capacity technology of F&B MSMEs is critical for speeding their business development and

facing the hurdles of ever-increasing global competitiveness. Only a few MSMEs, on the other hand, have been adopting reasonably advanced technology, such as semi- and completely automatic machines. Most F&B MSMEs, on the other hand, still rely on traditional/manual technologies. In terms of technology, this poor adoption is driven by a lack of access to new technology developed by universities and research institutes, as well as a lack of understanding of the value of sophisticated technology in enhancing efficiency, increasing productivity, and expanding business.

Restricted investment costs, limited marketing coverage, low staff capabilities, and a lack of incentive for business expansion are some of the limits and problems that MSMEs confront. Meanwhile, the ecosystem is not yet conducive to boosting technological adoption. This situation is represented in the failure of numerous programs to encourage technology adoption due to a lack of cooperation among stakeholders, immature planning, inadequate targeting, and poor monitoring and evaluation by program owners. These findings indicate that the conditions for enhancing technology adoption, particularly among F&B MSMEs, have not been addressed.

The most important suggestion we provide is to use our technology adoption model. Efforts to increase MSMEs' technology adoption must be strategic, progressive, and long-term, and must engage all stakeholders. All of this must be visualized in the form of a model or strategy, which must then be tested in the field (See Figure 2). The model for increasing technology adoption and enhancing MSMEs' innovation ability should be implemented in three stages. First, an analysis of needs and requirements is conducted, followed by an examination of the availability of technology/product services and an examination of the organization's/readiness. business'. The most important step in determining what type of technology MSMEs require is to analyze their needs and requirements, taking into account the many needs and issues that SMEs encounter, both in terms of sub-sector and business scale. The second phase is the implementation phase, which begins with the launch of a pilot project in a specified group or location. This pilot project is critical in ensuring that technology adoption and innovation capability are operational before being scaled up to a larger scale, such as provincial or national. Third, evaluation to obtain feedback on the pilot project's ongoing model consolidation.

The government plays an important role in this paradigm at every step. The government must ensure that industry players may make use of the numerous technology developed by research institutes and colleges. The government is speeding up and strengthening technology provision programs like science and technology parks and technological transfer offices to help bridge the gap between the two parties.

We suggest a one-stop integrated system in the forms of application to reduce the negative externalities of the

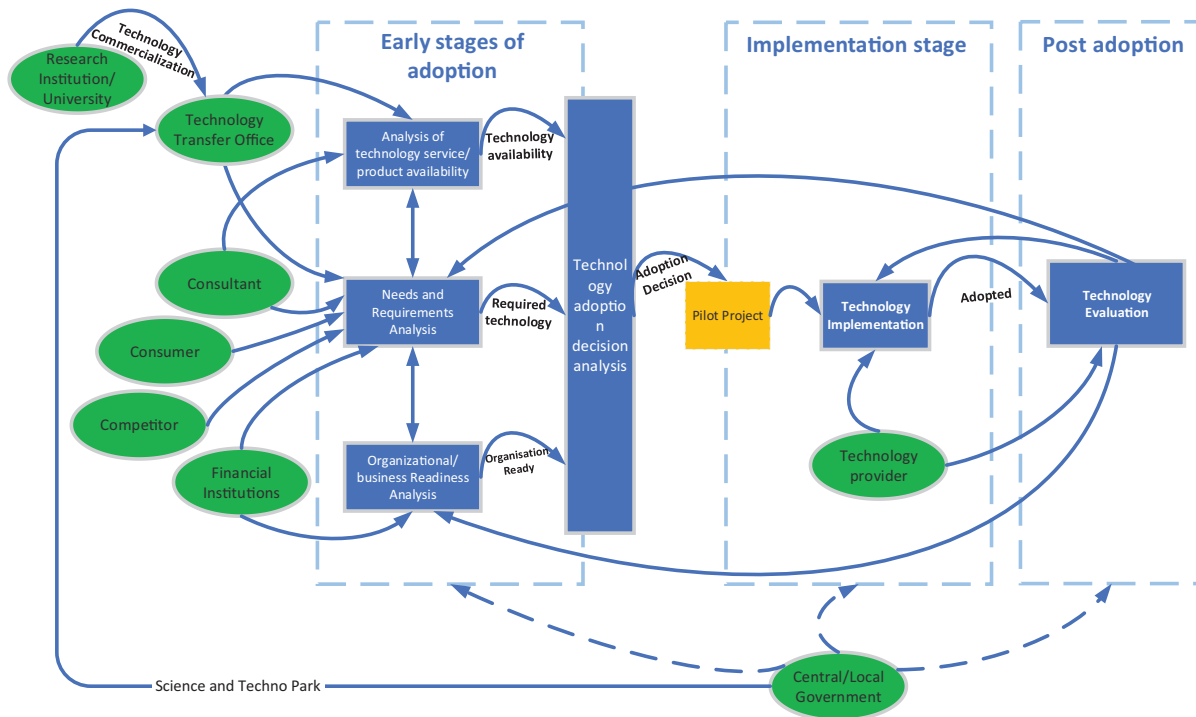


Figure 2: Technology Adoption Development and Strengthening the Innovation Capability of SMEs Model

environmental aspect, notably the MSMEs support and development programs. The system/application will have detailed information about the company from its inception to its current state. The national identification number is used to identify each company. The application will also incorporate other institutions' growth, help, and support initiatives. This connection will allow institution policymakers to see how their programs compare to other similar programs, what parts overlap, and how they may collaborate to improve efficiency and effectiveness.

The application will also include information on each MSME that is a program participant or beneficiaries, such as which programs they are a part of, a list of capacity-building training they have participated in, machinery and other resources they have received, and other assistance. The negative externalities of unduly and frequently supporting specific MSMEs can be reduced in this way. Owners of a program may choose to target MSMEs who are in desperate need of assistance. Aside from that, monitoring and assessment are crucial aspects of the system. The software will allow MSMEs to track their progress after completing the training and receiving other assistance. The evaluation can take the form of a corporate performance review, a managerial review, or anything else. They will also be able to provide feedback on the programs and services. Furthermore, the system enables MSMEs to track their

accounting, commercial, and financial transactions to assess their efficiency and performance. It can be utilized as one of the evaluation criteria. It can also be used as a consideration for financial institutions such as banks and fintech to distribute loans for them by cooperating with them.

References

- Ajzen, I. (1991). *The theory of planned behavior*. New Jersey: Prentice-Hall.
- Hillmer, U. (2009). Existing theories considering technology adoption. *Technology Acceptance in Mechatronics*, 11, 9–28. https://doi.org/10.1007/978-3-8349-8375-6_3
- Ministry of Communication and Informatics. (2021). *Boost exports of industrial goods and high-tech industries for Indonesia's transformation*. <https://kominfo.go.id/content/detail/32414/genjot-ekspor-barang-industri-dan-industri-berteknologi-tinggi-untuk-transformasi-indonesia/0/berita>
- Ministry of Industry. (2019). *Making Indonesia 4.0*. <https://doi.org/10.7591/9781501719370>
- Molinillo, S., & Japutra, A. (2017). Organizational adoption of digital information and technology: A theoretical review. *Bottom Line*, 30(1), 33–46. <https://doi.org/10.1108/BL-01-2017-0002>
- Nugroho, M. A., Susilo, A. Z., Fajar, M. A., & Rahmawati, D. (2017). An exploratory study of SMEs technology adoption

- readiness factors. *Procedia Computer Science*, 124, 329–336. <https://doi.org/10.1016/j.procs.2017.12.162>
- Qalati, S. A., Li, W., Vela, E. G., Bux, A., Barbosa, B., & Herzallah, A. M. (2020). Effects of technological, organizational, and environmental factors on social media adoption. *Journal of Asian Finance, Economics, and Business*, 7(10), 989–998. <https://doi.org/10.13106/jafeb.2020.vol7.no10.989>
- Rahayu, A. C. (2021). *These are the industrial sectors that grew positively in the fourth quarter of 2020*. <https://industri.kontan.co.id/news/ini-sektor-sektor-industri-yang-tumbuh-positif-dikuartal-iv-2020>
- Rogers, E. M. (1983). *Diffusion of innovations* (3rd ed.). New York: Wiley & Sons.
- Scott, W. R. (1995). Introduction: Institutional theory and organizations. *The Institutional Construction of Organizations*, 71, 11–23. <https://doi.org/10.1016/j.cca.2013.05.002>
- Sitorus, R. (2019). *Spread across 18 Ministries, the MSME financing budget is to be consolidated immediately*. <https://ekonomi.bisnis.com/read/20191112/12/1169298/tersebar-di-18-kementerian-anggaran-pembiayaan-umkm-segera-dikonsolidasikan>
- Statistics Indonesia. (2021). *Distribution of 2010 series quarterly GDP based on current prices (percent), 2020*. <https://www.bps.go.id/indicator/11/106/2/-seri-2010-distribusi-pdb-triwulanan-seri-2010-atas-dasar-harga-berlaku.html>
- Sunardi, R., Hamidah, H., Dharmawan Buchadadi, A., & Purwana, D. (2022). Factors determining adoption of fintech peer-to-peer lending platform: An empirical study in Indonesia. *The Journal of Asian Finance, Economics, and Business*, 9(1), 43–51. <https://doi.org/10.13106/jafeb.2022.vol9.no1.0043>
- Tornatzky, L. G., Fleischer, M., & Chakrabarti, A. K. (1990). The processes of technological innovation. Issues in organization and management series. Lanham: Lexington Books. <https://doi.org/10.1016/j.cca.2013.05.002>
- Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 16(2), 425–478. <https://doi.org/10.1123/mis.2003.15.5.425-478>
- Yoon, T. E., & George, J. F. (2013). Why aren't organizations adopting virtual worlds? *Computers in Human Behavior*, 29(3), 772–790. <https://doi.org/10.1016/j.chb.2012.12.003>
- Yuningsih, N. (2019). *Indonesia: Food processing ingredients report update*. https://apps.fas.usda.gov/newgainapi/api/report/downloadreportbyfilename?filename=Food Processing Ingredients_Jakarta_Indonesia_4-8-2019.pdf