

A Model for the Sustainable Development of the Traditional Food Industry as a Support for Food Security Using the Dematel and ISM Approaches

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Keywords: DEMATEL; ISM; traditional food SMEs; sustainability	Abstract Traditional food SMEs play a very important role in national economic growth and development. Therefore, it is essential to develop traditional food SMEs in a sustainable manner. This study focuses on the driving factors for the successful and sustainable development of traditional food SMEs. It seeks to explore the hierarchy, interrelationships, and strength of factors that play important roles in the development of these SMEs. To address the research questions, a survey was conducted. The respondents comprised 12 SME actors engaged in producing and selling wajit and gurilem in West Bandung Regency, West Java Province. The respondents also included four community leaders, two sub-district officials, four academics, and 25 consumers. This study employed a mixed-methods design. Data were collected through interviews, surveys, and secondary sources from August to October 2024. The Interpretive Structural Modeling (ISM) method was used to construct the hierarchical structure of factors, while the Decision-Making Trial and Evaluation Laboratory (DEMATEL) approach was applied to analyze cause-and-effect relationships. MICMAC analysis was also conducted to classify factors based on driving power and dependence. The results indicate that, of the 15 factors examined, three factors act as linkage factors (i.e., marketing, product development, and business networks); six factors are categorized as dependent (i.e., technology and digitalization, internationalization, and socio-cultural factors); and six factors are categorized as independent (i.e., managerial skills, business models, entrepreneurial skills, financial resources, innovation, and human resource capacity). The findings reveal that managerial skills, business models, entrepreneurial skills, financial resources, innovation, and human resource capacity are critical factors that should receive primary attention in the sustainable development of traditional food SMEs.
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INTRODUCTION

The law mandates the government to establish national policies aimed at ensuring national food security (Arowosegbe et al., 2024; Asirvatham et al., 2022; Thorndike et al., 2022; Wahbeh et al., 2022; Zhu et al., 2023). Food security refers to a condition in which food needs are fulfilled for the state and society, reflected in the availability of sufficient food in both quantity and quality; safe, diverse, nutritious, equitable, and affordable access; and food that does not conflict with the religion, beliefs, and culture of the community, enabling people to live healthy, active, and productive lives in a

sustainable manner (Food Law, 2012). Food diversity, including traditional foods, is a key component of sustainable food security and part of Indonesia's rich biodiversity heritage. Traditional foods and food processing techniques are also part of the community's cultural heritage (Sgroi, 2023). Traditional food refers to a coherent tradition of food preparation that emerges from a community's kitchen over a long period within a specific region and, when localized, exhibits distinctive characteristics compared to cuisines from other regions. The food industry, including the traditional food industry, is one of the penta-helix elements that must be developed to achieve sustainable development goals (Fontefrancesco, 2023).

Referring to Pivarski (2022), this study argues that the traditional food industry must be developed sustainably. In addition to being part of national heritage and culture and playing an important role in achieving sustainable development goals, evidence in Indonesia shows that actors in the traditional food industry are predominantly small and medium-sized enterprises (SMEs). However, the sustainability of traditional food SMEs has been threatened by various factors, including the ongoing industrialization and proliferation of processed and fast-food products. Therefore, the development of traditional food SMEs requires continuous intervention from all elements of the penta-helix.

The literature review shows that several studies on traditional food SME development models have been conducted. For instance, Rosalina & Ahmad (2020) used SWOT analysis to develop strategies for the traditional Minangkabau food industry. Suter (2022) conducted a literature review to explore the potential and prospects of traditional Balinese food. Egim & Nenengsih (2029) highlighted the important role of product development in marketing traditional Padang food. Marsiti et al. (2019) emphasized the importance of technology adoption and digitalization in developing traditional Balinese food. Meanwhile, Windiana & Putri (2022) emphasized the importance of regulations and policies, business capital support, and the preservation of regional culture in developing regional food industries.

Although these studies provide insights into factors driving the success of traditional food SMEs, they remain partial, lack a systemic perspective, and overlook the interrelationships among these factors. This research builds on previous studies by offering a structured approach using ISM and DEMATEL to strengthen success drivers and improve decision-making for the sustainable development of traditional food SMEs. By integrating insights from the literature on food industry development, this study contributes an important dimension to existing knowledge, particularly in the traditional food SME sector.

By utilizing ISM and DEMATEL as analytical methodologies, this research aims to provide valuable systemic insights applicable to the sustainable development of traditional food SMEs. In particular, four research questions are addressed. First, what factors drive the successful and sustainable development of traditional food SMEs? Second, how are these driving factors interrelated? Third, to what extent does each factor

influence the success of traditional food SMEs? Fourth, what policy recommendations can be proposed for stakeholders to support sustainable development in this sector?

This study aims to identify key driving factors for the sustainable development of traditional food SMEs, analyze the hierarchical structure and interrelationships among these factors, measure the strength of influence and cause–effect relationships between them, and formulate strategic policy recommendations for stakeholders. The study offers both theoretical and practical contributions. Theoretically, it enriches the literature on SME sustainability and traditional food industry development by providing a systemic framework. Practically, it offers actionable insights for policymakers, industry practitioners, and local communities to support the sustainable growth of traditional food SMEs, thereby strengthening food security and preserving cultural heritage.

METHOD

Research design

The research employed a mixed-methods design to investigate the development of SMEs in the traditional food industry. Both quantitative and qualitative approaches were used to capture numerical data and contextual insights related to challenges faced by SMEs in the sector. The integration of ISM and DEMATEL was applied to systematically analyze complex relationships among key factors influencing SME development. This approach enabled a structured cause-and-effect analysis of the driving factors for sustainable SME development. The combined use of these methodologies ensured that the study identified the most relevant influencing factors and supported the formulation of actionable insights for improving SME development in practice.

Research sample

The population of the object of this study is traditional food SMEs that produce and sell Wajit and Gurilem in West Bandung Regency, West Java Province. The sample size for this study was determined based on purposive sampling, in which traditional food SMEs were selected. A sample of 12 SMEs was selected to ensure diversity in terms of company size and production capacity. This sample size is considered sufficient to provide insight while balancing the practical constraints of data collection. The selection of *purposive sampling* techniques ensures that only relevant companies are included, although this may limit the generalization of findings to other industries or regions.

Data collection tools and procedures

Data collection was carried out using a combination of interviews, field surveys, and secondary data sources. Semi-structured interviews were conducted to gather qualitative insights on the challenges faced by traditional food SMEs. The interviews explore more in-depth experiences and strategies used to address SME development challenges. Data collection was conducted during August to October 2024, with all interviews recorded and transcribed for further analysis.

Research Variables

The factors driving success are qualitative variables that are considered as inputs in the development of sustainable traditional food SMEs. In a business context, these

factors are important inputs to achieve sustainability. These factors are the elements needed for traditional food SMEs to operate, grow, and be sustainable. Table 1 shows the factors driving the success of traditional food SMEs summarized from various sources.

Table 1. Factors driving the success of traditional food SMEs

No.	Sustainability factors	References
1	Managerial skills (F1)	Adamu & Musa (2021)
2	Business model (F2)	Al Shehhi et al. (2023)
3	Financial resources (F3)	Bensalah & Tinaztepe (2021)
4	Marketing (F4)	Gumel & Bardai (2023)
5	Entrepreneurial skills (F5)	
6	Technology and digitalization (F6)	
7	Innovation (F7)	
8	HR Capacity (F8)	
9	Market & Product Development (F9)	
10	Business networking (F10)	
11	Customer relationship management (F11)	
12	Internationalization (F12)	
13	Strategic planning (F13)	
14	Laws and Regulations (F14)	
15	Socio-Cultural (F15)	

Source: Compiled from Adamu & Musa (2021), Al Shehhi et al. (2023), Bensalah & Tinaztepe (2021), and Gumel & Bardai (2023)

RESULTS AND DISCUSSION

MICMAC Analysis

This study applied the MICMAC procedure to determine the level of dependence and impetus of the variables that were seen as determining factors for the success of the sustainable development of traditional food SMEs. This analysis is conducted to determine the dominant factors, which can help drive the sustainable development of SMEs. To find the thrust level and the dependency level of each factor, the data used is the final RM matrix. On the basis of the level of thrust and the level of dependence, these factors are divided into four categories. These categories of factors are dependent factors, independent factors, autonomous factors, and linkage factors. Figure 1 shows the MICMAC analysis for variables that are seen as determinants of success for the sustainable development of traditional food SMEs.

As seen in Figure 1, the MICMAC analysis indicates the absence of factors in the autonomous category, namely factors with a low level of thrust and dependency. Autonomous categorical factors are placed in quadrant I of the MICMAC diagram. Furthermore, the MICMAC analysis found that there were three factors in the linkage category, namely a factor with a strong level of thrust and dependence. This category includes marketing factors (F4), product development (F9), and business networking (F10). These linkage categorical factors are placed in quadrant III of the MICMAC diagram. These factors are not fixed: that is, any changes in these factors affect the others. At the same time, these factors are also affected by changes in other factors. Furthermore,

the MICMAC analysis showed that there were six factors that were categorized as dependent, namely factors with a strong level of dependence and a weak level of thrust. Technology and digitalization (F6), customer relationship management (F11), strategic planning (F13), and law and regulation (F14) are included in this category. In addition, internationalization (F12) and socio-cultural (F15) factors are also categorized as dependent factors. These categorical dependent factors are placed in quadrant II of the MICMAC diagram.

Finally, the MICMAC analysis showed that there were six factors that were categorized as independent or factors with a strong level of thrust and a weak level of dependence. Managerial skills (F1), business model (F2), entrepreneurial skills (F5) are included in this category. Other factors that are categorized as independent are financial resources (F3), innovation (F7), and human resource capacity (F8). These independent categorical factors are placed in quadrant IV of the MICMAC diagram. Factors with strong thrust and low degree of dependency will be included in the independent factors, referred to as key factors. These are key factors for the sustainable development of traditional food SMEs. These independent factors will support traditional food SMEs to achieve their goals and objectives and to improve the operational performance and competitive advantage of SMEs on a sustainable basis. These factors should be given primary attention when developing traditional food SMEs. These factors require maximum attention during the SME development process.

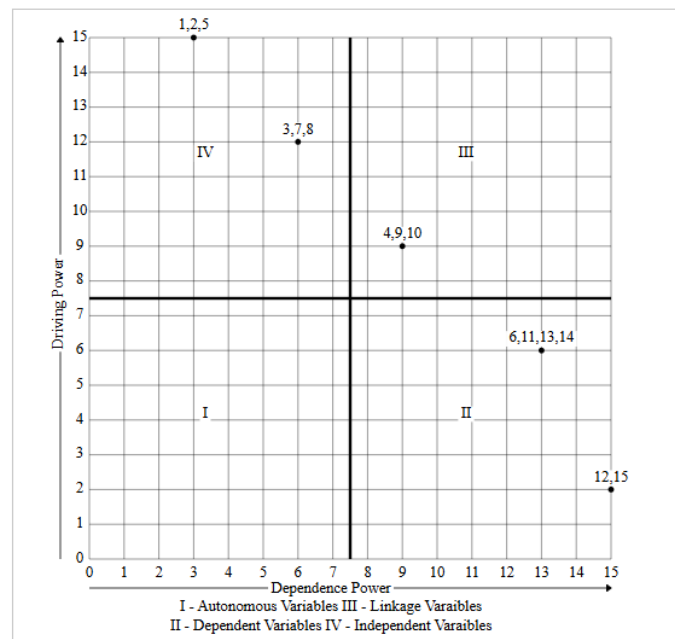


Figure 1. External MICMAC

Source: Research data processed with SmartISM application, 2024

Structural Hierarchy Analysis

The structural hierarchy analysis is aimed at understanding the hierarchy of factors that drive sustainability and pose challenges in the development process of traditional food

SMEs. SMEs and stakeholders need to pay more attention to the hierarchy of these driving factors to implement sustainable SME development strategies. In this study, the approach used to construct the hierarchical structure of these factors is the ISM method. Using the SmartISM application, the hierarchical structure of these factors is obtained as shown in Figure 2.

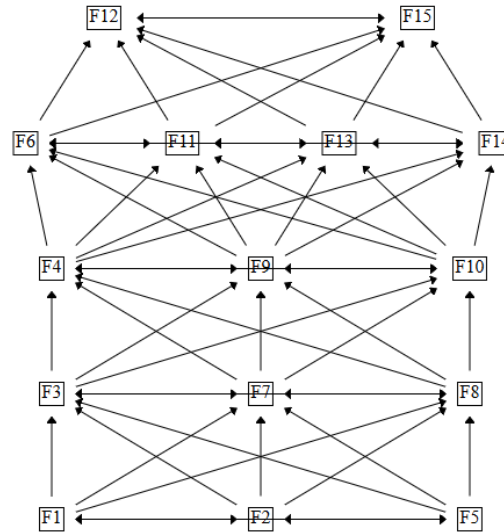


Figure 2. ISM hierarchical structure

Source: Research data processed with SmartISM application, 2024

As shown in Figure 2, it can be seen that the internationalization (F12) and socio-cultural (F15) factors are located at the top of the hierarchical structure. This indicates that these two factors are influenced by other variables located at a lower level. Meanwhile, managerial skills (F1), business model (F2), and entrepreneurial skills (F5) are at the lower level, suggesting that these three factors are the most crucial factors for the sustainable development of traditional food SMEs. These findings are in line with the concept put forward in the literature that managerial skills, business models, and entrepreneurial skills have a significant impact on improving the operational performance and competitive advantage of SMEs. Several empirical studies on SME performance also emphasize the important role of these three factors in supporting SME performance (Namagembe & Mbago, 2023).

The importance of financial resources (F3), innovation (F7), and human resource capacity (F8) has also been recognized by several researchers in relation to SME performance (Demirkan et al., 2022). These three factors also occupy the lower levels of the hierarchical structure. The findings highlight the importance of six driving factors for the sustainable development of traditional food SMEs, and highlight the position of each of these factors based on the level of importance. However, this ISM model shows the dominant effect of six factors: namely managerial skills (F1), business models (F2), entrepreneurial skills (F5), financial resources (F3), innovation (F7), and human resource capacity (F8) in the development of traditional food SMEs. Fadil & St-Pierre (2021)

emphasize the importance of financial resources, innovation, and business models for the sustainable growth of SMEs. Meanwhile, Fulgence et al. (2023) highlight the important role of human resource capacity to support innovation and operational performance in the context of SMEs.

DEMATEL Analysis

In DEMATEL's analysis, the factors supporting the success of the development of traditional food SMEs will be referred to as variables, because they reflect some characteristics or components of the development of traditional food SMEs that are studied. In this study, the DEMATEL method was used to assess the interdependence of various factors and to assess their mutual influence. These elements are referred to as systems in this study because they are a collection of interrelated elements or components that have the same function or purpose. This matrix of relationships between factors shows the degree of influence between the components. Each matrix value is assumed to indicate the influence of the elements in the row on the elements in the column. Figure 3 shows the categories of factors divided into two: namely causative factors and affected factors. As seen in Figure 3, the factors of managerial skills (F1), business model (F2), financial resources (F3), entrepreneurial skills (F5), innovation (F7), HR capacity (F8), business network (F10), and customer relationship management (F11) are categorized as causative variables. Meanwhile, the variables of marketing (F4), technology and digitalization (F6), Market & product development (F9), internationalization (F12), strategic planning (F13), law and regulation (F14), and socio-culture (F15) were categorized as affected variables.

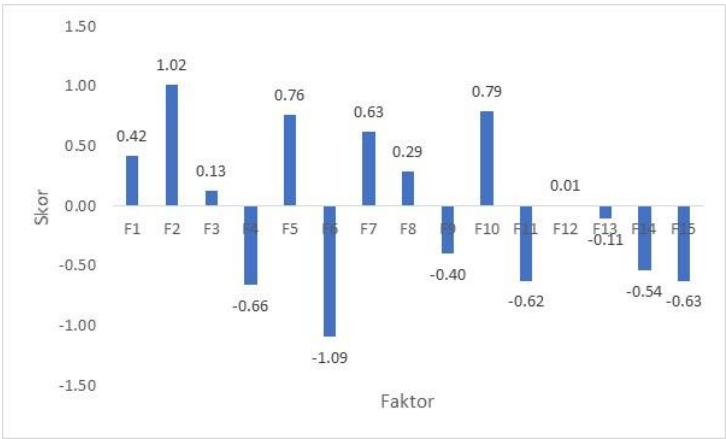


Figure 3. Categories of success factors for traditional food SMEs
Source: Research data processed with DEMATEL application, 2024

Furthermore, by following the DEMATEL procedure as mentioned in the work of Teymourifar & Trindade (2023), a direct/indirect relationship matrix of the factors driving the success of traditional food SMEs is obtained, where D is the sum of each column and R is the sum of each row. Next, it is to establish the statistical values of $D+R$ and $D-R$, as well as to set $D-R$ as the vertical axis and $D+R$ as the horizontal axis. These values represent the starting position of the vertical axis on the horizontal axis, and

provide the coordinate point in the quadrant. Next is to create a graphic model of the cause-and-effect relationship diagram, as shown in Figure 4. Figure 4 confirms the importance of the role of managerial skills (F1), business model (F2), and financial resources (F3) as drivers of success in the development of traditional food SMEs. In the matrix of inter-factor relationships, it is indicated that these three factors have a direct impact on marketing (F4), technology and digitalization (F6), innovation (F7), human resource capacity (F8), market & product development (F9), business network (F10), customer relationship management (F11), internationalization (F12), strategic planning (F13), and law and regulation (F14).

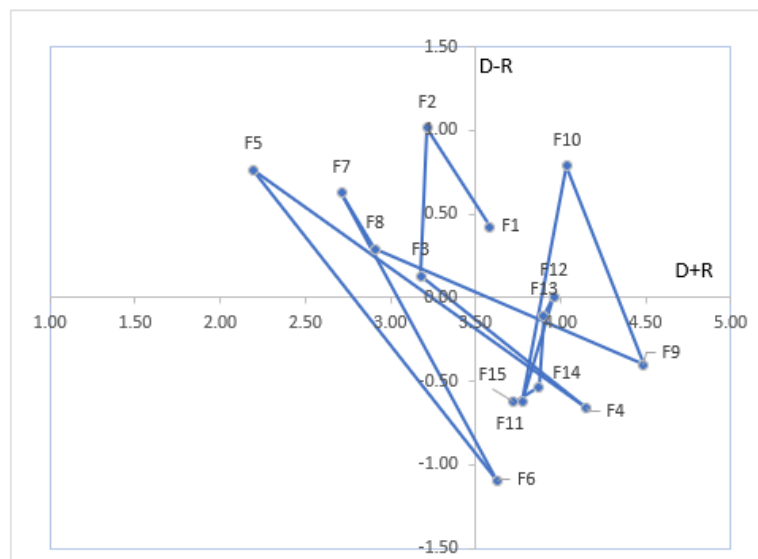


Figure 4. Causal relationship of success factors of traditional food SMEs
Source: Research data processed with DEMATEL application, 2024

CONCLUSION

The results of this study contribute to the literature on SMEs in the traditional food industry, particularly in identifying supporting factors required for sustainable development and examining the interrelationships among these factors. In addition, this study identifies critical factors that require primary attention in the development of traditional food SMEs. These findings may serve as a reference for industry practitioners and policymakers involved in strengthening the traditional food SME sector. An understanding of these critical factors and their interrelationships supports decision-makers in formulating appropriate strategies and policies for SME development.

Based on the findings of this study, it is essential for traditional food SMEs to enhance sustainable performance and adopt the DEMATEL and ISM methodologies as analytical tools to support business development. SMEs need to understand the interrelationships among success determinants and focus on strengthening the most influential factors. The study identifies managerial skills (F1), business models (F2), entrepreneurial skills (F5), financial resources (F3), innovation (F7), and human resource

capacity (F8) as critical determinants of SME success in the traditional food industry. Therefore, these factors should receive priority attention compared to other supporting factors. Policymakers and stakeholders should prioritize these determinants when designing strategies and interventions to strengthen and scale the performance of traditional food SMEs.

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