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Research Article

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MSME Sustainability Strategy Through the Application of Digital Marketing and Product Innovation in the VUCA Era: A Study of SMEs in Sukabumi City

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Abstract: *This study aims to analyze the influence of digital marketing and product innovation on the sustainability of food MSMEs in Sukabumi City in facing the challenges of the VUCA (Volatility, Uncertainty, Complexity, Ambiguity) era. The research method used a quantitative approach with Structural Equation Modeling – Partial Least Square (SEM-PLS) analysis technique through the SmartPLS 4.0 application. The research sample consisted of 100 food MSME actors selected using purposive sampling. The results showed that digital marketing had a significant negative effect on business sustainability. This indicates that the implementation of digital marketing in MSMEs is not yet optimal and still requires more appropriate strategies for its utilization. Conversely, product innovation was found to have a positive and dominant effect on business sustainability. This means that the higher the MSME's ability to innovate, the greater their chances of surviving and growing. The R-Square value of 0.955 shows that digital marketing and product innovation can explain 95.5% of MSME business sustainability, while the rest is influenced by other factors outside the model. In conclusion, MSME business sustainability is largely determined by the ability to innovate, while digital marketing will only be effective if supported by products that are relevant, high-quality, and in line with consumer needs. This study contributes theoretically to the development of literature on SME digital adaptation in the context of VUCA, as well as practically by providing recommendations for SMEs, the government, and supporting institutions to enhance product innovation while optimizing digital marketing strategies in a sustainable manner.*

Keywords: *Digital Marketing, Product Innovation, Business Sustainability, SMEs, VUCA.*

Introduction

The VUCA (Volatility, Uncertainty, Complexity, Ambiguity) era poses a major challenge for the business world, including food MSMEs in Indonesia. Rapid changes in consumer preferences, economic uncertainty, supply chain complexity, and ambiguity in regulations encourage businesses to be more adaptive (Najib *et al.*, 2021; Rumanti *et al.*, 2022). Digital marketing, as a technology-based marketing strategy, offers flexibility and speed in responding to market changes, while product innovation provides the ability to continuously meet dynamic consumer needs (Karimi and Walter, 2021; Najib *et al.,* 2021; Masrianto *et al.,* 2022; Sharabati *et al.*, 2024).

Digital transformation accelerates shifts in consumer behavior, which now prioritizes ease of access, personalized services, and product information transparency. On the other hand, product innovation in the food sector is key to maintaining competitiveness and sustainability, for example through quality improvements, flavor variations, and environmentally friendly packaging. The combination of digital marketing and product innovation is believed to strengthen the sustainability of food MSMEs in facing business uncertainty (Masrianto *et al.,* 2022; Bruce *et al.,* 2023; Trueba-Castañeda, Torre-Olmo and Somohano-Rodríguez, 2024).

The sustainability of food SME businesses encompasses three dimensions: economic, social, and environmental (Yanto *et al.*, 2022; Latifah and Soewarno, 2023; Sari, Alfarizi and Ab Talib, 2024). In economic terms, SMEs must maintain profitability despite market volatility. In the social aspect, MSMEs are expected to make a positive contribution to the local community through job creation. Meanwhile, in terms of the environment, the use of environmentally friendly materials and waste management are important issues (Nawi *et al.,* 2020; Tseng *et al.*, 2023). In the context of Sukabumi, as a city with local culinary potential, adapting to the VUCA era through digitalization and product innovation is an important step to maintain sustainability (Nowacka and Rzemieniak, 2021; Meng *et al.*, 2023).

The phenomenon of accelerated digitalization after the COVID-19 pandemic shows that many food MSMEs have switched to digital platforms such as marketplaces and social media to maintain their existence. However, this adoption is uneven due to the digital capability gap between business actors. In addition, consumers are increasingly demanding healthy, hygienic, and sustainable products, requiring MSMEs to continue to innovate. VUCA pressures require MSME players to be able to adapt quickly despite limited resources (Gaffar, Koeswandi and Suhud, 2022; Anatan and Nur, 2023).

Practical problems that arise include: limited understanding of effective digital marketing, limited capital for product innovation, and market uncertainty due to rapid changes in consumer trends (Anatan and Nur, 2023). These factors can hinder the sustainability of food MSMEs in Sukabumi if not addressed with the right strategy. Therefore, this research is important to understand how digital marketing and product innovation can be adaptation strategies for food SMEs in the VUCA era.

Based on literature reviews and field observations, there is a research gap that needs to be bridged regarding digital adaptation strategies for SMEs in the VUCA era. From a theoretical perspective, most previous studies discuss the digital transformation of MSMEs in a general context or in a single crisis situation such as the COVID-19 pandemic (Anand, Offergelt and Anand, 2021; Chi *et al.*, 2023) , but have not comprehensively examined digital adaptation in the VUCA framework, which encompasses *volatility, uncertainty, complexity,* and *ambiguity* simultaneously. From an empirical perspective, previous studies in Indonesia have focused more on measuring the level of technology adoption, such as the use of e-commerce or social media, but have not explored the strategic adaptation process and the development of dynamic capabilities that are the foundation of successful digitalization (Laldin and Furqani, 2016; Mohamed Salleh, 2021; Tiitu *et al.*, 2021). Meanwhile, from a practical perspective, the recommendations generated from various studies tend to be general and do not sufficiently consider the integration of technology, resource capabilities, business model innovation, and ecosystem collaboration in facing the dynamics of the VUCA environment (Lisdiono *et al.,* 2022; Minciu *et al.,* 2024; Tang *et al.*, 2024).

The urgency of this research lies in the need to identify effective digital adaptation strategies for MSMEs in Indonesia in facing the VUCA environment. Previous studies have discussed digital marketing and product innovation separately, but not many have examined the integration of the two in the context of the sustainability of food MSMEs, especially in areas such as Sukabumi City. Furthermore, previous research has emphasized macro aspects, while micro studies at the city or district level examining the impact of the VUCA era on MSMEs are still limited ((Bening *et al.*, 2023; Meng *et al.*, 2023)). The limitations of research linking economic, social, and environmental dimensions with digital marketing and product innovation also open up space for new contributions. Previous studies have discussed digital transformation in general, but have not specifically linked it to the challenges arising from the characteristics of VUCA in the context of local MSMEs. On the other hand, *the novelty* of this study is its integrative analysis of digital marketing and product innovation as sustainability strategies for food MSMEs in the VUCA era, focusing on the local

context of Sukabumi, which has rarely been studied in academic literature, through a deductive approach that links general theories about VUCA, digital marketing, and innovation with empirical phenomena in the field. The results of this study are expected to contribute theoretically to the SME literature as well as provide practical recommendations for business actors and stakeholders. Based on the above background and supported by the research gap and urgency, this study aims to analyze, formulate, and develop an effective digital adaptation strategy framework for SMEs in facing the dynamics of the VUCA (*Volatility, Uncertainty, Complexity, Ambiguity)* business environment. The benefits of this research are that, theoretically, it contributes to the enrichment of the literature on MSME digital adaptation by linking it to the VUCA context. Practically, this research is expected to provide strategic guidance for MSME actors, policy makers, and supporting institutions in designing sustainable digital-based assistance and intervention programs.

Literature Review

Digital Marketing

Digital marketing is defined as marketing activities that use digital media to reach consumers more effectively and efficiently (Ahmadian *et al.*, 2024). According to Kotler and Keller (2016), digital marketing enables companies to interact directly with consumers, provide personalized experiences, and increase brand awareness (Calvez, Carrillo and Hoffmann, 2020; E-Vahdati, Wan-Hussin, and Ling, 2022 ; Setiadi *et al.*, 2025) This strategy encompasses various forms such as social media marketing, search engine optimization (SEO), email marketing, and digital advertising. In the context of MSMEs, digital marketing plays an important role in reducing promotion costs, expanding market reach, and increasing connectivity with consumers (Masrianto *et al.,* 2022; Sharabati *et al.*, 2024). The use of social media provides opportunities for MSMEs to build emotional relationships with consumers through real-time interactions. Thus, digital marketing can be seen as a strategic instrument that supports business sustainability, especially in the VUCA era characterized by uncertainty and rapid change (Purba *et al.,* 2021; Hokmabadi, Rezvani and Matos, 2024).

Product Innovation

Product innovation refers to the process of creating, developing, or modifying products to meet market needs and provide added value compared to competing products (Firman *et al.*, 2022). According to Bamel *et al.* (2022) and Han *et al.* (2023) , product innovation is one of the most important forms of innovation because it is directly related to consumer satisfaction. Kesanakurti *et al.* (2020) add that innovation can take the form of developing new variants, improving quality, using alternative raw materials, or creating more attractive packaging designs. (Trivedi and Srivastava, 2022) also states that product innovation can increase competitiveness by creating differentiation that is difficult for competitors to imitate. In the context of food MSMEs, innovation is often manifested in the form of flavor variations, recipe innovations, or packaging that is in line with consumer trends. This not only increases consumer satisfaction but also opens up opportunities to enter new market segments. Therefore, product innovation is a key factor in maintaining the relevance of food SMEs in a dynamic market (Kesanakurti *et al.,* 2020; Bamel *et al.,* 2022; Trivedi and Srivastava, 2022; Han *et al.*, 2023).

Business Sustainability

Business sustainability refers to a company's ability to maintain long-term operations while considering economic, social, and environmental aspects (Andersson *et al.*, 2022; Ayu Purnamawati,

Yuniarta and Jie, 2023). This concept is in line with Elkington's (1997) *Triple Bottom Line* theory, which emphasizes that sustainability does not only prioritize profit, but also social contribution (*people)* and environmental sustainability (*planet)* (Loviscek, 2021; Moorkens *et al.*, 2024). MSME sustainability is understood as a concept that involves economic, social, and environmental dimensions in an integrated manner. From an economic perspective, sustainability is reflected in the ability of MSMEs to maintain cost efficiency, ensure income stability, and encourage business growth. Meanwhile, in the social dimension, sustainability is reflected in the contribution of MSMEs in providing employment, benefiting the surrounding community, and carrying out social responsibilities. In the environmental aspect, sustainability is related to efforts to manage waste, use energy efficiently, and use environmentally friendly materials (Laila *et al.,* 2022; Menne *et al.,* 2022; Harsanto *et al.*, 2023). For food SMEs, sustainability is also inseparable from compliance with food safety standards, consistency in maintaining product quality, and the application of innovations that support consumer health (Harsanto *et al.*, 2023).

Hypothesis Development

Digital Marketing on the Sustainability of SME Businesses

Digital marketing is a marketing strategy that utilizes digital technology, the internet, and social media to reach consumers more widely, quickly, and interactively (Ahmadian *et al.*, 2024). For food MSMEs, the use of digital marketing allows business actors to promote products efficiently, increase brand visibility, and strengthen relationships with customers through online platforms (Sultoni *et al.*, 2022). This contributes to increased sales, more effective cost management, and income stability, which are important indicators of SME economic sustainability (Udayana *et al.*, 2024). In addition, according to Munir *et al.* (2023) digital marketing also plays a role in expanding market reach, both locally and globally, thereby opening up greater business growth opportunities. Sustainability is not only seen from an economic perspective, but also from the ability of MSMEs to adapt to technological developments and changes in consumer behavior (Meng *et al.*, 2023). In the context of the VUCA (Volatility, Uncertainty, Complexity, Ambiguity) era, digital marketing has become a vital instrument for increasing business competitiveness and resilience (Ramadan *et al.*, 2023).

Based on the theoretical discussion above, the following research hypotheses can be formulated:

H1: Digital Marketing has a positive effect on the sustainability of food SMEs.

Product Innovation on the Sustainability of MSME Businesses

Product innovation is understood as the ability of a business to create, develop, or modify products so that they have higher added value and relevance in the market (Farida and Nuryakin, 2021). For food MSMEs, innovation can be realized in the form of flavor variations, quality improvements, attractive packaging designs, and the use of healthier and more environmentally friendly ingredients. These efforts not only enhance appeal to consumers but also strengthen the competitive position of SMEs amid increasingly intense competition (Harsanto *et al.*, 2023).

The sustainability of MSME businesses is greatly influenced by their ability to adapt to changing trends and consumer preferences (Gupta and Singh, 2022). Product innovation provides opportunities for MSMEs to meet dynamic market demands, maintain customer loyalty, and expand their consumer reach (Sarfo, Fakhar Manesh and Caputo, 2024). In the context of the VUCA era, innovation has become an adaptive strategy that supports sustainability not only in economic aspects but also in social and

environmental dimensions, for example through the use of environmentally friendly packaging or products that support a healthy lifestyle (D'Almeida and De Albuquerque, 2024).

Based on this theoretical foundation, the hypothesis proposed is:

H2: Product Innovation has a positive effect on the sustainability of SME businesses

Based on the development of the above hypothesis, the research framework is described as follows:

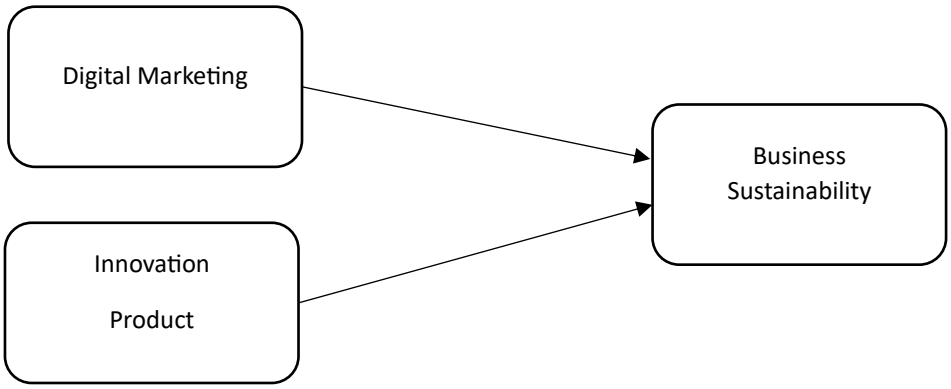

Figure 1. Research Framework

Method

This study uses a quantitative method to analyze the influence of digital marketing and product innovation on the business sustainability of MSMEs in Sukabumi City. The analysis tool used in this study is a structural equation model (SEM)-partial least square (PLS) using the SmartPLS 4.0 application.

The population in this study was the food industry in Sukabumi City, which numbered 861 (opendata.sukabumikota.go.id). The sample was taken using non-probability purposive sampling, with criteria of a minimum business capital of IDR 15,000,000, a minimum business age of 5 years, and the position of the business owner. A total of 100 business actors were selected as respondents in this study.

In this study, there are 5 variables, including 2 independent variables (Digital Marketing and Product Innovation) and 1 dependent variable (Business Sustainability). Quantitative data was collected through a questionnaire (Google Form) based on a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree).

This study used a quantitative method with Structural Equation Model (SEM) – Partial Least Square (PLS) analysis tools through the SmartPLS 4.0 application. This method was chosen to analyze the influence of digital marketing and product innovation on the business sustainability of MSMEs. The analysis in SEM-PLS was carried out through two main models, namely the outer model and the inner model. The outer model was used to test the validity and reliability of indicators against latent constructs (Mohd Dzin and Lay, 2021). The validity test included *convergent validity* with a loading factor requirement of more than 0.7, as well as *discriminant validity* with an Average Variance Extracted (AVE) value above 0.5 (Ciavolino *et al.*, 2021). Reliability was tested using *composite reliability* and Cronbach's Alpha, where variables were declared reliable if their values exceeded 0.7. Meanwhile, the inner model was used to analyze the relationship between latent variables. Testing was carried out by looking at the *path coefficient* value to determine the influence between variables, as well as *R-Square* (R^2), which indicates the predictive power of the model. Model suitability was also examined through the *Goodness of Fit* (Q^2) value, Goodness of Fit (GoF) assessment, and the PLS model goodness of fit test based on the SRMR model value. The PLS model is declared to have met the goodness of fit model criteria if the SRMR value is < 0.10, and the model

is declared a perfect fit if the SRMR value is < 0.08*et al.*, 2024). Additionally, hypothesis testing was conducted using the *bootstrapping* method to address the issue of non-normal data distribution (Zhang and Wu, 2024; Bader and Moshagen, 2025). The criteria for accepting a hypothesis are if the t-statistic value is greater than 1.96 and the p-value is less than 0.05. Thus, the proposed hypothesis can be accepted (Ha) and the null hypothesis (H0) rejected if it meets these criteria.

Results and Discussion

Testing with the Measurement Model (Outer Model)

In the field of analysis, **the measurement model (outer model)** serves to assess the level **of validity** and **reliability** of a research model. The outer model also plays a role in explaining the relationship between each indicator and the latent variable it represents. In other words, the measurement model is used to test the suitability of instruments through validity and reliability testing (Fithri *et al.,* 2024; Subhaktiyasa, 2024). In this study, the measurement methods used were:

1. Validity Test

The validity test in this study was conducted using two measurement methods, namely convergent validity and discriminant validity (Yang, 2023).

a) Convergent Validity

Convergent validity is one of the essential criteria in analytical testing with SmartPLS (Carlos Rodr´Igue *et al.*, 2024). The evaluation of convergent validity in SmartPLS with a reflective indicator approach was conducted through factor loading testing. 's factor loadings describe the level of correlation between scores on specific items or indicators and the overall construct score, thereby indicating the extent to which the indicators are able to represent the construct being measured. As a general guideline, factor loading values above 0.70 are considered adequate for confirmatory research, while values above 0.60 are still acceptable in exploratory research. In this study, a factor loading criterion greater than 0.70 was used. In addition, convergent validity can also be evaluated through the Average Variance Extracted (AVE) value, with the provision that the AVE value must be greater than 0.50. The description of the causal relationship between constructs and the factor loading values of each indicator are shown in Figure 2:

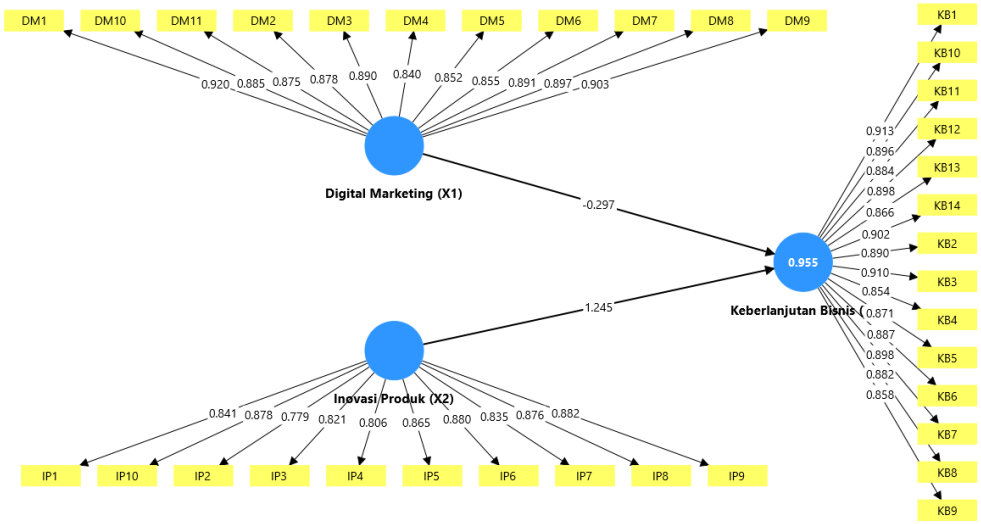

Figure 2. Outer Model
Source: processed using SMART PLS4 (2025)

Figure 2 shows the convergent validity obtained through data processing using PLS software. The evaluation was carried out by looking at the loading factor value for each construct indicator. A construct is declared to meet convergent validity if the loading factor is greater than 0.70 and the AVE value exceeds 0.5. The test results obtained are as follows:

Table 1. Final Factor Loadings

Variable (Symbol)	Indikator	Factor Loadings	Note
Digital Marketing (X1)	X1.1	0.920	Valid
	X1.2	0.878	Valid
	X1.3	0.890	Valid
	X1.4	0.840	Valid
	X1.5	0.852	Valid
	X1.6	0.855	Valid
	X1.7	0.891	Valid
	X1.8	0.897	Valid
	X1.9	0.903	Valid
	X1.10	0.885	Valid
	X1.11	0.875	Valid
Product Innovation (X2)	X2.1	0.841	Valid
	X2.2	0.779	Valid
	X2.3	0.821	Valid
	X2.4	0.806	Valid
	X2.5	0.865	Valid
	X2.6	0.880	Valid
	X2.7	0.835	Valid
	X2.8	0.876	Valid
	X2.9	0.882	Valid
	X2.10	0.878	Valid
Business Sustainability (Y)	Y1	0.913	Valid
	Y2	0.890	Valid
	Y3	0.910	Valid
	Y4	0.854	Valid
	Y5	0.871	Valid
	Y6	0.887	Valid
	Y7	0.898	Valid
	Y8	0.882	Valid
	Y9	0.858	Valid
	Y10	0.896	Valid
	Y11	0.884	Valid
	Y12	0.898	Valid
	Y13	0.866	Valid
	Y14	0.902	Valid

Source: Data processed by the researcher (2025)

Table 1, information about the results of the Loading Factor on each manifest variable shows that all indicators for the latent variable have a value greater than 0.70, so these indicators are considered valid.

Table 2. AVE Values

Variable	AVE Values
Digital Marketing	0.776
Product Innovation	0.717
Business Sustainability	0.786

Source: Data processed by the researcher (2025)

Based on **Table 2**, it can be seen that each research variable has an **Average Variance Extracted (AVE)** value that exceeds the minimum limit set at **0.5**. With this value achieved, all variables used in this study can be declared valid in describing or representing the latent variables measured. This condition indicates that the indicators or manifest variables used have sufficient ability to explain the intended construct. In other words, the use of manifest variables in the research model is in accordance with the convergent validity testing standard because it meets the required AVE value. This reinforces the belief that the relationship between the indicators and the constructs they represent is reliable and can be used as a basis for further analysis.

b) Discriminant Validity

Discriminant validity can be tested through *Cross Loading Factor* and comparison of AVE values with correlations between latent variables. If the indicators are more correlated with the main construct than with other constructs, then discriminant validity is considered to be fulfilled. The *Cross Loading* results are presented as follows:

Table 3. Cross Loading Factor

Indicator	**Digital Marketing (X1)**	**Product Innovation (X2)**	**Sustainability (Y)**
X1.1	0.920	0.848	0.789
X1.2	0.878	0.815	0.752
X1.3	0.890	0.810	0.748
X1.4	0.840	0.777	0.713
X1.5	0.852	0.805	0.742
X1.6	0.855	0.798	0.730
X1.7	0.891	0.822	0.756
X1.8	0.897	0.828	0.760
X1.9	0.903	0.827	0.766
X1.10	0.885	0.816	0.768
X1.11	0.875	0.804	0.741
X2.1	0.883	0.841	0.771
X2.2	0.804	0.779	0.688
X2.3	0.863	0.821	0.737
X2.4	0.851	0.806	0.731
X2.5	0.720	0.865	0.888
X2.6	0.800	0.880	0.896
X2.7	0.698	0.835	0.844

Indicator	Digital Marketing (X1)	Product Innovation (X2)	Sustainability (Y)
X2.8	0.757	0.876	0.863
X2.9	0.747	0.882	0.882
X2.10	0.758	0.878	0.875
Y1	0.775	0.878	0.913
Y2	0.731	0.864	0.890
Y3	0.792	0.889	0.910
Y4	0.701	0.817	0.854
Y5	0.763	0.852	0.871
Y6	0.743	0.857	0.887
Y7	0.765	0.881	0.898
Y8	0.750	0.852	0.882
Y9	0.742	0.841	0.858
Y10	0.751	0.860	0.896
Y11	0.732	0.846	0.884
Y12	0.811	0.893	0.898
Y13	0.763	0.848	0.866
Y14	0.765	0.865	0.902

Source: Data processed by the researcher (2025)

Table 3 shows that the Cross Loading Factor values indicate a higher correlation between each latent construct and the corresponding indicators compared to other constructs. Thus, it can be concluded that the indicators used have met the criteria for measuring latent variables.

2. Reliability Test

Composite Reliability (CR) and Cronbach's Alpha (CA) are two methods that can be used to measure the reliability of Partial Least Square (PLS):

Table 4. CA and CR

Variable	CA	CR	Conclusion
Digital Marketing	0.971	0.974	Reliable
Product Innovation	0.956	0.962	Reliable
Business Sustainability	0.979	0.981	Reliable

Source: Data processed by the researcher (2025)

The test results show that the data used is reliable, meaning that all indicators are consistent in measuring each variable. This is indicated by a Composite Reliability (CR) value exceeding 0.7 and a Cronbach's Alpha (CA) value above 0.6. Meanwhile, testing of the Structural Model (Inner Model) was conducted to assess the relationship between latent variables. This evaluation was carried out by looking at the path coefficient value to determine whether the emerging influence was significant or not, using the *bootstrapping* technique. The following figure shows the *bootstrapping* results obtained in this study:

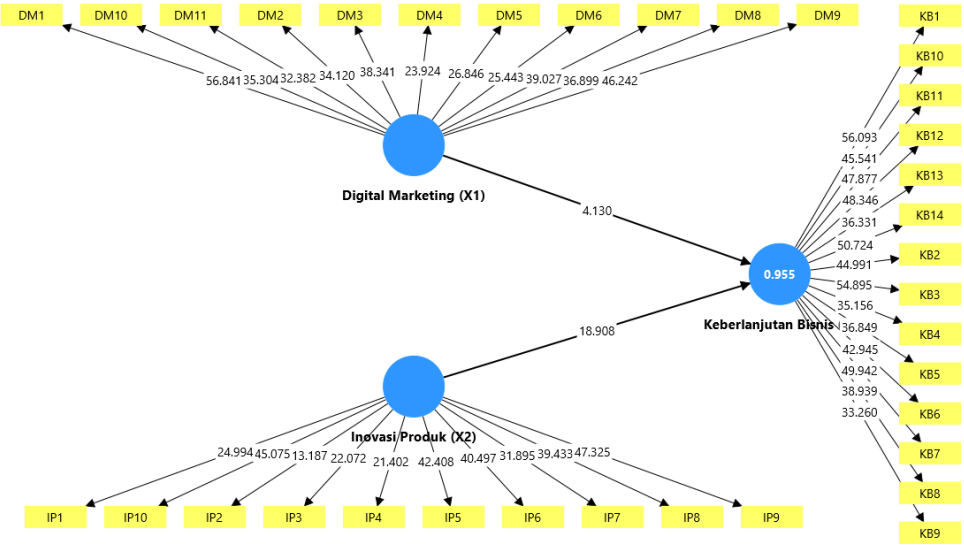

Figure 3. *Bootstrapping*
Source: processed by Smart PLS 4(2025)

Figure 3 shows that **the *Path Coefficient* value** is determined through **t-statistics**, where the results are considered significant if they exceed 1.96 in a two-tailed test. Based on the results in the figure, the t-statistic value for the relationship **between X1 and** Y is 4**.130,** indicating that digital marketing has a positive effect on business sustainability, while **X2 to Y** also shows a strong contribution with a value **of 18.908,** indicating that product innovation has a stronger and more significant effect on business sustainability. Both variables exceed the significance threshold, thus supporting the research hypothesis. All indicators also show high t-statistic values, confirming the validity and convergent reliability of the construct. These findings indicate that business collaboration and competitiveness play an important role in promoting business sustainability. Testing of **the structural model (inner model)** was conducted using **SMARTPLS 4,** where the interrelationships between latent constructs were evaluated using **R-Square** values**.** For the dependent constructs, t-tests and significance analyses were conducted on the structural path coefficients.

Table 5. R *Square* Results

Variable	R-square	Adjusted R-square
Business Sustainability	0.955	0.954

Source: Data processed by the researcher (2025)

R-square is calculated on the dependent variable. The analysis results show that the *R-square* value for Business Sustainability is 0.955, which means that Digital Marketing and Product Innovation contribute 95.5% to this variable. This very high figure indicates that the research model has strong predictive capabilities, so that the variables studied play a significant role in influencing business sustainability, while the rest are influenced by other factors outside the model.

Furthermore, the Goodness of Fit (GoF) assessment criteria for the model are that the SRMR value is < 0.10 and the model is declared a perfect fit if the SRMR value is < 0.08. This indicates that the model is acceptable and functions well in describing the relationships in the data used. This means that the model

is very good at matching the data without much residual (Legate, Ringle and Hair, 2023; Imtihansyah *et al.*, 2024).

Table 6. Q-Square

Variable	Saturated model	Estimated model
SRMR	0.049	0.049

Source: Data processed by the researcher (2025)

Based on the ***Goodness of Fit (GoF)*** analysis results, the **SRMR** ***(Standardized Root Mean Square Residual)*** value obtained was **0.049**. This value indicates that the model has a very good fit, as it meets the acceptance criteria where SRMR ≤ 0.08 is considered good and SRMR ≤ 0.05 is categorized as very good. Thus, these results indicate that the difference between the observed covariance matrix and the covariance matrix predicted by the model is very small. This means that the model used in this study is reliable and appropriate in explaining the relationship between variables, namely digital marketing, product innovation, and MSME business sustainability. This shows that the difference between the actual data and the data predicted by the model is very small, so that the model used is appropriate for explaining the relationship between variables.

3. Hypothesis Testing

Hypothesis testing was conducted after the data met the measurement criteria using the **bootstrapping** method in **Smart PLS4**. This technique does not require the assumption of normal distribution or a large sample size (Xu *et al.*, 2023). The testing was conducted through an analysis of path coefficient values, ***t-values***, and ***p-values*** to assess the influence between variables, as well as parameter coefficients that indicate the level of significance of each variable.

Table 6. Path Significance Test

Relationship	Original sample (O)	T statistics (|O/STDEV|)	P values
Digital Marketing (X1) -> Business Sustainability (Y)	-0.297	4.130	0.000
Product Innovation (X2) -> Business Sustainability (Y)	1.245	18,908	0.000

The researcher applied a confidence level of 95%. For a two-tailed hypothesis, the Path Coefficient value indicated by the t-statistic value must exceed 1.96. Based on the Path Coefficient and t-statistic, as well as the available table, the following direct effects can be concluded:

The Effect of Digital Marketing on Business Sustainability (H1)

H0: Digital Marketing does not affect Business Sustainability

H1: Digital Marketing has an effect on Business Sustainability

Reject H0 and accept H1 if the t-value is greater than the t-table value.

To test the proposed hypothesis, an analysis was conducted using the *t-value* to evaluate the effect of digital marketing on business sustainability. The test results showed that the *t-value* was 4.130, which exceeded the threshold of 1.96, with *a p-value* of 0.000, which was less than the significance level of 0.05 (α = 0.05). This finding indicates that the third hypothesis (H1) is accepted, so it can be concluded that there is a significant effect of digital marketing on business sustainability. Furthermore, the original sample

estimate value for the digital marketing variable on business sustainability is -0.297 with a negative direction, indicating a **negative** relationship between digital marketing and business sustainability. This means that an increase in digital marketing tends to reduce business sustainability, but the hypothesis stating that digital marketing has an effect on business sustainability **is accepted.**

The Effect of Product Innovation on Business Sustainability (H4)

H0: Product Innovation does not affect Business Sustainability

H2: Product Innovation affects Business Sustainability

Reject H0 and accept H4 if the t-value is greater than the t-table value

The results of the analysis show that product innovation has a significant effect on business sustainability, with a *t-value* of 18.908 (>1.96) and *a p-value* of 0.000 (<0.05). This finding indicates that the third hypothesis (H2) is accepted, so it can be concluded that there is a significant effect of product innovation on business sustainability. Furthermore, the original sample estimate value for the digital marketing variable on business sustainability is 1.245 with a positive direction, indicating a very strong **positive** relationship. This means that the higher the product innovation, the greater the business sustainability.

The Influence of Digital Marketing on Business Sustainability

Based on the results of the study, the **Digital Marketing** variable **(X1)** shows a path coefficient of **-0.297** with a **t-statistic** value **of 4.130** (> 1.96) and **a p-value of 0.000** (< 0.05). This means that digital marketing has a significant effect on business sustainability, but with a **negative** direction of influence. This finding is quite interesting, because digital marketing is generally expected to contribute positively to business performance. This condition can be interpreted as meaning that the implementation of digital marketing in MSMEs in the context of this study is still not optimal. The digital marketing strategies carried out may be less targeted, inconsistent, or incur high costs that are not proportional to the benefits obtained. This is in line with the findings of Nuseir and Refae (2022), which emphasize that the effectiveness of digital marketing is greatly influenced by strategic planning, market segmentation, and digital data analysis capabilities. Thus, although digital marketing has great potential, improper implementation can actually have a negative impact on business sustainability.

The Influence of Product Innovation on Business Sustainability

Based on the results of the study, **the Product Innovation** variable **(X2)** has a path coefficient of **1.245** with a **T-statistic** value of **18.908** (> 1.96) and **a p-value of 0.000** (<0.05). These results prove that product innovation has a significant and positive effect on business sustainability. The higher the ability of MSMEs to innovate products, the greater the opportunity for businesses to survive and grow. Previous research by Trivedi and Srivastava (2022) also supports these results, where product innovation has been proven to increase a company's competitiveness through the creation of added value and differentiation that is difficult for competitors to imitate. In the context of MSMEs, the ability to introduce new products or make modifications according to consumer needs is the key to maintaining business sustainability amid increasingly fierce competition.

Overall, the results of the study show that **product innovation has a far more dominant influence than digital marketing on the sustainability of MSME businesses**. This confirms that although digital marketing is important as a means of promotion and communication, business sustainability is largely

determined by the ability of MSMEs to innovate. In other words, a good digital marketing strategy will only be effective if it is supported by product quality that is continuously updated according to consumer needs. These findings reinforce previous research stating that the combination of innovation and digital adaptation is key for SMEs to survive in the VUCA era (Christofi *et al.*, 2024; Cong, Yang and Zhang, 2024; Prihandono *et al.*, 2024).

Conclusion

The results of this study provide empirical evidence that digital marketing and product innovation have a significant effect on the sustainability of food SME businesses in Sukabumi City. Interestingly, the effect of digital marketing in this study is significant but shows a negative direction, which means that the implementation of digital marketing strategies in most SMEs has not been optimal. This condition may occur due to a number of factors, including the inappropriate selection of digital platforms used, limited digital literacy and skills of business actors, and high digital marketing operational costs that are not proportional to the results obtained. In other words, although digital marketing is believed to be an effective means of expanding market reach, in practice there are still various obstacles that prevent it from contributing optimally to business sustainability.

On the other hand, product innovation has proven to have a positive influence and is the most dominant factor in maintaining the sustainability of MSME businesses. The ability of business actors to innovate their products, whether through the creation of new products, quality improvements, addition of variety, or adjustments to design and packaging according to consumer tastes, has proven to play an important role in maintaining customer loyalty while expanding market segments. In the context of the VUCA era, which is full of uncertainty, complexity, and rapid change, product innovation has become an adaptive asset that allows MSMEs to remain relevant and able to compete with increasingly diverse competitors.

Overall, this study confirms that the ability to innovate is more decisive for the sustainability of MSMEs than the application of digital marketing alone. However, digital marketing still has an important role to play when used with the right strategy, namely when combined with products that are high-quality, unique, and tailored to consumer needs. The combination of the two will produce strong synergy: product innovation provides added value, while digital marketing accelerates the dissemination of information and expands market reach. Thus, the integration of product innovation strategies with the effective use of digital marketing is a key factor for food MSMEs in Sukabumi City to remain sustainable, grow, and be competitive amid the dynamics of an uncertain business environment.

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