Journal of Research on Business and Tourism
Volume 6 No. 1, June 2026, p 15 - 33
Submitted: May 2026 | ***Accepted***: June 2026 | ***Published***: June 2026
ISSN: 2797-3263 (cetak), ISSN: 2797-9938 (online)
DOI : https://doi.org/10.37535/104006120262

JOURNAL OF RESEARCH ON BUSINESS AND TOURISM

Industrial Estate Spillover and Food MSME Upgrading in Batang

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ABSTRACT

Industrial estate development can create new economic opportunities for local micro, small, and medium-sized enterprises (MSMEs), but these opportunities do not automatically lead to business upgrading. This study examines the effect of industrial estate spillover on food and beverage MSME upgrading in Batang Regency, Central Java, Indonesia, through the mediating roles of absorptive capacity and digital capability, as well as the moderating role of institutional support. A quantitative explanatory approach was applied using data from 350 food and beverage MSME owners, managers, and business operators. The data were analyzed using partial least squares structural equation modeling (PLS-SEM). The findings show that industrial estate spillover positively influences absorptive capacity and MSME upgrading. Absorptive capacity positively affects digital capability and MSME upgrading, while digital capability also contributes positively to MSME upgrading. The mediation results confirm that absorptive capacity and digital capability serve as important mechanisms linking industrial estate spillover to MSME upgrading. Institutional support strengthens the relationship between industrial estate spillover and absorptive capacity. This study concludes that MSME upgrading depends not only on external industrial opportunities but also on learning capability, digital readiness, and institutional support.

Keywords: industrial estate spillover; absorptive capacity; digital capability; institutional support; MSME upgrading

INTRODUCTION

Micro, small, and medium-sized enterprises (MSMEs) play a strategic role in employment creation, household income, local entrepreneurship, and regional economic resilience. In Indonesia, MSMEs account for a large proportion of business units and remain an important contributor to national economic activity (Kementerian Koordinator Bidang Perekonomian Republik Indonesia, 2022). However, the current business environment increasingly requires MSMEs to move beyond survival-oriented operations. They are expected to improve product quality, strengthen business legality, adopt digital tools, expand market access, and prepare for broader forms of business partnership.

These challenges become more relevant in regions experiencing rapid industrial development. Industrial estates may create new opportunities for local firms through increased demand, infrastructure improvement, supplier networks, market expansion, and exposure to higher business standards (Whitfield et al., 2020). Nevertheless, such opportunities do not automatically result in MSME upgrading (Pahl & Timmer, 2020). Local enterprises need to recognize external changes, absorb relevant knowledge, and translate emerging opportunities

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into improvements in products, processes, marketing practices, and business readiness (Islam & Polonsky, 2020).

Batang Regency, Central Java, Indonesia, provides a relevant context for examining this issue. The development of the Batang Integrated Industrial Estate, known as Kawasan Industri Terpadu Batang (KITB), has positioned Batang as an emerging industrial region. The Indonesian government stated that KITB has a total development target of 4,300 hectares and is expected to create employment opportunities for approximately 250,000 workers (Office of Assistant to Deputy Cabinet Secretary for State Documents & Translation, 2024). This transformation may generate spillover effects for surrounding MSMEs through worker consumption, new customer demand, business networks, partnership opportunities, and pressure to meet higher product and service standards.

Food and beverage MSMEs are particularly relevant in this setting because their products are closely linked to daily consumption, catering needs, packaged food, beverages, local culinary identity, and tourism-related demand. The growth of an industrial area can increase demand for ready-to-eat meals, snacks, beverages, and supporting food services. However, benefiting from this opportunity requires more than increasing sales volume. Food and beverage MSMEs must improve hygiene, packaging, legality, certification readiness, production capacity, digital promotion, and partnership capability (Eller et al., 2020). In Batang, these requirements are especially important because local MSMEs may face new expectations from industrial workers, suppliers, visitors, and potential institutional or corporate partners.

Despite these opportunities, many MSMEs still experience difficulties in converting industrial development into concrete business improvement. The 2023 Micro and Small Industry Profile of Batang Regency indicates that micro and small industries in Batang continue to face constraints related to capital, marketing, internet use, innovation, and partnership development (BPS Kabupaten Batang, 2024). This condition suggests an opportunity-capability gap: industrial estate development may create demand and exposure, but local MSMEs may not have sufficient capability to absorb, adapt, and use those opportunities for upgrading.

Previous studies have examined MSME development through digital marketing, e-commerce adoption, entrepreneurial orientation, innovation capability, and institutional support (Adithia & Jaya, 2021; Cenamor et al., 2019). Recent research also shows that digital capabilities can help small and medium-sized enterprises identify opportunities and improve entrepreneurial outcomes (Kim & Jin, 2024; Kraus et al., 2022). In the Indonesian food MSME context, prior studies have discussed the relationship among e-commerce use, innovation capability, and business performance (Wijaya et al., 2025). Although these studies offer important insights, much of the existing literature still emphasizes direct relationships between digitalization, innovation, support, and performance. Less attention has been given to the internal process through which local MSMEs absorb opportunities from industrial estate development and transform them into upgrading.

This study addresses this gap by developing an integrated model that links industrial estate spillover, absorptive capacity, digital capability, institutional support, and MSME upgrading. The first gap concerns the limited empirical attention given to how industrial estate development creates spillover effects for local food and beverage MSMEs in emerging

industrial regions. The second gap relates to the use of business performance as the dominant outcome in many MSME studies, whereas MSME upgrading provides a broader perspective on capability improvement, market readiness, operational standards, and partnership capability. The third gap concerns the limited explanation of how MSMEs recognize, absorb, and apply external opportunities. The fourth gap relates to the role of institutional support, which is often treated as a direct predictor rather than as a condition that may strengthen the effect of industrial estate spillover on absorptive capacity.

The theoretical foundation of this study is based on the dynamic capability perspective. This perspective explains that firms operating in changing environments need to sense opportunities, reconfigure resources, and adjust business practices (Teece et al., 1997; Teece, 2007). In this study, industrial estate development is viewed as an external environmental change that may create new demand, new standards, and new linkages for local MSMEs. The ability of MSMEs to benefit from this change depends on their capacity to interpret market signals and convert them into practical business improvements.

This study also draws on the knowledge spillover perspective. Industrial development may generate indirect benefits for nearby firms through exposure to new customer needs, quality expectations, business practices, and partnership possibilities (Whitfield et al., 2020). Such spillovers may occur not only through formal collaboration but also through market interaction, observation, supplier networks, worker demand, and changes in local consumption patterns (Audretsch & Feldman, 1996). In this study, industrial estate spillover refers to the perceived opportunities and learning exposure obtained by food and beverage MSMEs from the development of KITB.

However, spillover effects alone are not sufficient to support upgrading. MSMEs need absorptive capacity to identify useful information, understand its relevance, and apply it to business improvement (Corral de Zubielqui et al., 2019). Absorptive capacity allows firms to use external knowledge for innovation and development (Cohen & Levinthal, 1990; Zahra & George, 2002). For food and beverage MSMEs, this capability can be reflected in their ability to understand changing customer preferences, learn product standards, improve packaging and hygiene, and adjust business practices based on market information.

Digital capability is also important in the upgrading process. After MSMEs recognize and absorb external knowledge, they need practical tools to reach customers, communicate product value, manage transactions, and expand market access. Digital capability enables MSMEs to use social media, digital payment systems, online communication channels, and digital promotion tools to support business development (Matarazzo et al., 2021; Papadopoulos et al., 2020). In this study, digital capability is not limited to technology ownership; rather, it refers to the meaningful use of digital tools to improve business activities (Verhoef et al., 2021).

Institutional support may further influence the ability of MSMEs to benefit from industrial estate spillovers. Institutional theory suggests that firms are shaped by formal and informal institutions that provide resources, legitimacy, rules, and support (Scott, 2014; Stam & van de Ven, 2021). For food and beverage MSMEs, institutional support may include training, mentoring, financing information, legality assistance, certification support, digital marketing assistance, exhibition programs, and partnership facilitation. Such support can help MSMEs

interpret external opportunities more effectively and strengthen their ability to absorb knowledge from the surrounding industrial environment (Yang & Yu, 2022).

Based on this reasoning, this study argues that industrial estate spillover can contribute to MSME upgrading both directly and indirectly. Absorptive capacity and digital capability are expected to function as key mechanisms that explain how external opportunities from industrial estate development are transformed into business improvement. Institutional support is also expected to strengthen the relationship between industrial estate spillover and absorptive capacity by helping MSMEs access knowledge, guidance, and resources.

The novelty of this study lies in its integrated explanation of how industrial estate spillover contributes to food and beverage MSME upgrading through absorptive capacity and digital capability, while positioning institutional support as a moderating variable. Unlike previous studies that mainly examine digitalization, innovation, or institutional support as direct predictors of MSME performance, this study explains the process through which external opportunities are absorbed, transformed, and translated into upgrading. By focusing on food and beverage MSMEs in Batang Regency, this study provides empirical insight into how local enterprises in an emerging industrial region can benefit from large-scale industrial development.

The objective of this study is to examine the effect of industrial estate spillover on food and beverage MSME upgrading in Batang Regency through the mediating roles of absorptive capacity and digital capability. This study also investigates whether institutional support strengthens the relationship between industrial estate spillover and absorptive capacity. The findings are expected to contribute to the literature on MSME upgrading, dynamic capabilities, knowledge spillover, digital capability, and institutional support. Practically, this study may provide insights for local governments, industrial estate managers, MSME associations, and development agencies in designing programs that help food and beverage MSMEs improve quality, strengthen digital readiness, expand markets, and prepare for formal business partnerships.

Hypothesis Development

Based on the theoretical arguments above, this study proposes the following hypotheses. First, industrial estate spillover has a positive effect on absorptive capacity (H1). Second, absorptive capacity has a positive effect on digital capability (H2). Third, digital capability has a positive effect on MSME upgrading (H3). Fourth, absorptive capacity has a positive effect on MSME upgrading (H4). Fifth, industrial estate spillover has a positive effect on MSME upgrading (H5). In addition, absorptive capacity is proposed to mediate the relationship between industrial estate spillover and MSME upgrading (H6), while digital capability is expected to mediate the relationship between absorptive capacity and MSME upgrading (H7). Furthermore, absorptive capacity and digital capability are hypothesized to sequentially mediate the relationship between industrial estate spillover and MSME upgrading (H8). Finally, institutional support is expected to moderate the relationship between industrial estate spillover and absorptive capacity (H9).

Research Framework

The research framework was developed based on the proposed hypotheses. Figure 1 illustrates the direct, mediated, and moderated relationships among industrial estate spillover,

absorptive capacity, digital capability, institutional support, and MSME upgrading. H1-H5 represent the direct effects, H6-H8 represent the mediated effects, and H9 represents the moderating effect of institutional support on the relationship between industrial estate spillover and absorptive capacity.

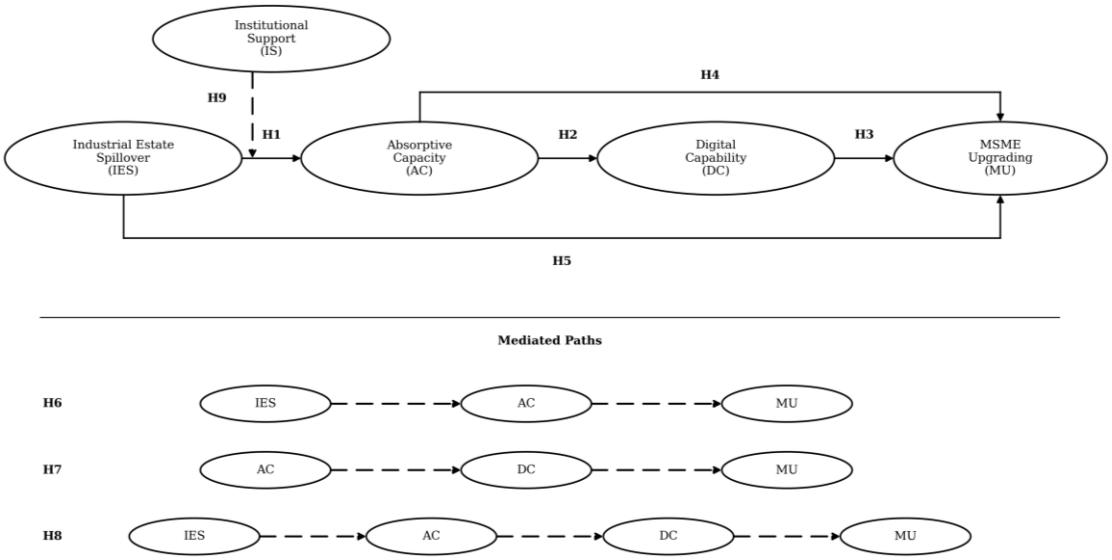

Figure 1. Research Model
Source: Author's elaboration (2026)

METHOD

This study employed a quantitative explanatory research design to examine the relationships among industrial estate spillover, absorptive capacity, digital capability, institutional support, and micro, small, and medium-sized enterprise (MSME) upgrading. This approach was appropriate because the study tested a theoretically developed model involving direct, mediating, and moderating relationships among latent variables. The unit of analysis was food and beverage MSMEs in Batang Regency, Central Java, Indonesia. The respondents were MSME owners, managers, or business operators who had sufficient knowledge of business operations, marketing activities, digital practices, institutional support, and business development.

The population of this study consisted of food and beverage MSMEs in Batang Regency with potential exposure to the development of the Batang Integrated Industrial Estate, known as Kawasan Industri Terpadu Batang (KITB). Food and beverage MSMEs were selected because this sector is closely related to daily consumption, worker demand, catering services, packaged food, beverages, local culinary products, and supporting business activities in industrial regions. This sector also provides a suitable context for observing upgrading through improvements in product quality, packaging, hygiene standards, legality, certification readiness, production capacity, digital marketing, and partnership readiness.

This study used stratified purposive sampling. Stratification was applied to capture variation among MSMEs based on geographical exposure to industrial estate development and type of food and beverage business. The geographical strata consisted of MSMEs located near the industrial estate area, MSMEs located in central business or market areas, and MSMEs located in other sub-districts within Batang Regency. The business-type strata included ready-to-eat

food businesses, catering businesses, packaged food or snack producers, beverage businesses, and local culinary product enterprises. Purposive sampling was then applied within these strata to ensure that the respondents met the study criteria.

The inclusion criteria required MSMEs to operate in the food and beverage sector, be located in Batang Regency, have operated for at least one year, and be represented by owners, managers, or operators involved in business decision-making. Responses were excluded when the respondents did not understand the business operations, provided incomplete answers, showed straight-line response patterns, or did not meet the inclusion criteria.

A total of 430 questionnaires were distributed to food and beverage MSME owners, managers, or business operators in Batang Regency. Of these, 386 questionnaires were returned, resulting in a response rate of 89.8%. After data screening, 36 responses were excluded from further analysis. Eighteen responses were removed because they were incomplete, eleven were excluded due to straight-line response patterns, and seven were removed because the respondents did not meet the inclusion criteria. Therefore, the final dataset consisted of 350 valid responses, representing a usable response rate of 81.4%.

Table 1. Sample Distribution

Category	Frequency	Percentage
Geographical Exposure		
Near the industrial estate area	140	40.0%
Central business or market areas	120	34.3%
Other sub-districts in Batang Regency	90	25.7%
TOTAL	**350**	**100.0%**
Type of food and beverage business		
Ready-to-eat food businesses	115	32.9%
Catering businesses	50	14.3%
Packaged food or snack producers	80	22.9%
Beverage businesses	55	15.7%
Local culinary product enterprises	50	14.3%
TOTAL	**350**	**100.0%**

Source: Primary data processed by the authors (2026)

Table 1 shows the distribution of the final sample based on geographical exposure and type of food and beverage business. The geographical distribution allowed this study to include MSMEs located near the industrial estate area, MSMEs in central business or market areas, and MSMEs in other sub-districts within Batang Regency. The business-type distribution was also considered important because food and beverage MSMEs may experience industrial estate spillovers differently depending on their market orientation, production capacity, product characteristics, and level of digital adoption.

Data were collected using a structured questionnaire consisting of two sections. The first section collected respondent and business profile information, including respondent position, business age, number of employees, type of food and beverage business, business location, digital platform use, and exposure to institutional support. The second section measured the main research constructs: industrial estate spillover, absorptive capacity, digital capability, institutional support, and MSME upgrading. All construct items were measured using a seven-point Likert scale ranging from 1, strongly disagree, to 7, strongly agree.

The measurement items were adapted from established concepts and prior studies, with contextual adjustments to fit food and beverage MSMEs in Batang Regency. Table 2 presents the operational definition, main indicators, and sources of each research variable.

Table 2. Operational Definition of Variables

Variable	Operational Definition	Main Indicators	Sources
Industrial Estate Spillover	Perceived opportunities and learning exposure obtained by food and beverage MSMEs from industrial estate development.	Market opportunities, new customer demand, business networks, partnership potential, higher product and service standards.	Audretsch & Feldman (1996); Teece (2007)
Organizations	The ability of MSMEs to recognize, understand, assimilate, and apply external knowledge for business improvement.	Recognizing external knowledge, understanding market information, learning product standards, applying knowledge to business improvement.	Cohen & Levinthal (1990); Zahra & George (2002)
Digital Capability	The ability of MSMEs to use digital tools meaningfully to support business activities.	Social media use, digital payment, online communication, digital promotion, customer relationship management, market expansion.	Kim & Jin (2024); Teece (2007)
Institutional Support	Support received from government, institutions, associations, or related stakeholders that helps MSMEs improve their business.	Training, mentoring, legality assistance, certification support, financing information, promotion programs, partnership facilitation.	Scott (2014)
MSME Upgrading	The process of improving business capacity, market readiness, operational standards, and partnership capability.	Product quality, packaging, hygiene standards, legality, certification readiness, production capacity, market expansion, partnership readiness.	Humphrey & Schmitz (2002); Zahra & George (2002)

Source: Adapted from the cited sources and adjusted to the context of food and beverage MSMEs in Batang Regency

Before the main survey, a pilot test was conducted with 40 food and beverage MSME respondents in Batang Regency. The pilot test was used to assess the clarity, readability, and contextual relevance of the questionnaire items. Feedback from the pilot respondents was used to refine several item wordings so that the questionnaire could be more easily understood by MSME respondents. The pilot responses were not included in the final analysis.

Several procedural remedies were applied to reduce potential common method bias. Respondents were informed that there were no right or wrong answers and that their responses would be treated anonymously and used only for academic purposes. The questionnaire was designed with clear instructions, simple wording, and separated sections for predictor and outcome variables. Common method bias was also assessed statistically

using full collinearity variance inflation factor (VIF), while Harman's single-factor test was used as a supplementary diagnostic procedure.

The data were analyzed using partial least squares structural equation modeling (PLS-SEM) with SmartPLS. PLS-SEM was selected because it is suitable for examining complex models involving latent variables, sequential mediation, moderation, and prediction-oriented relationships (Hair et al., 2019). Before the main analysis, the data were screened for missing values, duplicate responses, straight-line answers, inconsistent responses, eligibility mismatches, and outliers. Descriptive statistics were then used to summarize the respondent and business profiles.

The analysis was conducted in two stages: measurement model assessment and structural model assessment. All constructs were treated as reflective constructs because their indicators represented perceptions of the same underlying construct. The measurement model was assessed using outer loadings, Cronbach's alpha, composite reliability, rho_A, average variance extracted (AVE), and discriminant validity. Indicator loadings were expected to exceed 0.70, although indicators with loadings between 0.40 and 0.70 could be considered for removal if their deletion improved reliability and validity. Cronbach's alpha, composite reliability, and rho_A were expected to exceed 0.70, while AVE was expected to exceed 0.50. Discriminant validity was assessed using the heterotrait-monotrait ratio (HTMT), following common PLS-SEM assessment guidelines (Hair et al., 2022).

After the measurement model met the required criteria, the structural model was assessed using collinearity diagnostics, path coefficients, t-statistics, p-values, coefficient of determination (R^2), effect size (f^2), predictive relevance (Q^2), and confidence intervals where applicable. Bootstrapping with 5,000 resamples was used to test the significance of direct, mediating, and moderating effects. The mediation analysis examined the indirect effects of absorptive capacity and digital capability, including the sequential mediation path from industrial estate spillover to MSME upgrading through absorptive capacity and digital capability.

The moderating effect of institutional support was tested by creating an interaction term between industrial estate spillover and institutional support. This interaction term was used to examine whether institutional support strengthened the relationship between industrial estate spillover and absorptive capacity. In addition, PLSpredict was conducted to assess the predictive performance of the model by comparing the prediction errors of the PLS-SEM model with those of the linear model benchmark (Shmueli et al., 2019). Importance-performance map analysis (IPMA) was also conducted to identify constructs with high importance for MSME upgrading but lower performance.

Ethical considerations were observed throughout the research process. Participation was voluntary, and respondents were informed about the purpose of the study before completing the questionnaire. Respondents were not required to provide sensitive personal information, and their responses were treated confidentially. The data were used only for academic research purposes.

RESULTS

This section presents the results of the data analysis using partial least squares structural equation modeling (PLS-SEM). The analysis covers the respondent profile, common method

bias assessment, measurement model evaluation, structural model evaluation, direct effect testing, mediation analysis, moderation analysis, predictive assessment, and importance-performance map analysis.

Respondent Profile

A total of 350 valid responses were included in the final analysis. The respondents consisted of owners, managers, and business operators of food and beverage MSMEs in Batang Regency. Table 3 presents the respondent and business profiles.

Table 3. Respondent Profile

Profile	Category	Frequency	Percentage
Respondent position	Owner	242	69.1%
	Manager	63	18.0%
	Business operator	45	12.9%
Business age	1-3 years	96	27.4%
	4-6 years	139	39.7%
	More than 6 years	115	32.9%
Number of employees	1-4 employees	211	60.3%
	5-19 employess	117	33.4%
	20 or more employees	22	6.3%
Digital platform use	Yes	287	82.0%
	No	63	18.0%
Institutional support exposure	Yes	231	66.0%
	No	119	34.0%

Source: Primary data processed by the authors (2026)

As shown in Table 3, most respondents were business owners, accounting for 69.1% of the sample. The largest proportion of MSMEs had operated for four to six years, while most employed one to four workers. The profile also shows that 82.0% of respondents used digital platforms in their business activities, and 66.0% had received at least one form of institutional support.

Common Method Bias Assessment

Common method bias was assessed because all constructs were measured using the same questionnaire. Full collinearity variance inflation factor (VIF) was used as the main diagnostic procedure, while Harman's single-factor test was applied as an additional assessment. The results are presented in Table 4.

Table 4. Common Method Bias Assessment

Construct	Competitive
Industrial Estate Spillover	2.041
Absorptive Capacity	2.356
Digital Capability	2.489
Institutional Support	1.923
MSME Upgrading	2.611

Source: Primary data processed by the authors (2026)

All full collinearity VIF values were below the threshold of 3.3, indicating that common method bias was not a serious concern in this study. Harman's single-factor test also showed that the first factor explained 34.72% of the total variance, which was below the 50% threshold.

Model Assessment

The measurement model was evaluated to examine the reliability and validity of the reflective constructs. The retained indicators had outer loading values ranging from 0.713 to 0.862, indicating acceptable indicator reliability. Table 5 presents the results of the reliability and convergent validity assessment.

Table 5. Reliability and Convergent Validity

Construct	Cronbach's Alpha	rho_A	Composite Reliability	AVE
Industrial Estate Spillover	0.874	0.881	0.908	0.623
Absorptive Capacity	0.861	0.868	0.901	0.646
Digital Capability	0.883	0.889	0.914	0.640
Institutional Support	0.872	0.877	0.907	0.619
MSME Upgrading	0.895	0.902	0.921	0.596

Source: Primary data processed by the authors (2026)

The results show that all Cronbach's alpha, rho_A, and composite reliability values exceeded 0.70. In addition, all average variance extracted (AVE) values were above 0.50. These results confirm that all constructs met the requirements for internal consistency reliability and convergent validity.

Discriminant validity was assessed using the heterotrait-monotrait ratio (HTMT). The results are presented in Table 6.

Table 6. Discriminant Validity Using HTMT

Construct	IES	AC	DC	IS	MU
Industrial Estate Spillover	–				
Absorptive Capacity	0.681	–			
Digital Capability	0.592	0.704	–		
Institutional Support	0.546	0.612	0.570	–	
MSME Upgrading	0.615	0.721	0.742	0.583	–

Source: Primary data processed by the authors (2026)

All HTMT values were below 0.85, indicating that the constructs were empirically distinct from one another. Therefore, the measurement model satisfied the discriminant validity criterion.

Structural Model Assessment

After the measurement model fulfilled the required reliability and validity criteria, the structural model was assessed. The inner VIF values ranged from 1.316 to 2.104, showing that multicollinearity was not a major issue in the structural model. The coefficient of determination and predictive relevance values are presented in Table 7.

Table 7. Discriminant Validity Using HTMT

Endogenous Construct	R^2	Adjusted R^2	Q^2
Absorptive Capacity	0.462	0.457	0.274
Digital Capability	0.418	0.416	0.253
MSME Upgrading	0.567	0.562	0.336

Source: Primary data processed by the authors (2026)

The model explained 46.2% of the variance in absorptive capacity, 41.8% of the variance in digital capability, and 56.7% of the variance in MSME upgrading. These values indicate that the model had adequate explanatory power. The Q^2 values for all endogenous constructs were also greater than zero, confirming the predictive relevance of the model.

Direct Effect Testing

Bootstrapping with 5,000 resamples was used to test the direct relationships among the constructs. The results are shown in Table 8.

Table 8. Direct Effect Results

Hypothesis	Relationship	Path Coefficient	t-statistic	p-value	f^2	Decision
H1	IES → AC	0.438	8.214	<0.001	0.214	Supported
H2	AC → DC	0.647	14.228	<0.001	0.718	Supported
H3	DC → MU	0.392	6.934	<0.001	0.187	Supported
H4	AC → MU	0.311	5.621	<0.001	0.122	Supported
H5	IES → MU	0.174	3.102	0.002	0.052	Supported

Source: Primary data processed by the authors (2026)

Table 8 shows that industrial estate spillover had a positive and significant effect on absorptive capacity; therefore, H1 was supported. Absorptive capacity also had a positive and significant effect on digital capability, supporting H2. Furthermore, digital capability and absorptive capacity had positive and significant effects on MSME upgrading, supporting H3 and H4. Industrial estate spillover also had a positive and significant direct effect on MSME upgrading, supporting H5.

The effect size values indicate that the strongest direct effect was found in the relationship between absorptive capacity and digital capability. The other direct relationships also contributed to the structural model, although their effect sizes varied.

Mediation Analysis

The mediation analysis was conducted to examine the indirect effects among industrial estate spillover, absorptive capacity, digital capability, and MSME upgrading. The results are presented in Table 9.

Table 9. Direct Effect Results

Hypothesis	Indirect Relationship	Indirect Effect	t-statistic	p-value	Confidence Interval	Decision
H6	IES → AC → MU	0.136	4.956	<0.001	0.084 to 0.193	Supported

Hypothesis	Indirect Relationship	Indirect Effect	t-statistic	p-value	Confidence Interval	Decision
H7	AC → DC → MU	0254	6.525	<0.001	0.179 to 0.332	Supported
H8	IES → AC → DC → MU	0.111	5.761	<0.001	0.070 to 0.158	Supported

Source: Primary data processed by the authors (2026)

The mediation results show that all indirect effects were positive and significant. The indirect effect of industrial estate spillover on MSME upgrading through absorptive capacity was significant, supporting H6. The indirect effect of absorptive capacity on MSME upgrading through digital capability was also significant, supporting H7. In addition, the sequential indirect effect of industrial estate spillover on MSME upgrading through absorptive capacity and digital capability was significant, supporting H8. All confidence intervals excluded zero, confirming the significance of the mediation effects.

Moderation Analysis

The moderating effect of institutional support was tested by examining the interaction effect between industrial estate spillover and institutional support on absorptive capacity. The result is presented in Table 10.

Table 10. Moderation Effect Results

Hypothesis	Indirect Relationship	Indirect Effect	t-statistic	p-value	Confidence Interval	Decision
H9	IES × IS → AC	0.146	3.017	0.003	0.051 to 0.239	Supported

Source: Primary data processed by the authors (2026)

The interaction effect between industrial estate spillover and institutional support was positive and significant. The confidence interval did not include zero, indicating that the moderating effect was statistically significant. Therefore, H9 was supported. This result shows that institutional support strengthened the relationship between industrial estate spillover and absorptive capacity.

Predictive Assessment

PLSpredict was conducted to assess the predictive performance of the model by comparing the root mean square error (RMSE) values of the PLS-SEM model with those of the linear model benchmark. The results are shown in Table 11.

Table 11. Predictive Assessment Using PLSpredict

Target Construct	Indicator	PLS-SEM RMSE	LM RMSE	Predictive Result
MSME Upgrading	MU1	0.921	0.956	High predictive power
	MU2	0.887	0.916	High predictive power
	MU3	0.903	0.940	High predictive power

Target Construct	Indicator	PLS-SEM RMSE	LM RMSE	Predictive Result
	MU4	0.935	0.959	High predictive power
	MU5	0.914	0.944	High predictive power

Source: Primary data processed by the authors (2026)

The PLS-SEM model produced lower RMSE values than the linear model benchmark for all MSME upgrading indicators. This finding indicates that the model had high predictive power for MSME upgrading.

Importance-Performance Map Analysis

Importance-performance map analysis was conducted to identify the relative importance and performance of the main constructs in explaining MSME upgrading. The results are presented in Table 12.

Table 12. Importance-Performance Map Analysis

Construct	Importance	Performance
Industrial Estate Spillover	0.327	68.42
Absorptive Capacity	0.564	70.15
Digital Capability	0.392	64.38
Institutional Support	0.102	61.75

Source: Primary data processed by the authors (2026)

Table 12 shows that absorptive capacity had the highest importance and performance scores. Digital capability had the second-highest importance score, although its performance score was lower than that of absorptive capacity. Industrial estate spillover also showed a relevant importance score, while institutional support had the lowest importance score. These findings provide additional information on the relative contribution of each construct to MSME upgrading.

Overall, the results support all nine hypotheses proposed in this study. Industrial estate spillover, absorptive capacity, digital capability, and institutional support were significant in explaining MSME upgrading. The interpretation of these findings is presented in the Discussion section.

DISCUSSION

The findings of this study show that industrial estate spillover, absorptive capacity, digital capability, and institutional support are important factors in explaining the upgrading of food and beverage MSMEs in Batang Regency. The support for all nine hypotheses suggests that MSME upgrading is not only influenced by the presence of external opportunities but also by how local enterprises recognize, interpret, and respond to those opportunities. In the context of Batang, the development of the Batang Integrated Industrial Estate has created new market signals for surrounding MSMEs. However, these signals become valuable only when MSMEs are able to translate them into better products, stronger business practices, and greater market readiness.

The positive effect of industrial estate spillover on absorptive capacity indicates that industrial development can encourage learning among local MSMEs. Food and beverage MSMEs that perceive new demand, changing customer expectations, or possible business linkages from the industrial estate are more likely to seek information and adjust their business practices. For example, MSMEs may begin to pay closer attention to packaging, hygiene, production consistency, delivery readiness, or the possibility of supplying food products to workers and nearby businesses. This finding supports the knowledge spillover perspective, which explains that economic activity in a particular area can create learning opportunities for nearby firms through interaction, observation, market changes, and business networks (Audretsch & Feldman, 1996). In this study, spillover does not necessarily occur through formal partnerships. It may also emerge through daily market exposure, changing consumption patterns, and the pressure to meet higher business standards.

The significant relationship between absorptive capacity and digital capability suggests that digital adoption among MSMEs is closely related to learning capability. MSMEs do not use digital tools effectively simply because the tools are available. They need to understand how digital platforms can help them promote products, communicate with customers, process orders, manage payments, and expand market reach. MSMEs with stronger absorptive capacity are better able to identify which digital practices are relevant to their business needs. This result is consistent with the dynamic capability perspective, which emphasizes the importance of adapting resources and routines in response to environmental change (Teece, 2007). In practical terms, food and beverage MSMEs that are more responsive to market information are also more likely to use social media, digital payment systems, and online communication channels in ways that support business improvement.

The findings also confirm that absorptive capacity and digital capability contribute positively to MSME upgrading. Absorptive capacity helps MSMEs understand external expectations and convert them into improvements in product quality, hygiene standards, packaging, legality, and certification readiness. Digital capability then supports these improvements by helping MSMEs become more visible, accessible, and responsive to customers (Clemente-Almendros et al., 2024). For food and beverage MSMEs, digital tools can support product promotion, customer interaction, delivery coordination, and market expansion. These findings are in line with previous studies showing that digital capability can help small and medium-sized enterprises identify opportunities and improve business outcomes (Kim & Jin, 2024). They also support prior research in the Indonesian food MSME context, which highlights the relevance of e-commerce, innovation capability, and business performance (Wijaya et al., 2025).

The direct effect of industrial estate spillover on MSME upgrading shows that industrial estate development can support local business improvement. However, the relatively smaller direct effect suggests that the presence of an industrial estate is not enough by itself. New demand, infrastructure, and potential customers may open opportunities, but MSMEs still need the capability to respond. Without sufficient learning capacity and digital readiness, local MSMEs may only experience limited benefits from industrial development (Merín-Rodrigáñez et al., 2024). This finding is important because it shows that regional industrial growth should not be separated from MSME capability-building. Industrial development can create opportunity, but upgrading depends on whether MSMEs can turn that opportunity into concrete changes in their business operations.

The mediation results provide a clearer explanation of this process. The significant indirect effect through absorptive capacity shows that MSMEs first need to recognize and understand the opportunities created by industrial estate development before they can improve their businesses. The indirect effect through digital capability further indicates that learning becomes more useful when it is supported by practical tools for promotion, communication, transaction, and market access. The sequential mediation result strengthens this interpretation. It suggests that MSME upgrading occurs through a gradual process: MSMEs perceive external opportunities, absorb relevant knowledge, develop digital capability, and then use these capabilities to improve their business readiness. This staged process helps explain why some MSMEs may benefit more from industrial development than others.

The moderating effect of institutional support shows that MSMEs are better able to absorb industrial estate spillovers when they receive support from government agencies, institutions, associations, or related stakeholders. Training, mentoring, legality assistance, certification support, financing information, exhibitions, and partnership facilitation can help MSMEs understand what industrial development means for their business. Such support may reduce uncertainty and provide clearer guidance on how to improve product standards, access new markets, and prepare for more formal business relationships. This finding supports institutional theory, which argues that institutions provide resources, legitimacy, and support that influence how firms adapt to their environment (Scott, 2014). In the Batang context, institutional support is particularly important because many food and beverage MSMEs may still need assistance in meeting requirements related to hygiene, packaging, certification, digital marketing, and partnership readiness.

The importance-performance map analysis provides additional insight into the practical priorities for MSME upgrading. Absorptive capacity had the highest importance and performance scores, indicating that learning capability is central to business improvement. Digital capability also showed high importance, although its performance score was lower than that of absorptive capacity. This suggests that digital capability remains an area that requires further strengthening. MSMEs may already be aware of market changes, but they may not yet be fully able to use digital tools strategically. Institutional support had the lowest direct importance score, but its moderating role remains meaningful because it helps MSMEs benefit more effectively from industrial estate spillovers.

Overall, this study contributes to the MSME upgrading literature by showing that industrial estate spillover affects local enterprises through a capability-based process. The findings extend the dynamic capability and knowledge spillover perspectives by demonstrating that external opportunities become more valuable when MSMEs have the ability to absorb knowledge and apply digital tools effectively. This study also shows that institutional support does not only function as a direct source of assistance; it can also strengthen the learning process through which MSMEs respond to industrial change.

From a practical perspective, the findings suggest that local governments, industrial estate managers, MSME associations, and development agencies should design programs that connect industrial growth with MSME upgrading. Support should not only focus on providing market access, but also on strengthening learning capability, digital readiness, product quality, hygiene, packaging, legality, certification readiness, and partnership capability. For food and

beverage MSMEs in Batang Regency, these areas are important for responding to new demand and preparing for broader business opportunities. By combining industrial estate development with targeted MSME capability-building, local enterprises can become better prepared to participate in the economic transformation taking place around them.

CONCLUSION & RECOMMENDATION

This study examined the effect of industrial estate spillover on food and beverage MSME upgrading in Batang Regency through the mediating roles of absorptive capacity and digital capability, as well as the moderating role of institutional support. The findings show that all proposed hypotheses were supported. Industrial estate spillover positively influenced absorptive capacity and MSME upgrading. Absorptive capacity positively influenced digital capability and MSME upgrading, while digital capability also had a positive effect on MSME upgrading. The mediation results confirmed that absorptive capacity and digital capability served as important mechanisms linking industrial estate spillover to MSME upgrading. In addition, institutional support strengthened the relationship between industrial estate spillover and absorptive capacity.

These findings indicate that industrial estate development can create valuable opportunities for local MSMEs, but these opportunities do not automatically lead to business upgrading. Food and beverage MSMEs need the ability to recognize external changes, absorb relevant knowledge, and transform new opportunities into practical improvements. In this context, MSME upgrading should be understood as a capability-based process that involves improvements in product quality, hygiene standards, packaging, legality, certification readiness, production capacity, market access, digital promotion, and partnership capability.

Based on these findings, local governments, industrial estate managers, MSME associations, and development agencies are encouraged to design support programs that connect food and beverage MSMEs with opportunities generated by the Batang Integrated Industrial Estate. Such programs should strengthen absorptive capacity and digital capability through training, mentoring, legality assistance, halal or food safety certification support, product standardization, digital marketing assistance, financing information, exhibitions, and partnership facilitation. These efforts are important to help MSMEs meet higher market standards and become more prepared to participate in broader and more formal business networks.

This study is limited to food and beverage MSMEs in Batang Regency; therefore, the findings should be interpreted within this sectoral and regional context. Future studies may extend this research by comparing different MSME sectors, regions, or industrial estate contexts to examine whether the proposed model remains consistent in broader settings. Further research may also apply longitudinal or qualitative approaches to provide deeper insight into how MSMEs experience, interpret, and respond to industrial estate spillovers over time.

ACKNOWLEDGEMENT

The author would like to thank all food and beverage MSME owners, managers, and business operators in Batang Regency who participated in this study. The author also appreciates the support and information provided by relevant local stakeholders during the research process.

DECLARATION

The author declares that this manuscript is original, has not been published elsewhere, and is not currently under consideration by another journal. The author also declares that there is no conflict of interest related to this study.

REFERENCES

Adithia, S., & Jaya, M. P. P. (2021). Strategi Pemasaran Digital Produk Minuman Kopi di Masa Pandemi. *Journal of Research on Business and Tourism, 1*(1), 37-46. https://doi.org/10.37535/104001120213

Audretsch, D. B., & Feldman, M. P. (1996). R&D Spillovers and the Geography of Innovation and Production. *American Economic Review, 86*(3), 630-640.

BPS Kabupaten Batang. (2024). *Profil Industri Mikro dan Kecil Kabupaten Batang 2023*. Badan Pusat Statistik Kabupaten Batang. https://batangkab.bps.go.id/id/publication/2024/12/30/e0e96a26ebbb04f38da4e23a/profil-industri-mikro-dan-kecil-kabupaten-batang-2023.html

Cenamor, J., Parida, V., & Wincent, J. (2019). How entrepreneurial SMEs compete through digital platforms: The roles of digital platform capability, network capability, and ambidexterity. *Journal of Business Research, 100*, 196-206. https://doi.org/10.1016/j.jbusres.2019.03.035

Clemente-Almendros, J. A., Nicoara-Popescu, D., & Pastor-Sanz, I. (2024). Digital transformation in SMEs: Understanding its determinants and size heterogeneity. *Technology in Society, 77*, 102483. https://doi.org/10.1016/j.techsoc.2024.102483

Cohen, W. M., & Levinthal, D. A. (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly, 35*(1), 128-152. https://doi.org/10.2307/2393553

Corral de Zubielqui, G., Lindsay, N., Lindsay, W., & Jones, J. (2019). Knowledge quality, innovation and firm performance: A study of knowledge transfer in SMEs. *Small Business Economics, 53*(1), 145-164. https://doi.org/10.1007/s11187-018-0046-0

Eller, R., Alford, P., Kallmünzer, A., & Peters, M. (2020). Antecedents, consequences, and challenges of small and medium-sized enterprise digitalization. *Journal of Business Research, 112*, 119-127. https://doi.org/10.1016/j.jbusres.2020.03.004

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2022). *A primer on partial least squares structural equation modeling (PLS-SEM)* (3rd ed.). SAGE Publications.

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review, 31*(1), 2-24. https://doi.org/10.1108/EBR-11-2018-0203

Humphrey, J., & Schmitz, H. (2002). How does insertion in global value chains affect upgrading in industrial clusters? *Regional Studies, 36*(9), 1017-1027. https://doi.org/10.1080/0034340022000022198

Islam, M. T., & Polonsky, M. J. (2020). Validating scales for economic upgrading in global value chains and assessing the impact of upgrading on supplier firms' performance. *Journal of Business Research, 110*, 144-159. https://doi.org/10.1016/j.jbusres.2020.01.010

Kementerian Koordinator Bidang Perekonomian Republik Indonesia. (2022, October 1). *Perkembangan UMKM sebagai Critical Engine Perekonomian Nasional Terus Mendapatkan Dukungan Pemerintah* [Press Release]. https://www.ekon.go.id/publikasi/detail/4593/perkembangan-umkm-sebagai-critical-engine-perekonomian-nasional-terus-mendapatkan-dukungan-pemerintah

Kim, J., & Jin, W. (2024). Impact of digital capabilities on entrepreneurial performance in SMEs. *Journal of Innovation & Knowledge, 9*(4), 100609. https://doi.org/10.1016/j.jik.2024.100609

Kraus, S., Durst, S., Ferreira, J. J., Veiga, P., Kailer, N., & Weinmann, A. (2022). Digital transformation in business and management research: An overview of the current status quo. *International Journal of Information Management, 63*, 102466. https://doi.org/10.1016/j.ijinfomgt.2021.102466

Matarazzo, M., Penco, L., Profumo, G., & Quaglia, R. (2021). Digital transformation and customer value creation in Made in Italy SMEs: A dynamic capabilities perspective. *Journal of Business Research, 123*, 642-656. https://doi.org/10.1016/j.jbusres.2020.10.033

Merín-Rodrigáñez, J., Dasí, À., & Alegre, J. (2024). Digital transformation and firm performance in innovative SMEs: The mediating role of business model innovation. *Technovation, 134*, 103027. https://doi.org/10.1016/j.technovation.2024.103027

Office of Assistant to Deputy Cabinet Secretary for State Documents & Translation. (2024, July 26). *President Jokowi inaugurates Batang Integrated Industrial Park*. Cabinet Secretariat of the Republic of Indonesia. https://setkab.go.id/en/president-jokowi-inaugurates-batang-integrated-industrial-park/

Pahl, S., & Timmer, M. P. (2020). Do global value chains enhance economic upgrading? A long view. *The Journal of Development Studies, 56*(9), 1683-1705. https://doi.org/10.1080/00220388.2019.1702159

Papadopoulos, T., Baltas, K. N., & Balta, M. E. (2020). The use of digital technologies by small and medium enterprises during COVID-19: Implications for theory and practice. *International Journal of Information Management, 55*, 102192. https://doi.org/10.1016/j.ijinfomgt.2020.102192

Scott, W. R. (2014). *Institutions and organizations: Ideas, interests, and identities* (4th ed.). SAGE Publications.

Shmueli, G., Sarstedt, M., Hair, J. F., Jr., Cheah, J.-H., Ting, H., Vaithilingam, S., & Ringle, C. M. (2019). Predictive model assessment in PLS-SEM: Guidelines for using PLSpredict. *European Journal of Marketing, 53*(11), 2322-2347. https://doi.org/10.1108/EJM-02-2019-0189

Stam, E., & van de Ven, A. (2021). Entrepreneurial ecosystem elements. Small Business Economics, 56(2), 809-832. https://doi.org/10.1007/s11187-019-00270-6

Teece, D. J. (2007). Explicating dynamic capabilities: The nature and microfoundations of sustainable enterprise performance. *Strategic Management Journal, 28*(13), 1319-1350. https://doi.org/10.1002/smj.640

Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal, 18*(7), 509-533. https://doi.org/10.1002/(SICI)1097-0266(199708)18:7%3C509::AID-SMJ882%3E3.0.CO;2-Z

Verhoef, P. C., Broekhuizen, T. L. J., Bart, Y., Bhattacharya, A., Dong, J. Q., Fabian, N., & Haenlein, M. (2021). Digital transformation: A multidisciplinary reflection and research agenda. *Journal of Business Research, 122*, 889-901. https://doi.org/10.1016/j.jbusres.2019.09.022

Whitfield, L., Staritz, C., & Morris, M. (2020). Global value chains, industrial policy and economic upgrading in Ethiopia's apparel sector. *Development and Change, 51*(4), 1018-1043. https://doi.org/10.1111/dech.12590

Wijaya, L. I., Zunairoh, Z., Izharuddin, M., & Rianawati, A. (2025). Scope of e-commerce use, innovation capability, and performance: Food sector MSMEs in Indonesia. *Journal of Open Innovation: Technology, Market, and Complexity, 11*(1), 100459. https://doi.org/10.1016/j.joitmc.2024.100459

Yang, J., & Yu, M. (2022). The influence of institutional support on the innovation performance of new ventures: The mediating mechanism of entrepreneurial orientation. *Sustainability, 14*(4), 2212. https://doi.org/10.3390/su14042212

Zahra, S. A., & George, G. (2002). Absorptive capacity: A review, reconceptualization, and extension. *Academy of Management Review, 27*(2), 185-203. https://doi.org/10.5465/amr.2002.6587995