

Innovation strategies and resiliency of MSMEs in the Province of Apayao

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Abstract

Aim: This study determined the influence of innovation strategies on the resiliency of Micro, Small, and Medium Enterprises (MSMEs) in the Province of Apayao, Philippines. Specifically, it examined product innovation, digitalization, process improvement, and customer engagement tactics; assessed MSME resiliency according to enterprise size; analyzed the relationship and predictive influence of innovation strategies on resiliency; and identified the major challenges encountered by MSMEs.

Methodology: The study employed a descriptive-correlational research design with a complementary qualitative component. Data were collected from 161 MSME owners and operators across the seven municipalities of Apayao using a researcher-made questionnaire validated by experts and pilot-tested for reliability. Frequency counts, percentages, weighted mean, Pearson product-moment correlation, and multiple linear regression were used for quantitative analysis, while open-ended responses were analyzed through content analysis.

Results: Findings revealed that innovation strategies were generally highly influential (overall weighted mean = 3.29), with process improvement obtaining the highest mean. MSMEs also demonstrated high resiliency across enterprise sizes (overall weighted mean = 3.32). All innovation domains showed significant positive relationships with resiliency, while the regression model explained 43.8% of the variance in MSME resiliency. Process improvement, product innovation, and customer engagement emerged as significant predictors. Major challenges included high transportation and logistics costs, limited financial capital, shortage of skilled labor, inadequate digital infrastructure, and difficulty adapting to new technologies.

Conclusion: Innovation strategies significantly strengthened MSME resiliency by improving operational continuity, market responsiveness, and recovery capability. The findings suggest that business owners, development agencies, and policymakers should prioritize process improvement, product development, customer-centered practices, financing access, and digital capability-building to strengthen resilient local enterprises.

Keywords: *innovation strategies, MSME resiliency, product innovation, digitalization, process improvement, customer engagement*

INTRODUCTION

Micro, Small, and Medium Enterprises (MSMEs) play a vital role in economic development, employment generation, livelihood creation, innovation, and inclusive growth. Across developing economies, MSMEs support local production systems and provide income opportunities for communities. Despite their importance, MSMEs remain vulnerable to financial constraints, market uncertainty, technological disruption, supply chain problems, and limited access to institutional support. These challenges are more evident in rural and geographically constrained areas where transportation difficulties, uneven digital connectivity, limited financing, and narrow market access affect business continuity and competitiveness.

In the Philippines, MSMEs serve as a major foundation of national and local economic activity. According to the Department of Trade and Industry, MSMEs accounted for 99.59% of registered business establishments and generated around 64% of employment, showing their strong contribution to enterprise development and livelihood stability (Department of Trade and Industry, 2024). In rural provinces, MSMEs are especially important because many local businesses are linked to agriculture, food processing, retail trade, crafts, and service-based activities. Their

capacity to survive, adapt, and grow is therefore essential not only to business development but also to local economic resilience.

Innovation has become an important strategy for strengthening MSME resiliency and long-term competitiveness. For small and rural enterprises, innovation does not always require advanced technology or large capital investment. It may involve practical improvements in products, services, work processes, customer relations, marketing practices, and digital tools. Recent studies emphasize that innovation, digital transformation, organizational learning, and marketing capability help enterprises improve adaptability, efficiency, responsiveness, and recovery capacity during uncertain conditions (Awad & Martín-Rojas, 2024; Hokmabadi et al., 2024). In the Philippine setting, innovation among SMEs is also associated with resourcefulness and entrepreneurial bricolage, especially when enterprises operate with limited resources (Flaminiano, 2024).

From an innovation-management perspective, this study views innovation as a set of managerial capabilities rather than a single product-related activity. Product innovation, digitalization, process improvement, and customer engagement are treated as interconnected strategies that help enterprises adjust to market changes, improve internal operations, sustain customer value, and recover from disruptions. This framing is consistent with the Resource-Based View and dynamic capabilities perspective, which explain that firms become more competitive when they develop valuable capabilities and reconfigure resources in response to changing conditions (Barney, 1991; Teece, 2018). Thus, the study contributes to innovation-management literature by showing how different innovation domains collectively support MSME resiliency in a rural and resource-constrained business environment.

The study also contributes to the literature on strategic competitiveness. MSME competitiveness is no longer shaped only by price, location, or product availability; it increasingly depends on the ability of enterprises to improve products, control costs, adopt appropriate digital tools, maintain customer relationships, and respond to changing market needs. Product innovation may strengthen differentiation and market relevance, while process improvement may enhance productivity, quality, and cost efficiency. Digitalization may expand communication and market reach, and customer engagement may support trust, loyalty, and repeat patronage. Together, these strategies can help MSMEs move beyond short-term survival toward long-term competitiveness and sustainable business performance.

In the Province of Apayao, MSMEs contribute to local economic activity through agriculture-based enterprises, food processing, retail trade, crafts, and services. However, many operate under rural enterprise conditions that may limit innovation adoption and business expansion, including logistics problems, limited financing, skills gaps, uneven digital access, and restricted market exposure. Although previous studies have examined innovation and SME resilience, limited empirical evidence focuses on rural MSMEs in geographically constrained Philippine provinces. Existing studies also tend to examine innovation dimensions separately, with less attention to how product innovation, digitalization, process improvement, and customer engagement collectively influence enterprise resiliency.

This study addresses this gap by examining the innovation strategies and resiliency of MSMEs in Apayao. Specifically, it investigates how product innovation, digitalization, process improvement, and customer engagement relate to MSME resiliency. The study provides localized but theoretically grounded evidence that may guide MSME owners, managers, policymakers, local government units, and enterprise-support institutions in designing innovation-based programs that strengthen operational continuity, customer retention, market responsiveness, competitiveness, and sustainable local economic development.

Review of Related Literature and Studies

Innovation Strategies

Innovation strategies referred to deliberate actions through which enterprises improved products, processes, market approaches, and organizational practices to enhance competitiveness and sustainability. In MSMEs, innovation commonly appeared as incremental change because smaller enterprises often operated with limited capital, personnel, and formal systems. Product innovation allowed businesses to improve existing offerings, introduce value-added goods, use local materials, and respond to changing customer preferences. Such improvements supported market differentiation and helped rural enterprises diversify income sources.

Recent studies further emphasized that innovation strategies among MSMEs should be understood not only as product-centered initiatives but also as multidimensional managerial responses to uncertainty. Innovation may involve digital adoption, market reorientation, process redesign, customer relationship strengthening, and resource recombination. In crisis and post-crisis environments, these strategies allow MSMEs to sense market changes, seize emerging opportunities, and transform internal operations to sustain competitiveness and continuity (Khurana et al., 2022; Dias et al., 2022).

Product Innovation

Product innovation involves developing new goods or significantly improving existing ones to meet changing consumer needs, respond to market trends, and differentiate the business from competitors. For MSMEs, product innovation strengthens resilience by allowing enterprises to adjust their offerings, diversify revenue sources, and remain competitive during uncertain market conditions. In rural settings such as Apayao, product innovation may include value-added agricultural processing, improved packaging, use of local materials, and culturally embedded products that reflect community resources and customer preferences. These practices help MSMEs sustain market relevance, reduce dependence on limited product lines, and expand opportunities for customer retention and market reach (Dias et al., 2022; Flaminiano, 2024; Khurana et al., 2022).

Digitalization

Digitalization provides MSMEs with opportunities to communicate with customers, promote products, process payments, and maintain business records more efficiently. Social media marketing, e-commerce platforms, mobile payment systems, and digital bookkeeping are useful for enterprises that need wider market reach despite geographic limitations. However, digital adoption may remain uneven in rural areas when internet connectivity, affordability, digital skills, and organizational readiness are limited. Thus, digitalization strengthens MSME resilience only when digital tools are aligned with business needs, owner capability, and continuity strategies (Awad & Martín-Rojas, 2024; Hokmabadi et al., 2024; Khurana et al., 2022).

Process Improvement

Process improvement involves streamlining operational workflows, strengthening quality control, and adopting practices that reduce waste, improve productivity, and increase operational efficiency. For MSMEs, process improvement supports resilience by helping enterprises control costs, maintain product quality, and continue operations during disruptions. In rural business settings, this may include improving production flow, inventory handling, post-harvest practices, scheduling, and resource utilization. These improvements are important because they reduce vulnerability to input shortages, price changes, labor limitations, and logistics-related delays. Recent literature emphasizes that SME resilience is strengthened when enterprises improve internal routines, adaptive capabilities, and operational systems that allow them to respond effectively to crisis conditions (Dias et al., 2022; Hokmabadi et al., 2024; Koporcic et al., 2025).

Customer Engagement Tactics

Customer engagement tactics strengthen MSME resilience by maintaining relationships with buyers, encouraging repeat transactions, and sustaining demand during uncertain periods. Personalized service, feedback mechanisms, after-sales communication, loyalty practices, and digital communication help enterprises build trust and remain responsive to customer needs. In small and rural markets, strong customer relationships may function as an important business asset because they support customer retention, market stability, and continuity of sales. Customer engagement therefore contributes to resilience by helping MSMEs maintain market relevance and recover more effectively from disruptions (Dias et al., 2022; Hokmabadi et al., 2024).

Taken together, the innovation domains examined in this study represent both market-oriented and operations-oriented responses to business uncertainty. Product innovation and customer engagement address market relevance and customer retention, while digitalization and process improvement support efficiency, market reach, recordkeeping, and operational continuity. Examining these dimensions separately helps identify which strategies are most influential in strengthening MSME resiliency in Apayao.

The review also emphasizes that innovation should be examined in relation to local capacity. Strategies that produce strong outcomes in urban or well-resourced settings may have different effects in rural areas where transportation, financing, connectivity, and labor availability remain major constraints. This justifies the need to analyze innovation and resiliency within the specific business environment of Apayao rather than relying only on broader MSME findings (Khurana et al., 2022; Koporcic et al., 2025).

Micro, Small, and Medium Enterprises (MSMEs) Resiliency

Business resiliency refers to the capacity of an enterprise to prepare for, adapt to, recover from, and transform after disruptions while sustaining essential operations and customer value. For MSMEs, resiliency is not limited to survival; it also involves learning, innovation, and strategic adjustment that allow enterprises to remain competitive in changing environments. Since MSMEs often operate with limited financial reserves, small workforces, and restricted access to formal support, their resilience depends on internal capabilities, technology readiness, external support, and

the ability to adjust business practices during uncertainty (Adam & Alarifi, 2021; Sindhvani et al., 2023; Koporcic et al., 2025).

Evidence from recent studies shows that innovation strengthens SME resilience by enabling enterprises to redesign products, use digital tools, improve processes, and sustain customer engagement. In rural areas such as Apayao, resilience may also be influenced by enterprise size, financing access, digital readiness, logistics conditions, and institutional support. Microenterprises may be more exposed to shocks due to limited resources, while small and medium enterprises may have more organized systems and wider networks. Nevertheless, smaller enterprises can still become resilient when they use flexible decision-making, local knowledge, and strong customer relationships to respond quickly to changing conditions (Khurana et al., 2022; Hokmabadi et al., 2024; Sagala & Ōri, 2025).

Synthesis and Research Gap

The literature consistently showed that innovation strategies supported MSME competitiveness, continuity, and recovery. Product innovation improved market relevance; digitalization expanded reach and transaction options; process improvement strengthened efficiency; and customer engagement sustained demand and trust. However, the strength and practical effect of these strategies varied across contexts because MSMEs differed in resources, infrastructure, capability, and access to support services. There remained limited empirical evidence on how these innovation strategies influenced resiliency among MSMEs in Apayao. This study therefore contributed to business and management knowledge by providing localized evidence for innovation-based resilience planning in a geographically constrained Philippine province.

Theoretical and Conceptual Framework

The study was anchored on the Resource-Based View (RBV) and the dynamic capabilities perspective. Resource-Based View (RBV) explains that enterprises gain advantage when they develop valuable and difficult-to-imitate resources and capabilities, while dynamic capabilities emphasize the ability of firms to sense opportunities, adapt resources, and reconfigure operations under changing conditions (Barney, 1991; Teece, 2018). These perspectives supported the assumption that innovation strategies function as internal capabilities that help Micro, Small, and Medium Enterprises (MSMEs) respond to disruption, sustain operations, and recover from business challenges.

The conceptual framework posited that product innovation, digitalization, process improvement, and customer engagement tactics influenced MSME resiliency. Resiliency was reflected in adaptive capacity, operational continuity, recovery capability, and sustainability. Contextual factors such as business size, industry type, years in operation, and municipality were considered because these conditions could affect both innovation adoption and resilience outcomes.

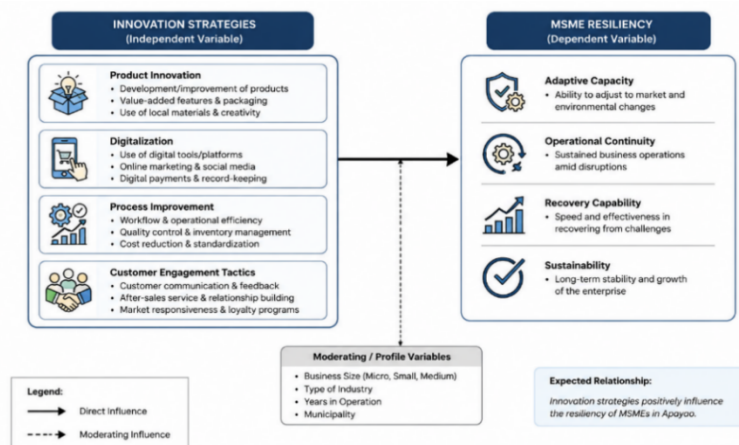


Figure 1. Conceptual Framework Diagram

Statement of the Problem

This study investigated the influence of innovation strategies on the resiliency of Micro, Small, and Medium Enterprises (MSMEs) in the Province of Apayao. MSMEs play a significant role in local economic development, employment generation, and business sustainability; however, many enterprises continue to face operational disruptions, financial limitations, technological challenges, and market uncertainties that affect their long-term

resiliency. Innovation strategies such as product innovation, digitalization, process improvement, and customer engagement may help enterprises strengthen operational continuity, adaptability, and competitiveness in changing business environments.

Specifically, the study sought to determine the level of innovation strategies employed by MSMEs in terms of product innovation, digitalization, process improvement, and customer engagement tactics; assess the level of MSME resiliency according to enterprise size; examine the significant relationship between innovation strategies and MSME resiliency; and identify the major challenges encountered by MSMEs in maintaining and sustaining business operations.

Research Objectives

This study aimed to determine the influence of innovation strategies on the resiliency of Micro, Small, and Medium Enterprises (MSMEs) in the Province of Apayao. Specifically, the study sought to:

1. Assess the level of innovation strategies of MSMEs in terms of:
 - a. product innovation;
 - b. digitalization;
 - c. process improvement; and
 - d. customer engagement tactics;
2. Determine the level of resiliency of MSMEs when grouped according to business size;
3. Examine the significant relationship between innovation strategies and MSME resiliency; and
4. Identify the major challenges encountered by MSMEs in maintaining and sustaining their business operations.

Research Questions

1. What is the level of innovation strategies of MSMEs in terms of:
 - a. product innovation;
 - b. digitalization;
 - c. process improvement; and
 - d. customer engagement tactics?
2. What is the level of resiliency of MSMEs when grouped according to business size?
3. Is there a significant relationship between innovation strategies and MSME resiliency among MSMEs in the Province of Apayao?
4. What are the major challenges encountered by MSMEs in maintaining and sustaining their business operations?

Hypotheses

H01: There is no significant relationship between innovation strategies and MSME resiliency among MSMEs in the Province of Apayao.

H02: Product innovation, digitalization, process improvement, and customer engagement tactics do not significantly predict MSME resiliency among MSMEs in the Province of Apayao.

METHODS

Research Design

The study employed a mixed-methods descriptive-correlational research design using quantitative and qualitative approaches. The quantitative component described innovation strategies and resiliency and tested the relationship and predictive influence of the variables without manipulation. The qualitative component summarized open-ended responses on challenges and support needs through content analysis.

Population and Sampling

The respondents of the study were MSME owners and operators from the seven municipalities of Apayao, namely Sta. Marcela, Calanasan, Flora, Conner, Kabugao, Luna, and Pudtol. Based on the Philippine MSME classification, microenterprises have assets of not more than ₱3,000,000 and employ 1 to 9 workers; small enterprises have assets of ₱3,000,001 to ₱15,000,000 and employ 10 to 99 workers; while medium enterprises have assets of ₱15,000,001 to ₱100,000,000 and employ 100 to 199 workers.

A total of 161 respondents participated in the study: 110 microenterprise, 40 small enterprise, and 11 medium enterprise owners or operators. By municipality, the respondents were distributed as follows: Luna, 36; Conner, 27; Kabugao, 24; Sta. Marcela, 21; Pudtol, 19; Calanasan, 18; and Flora, 16.

Purposive sampling was used because the study required respondents directly involved in business operations and knowledgeable about innovation practices, challenges, and resiliency strategies. This approach allowed the study to examine MSME resiliency across enterprise sizes and municipalities within the rural business conditions of Apayao.

Research Instrument and Validation

Data were gathered using a researcher-made questionnaire composed of three parts: respondent and enterprise profile; innovation strategies covering product innovation, digitalization, process improvement, and customer engagement; and MSME resiliency and challenges encountered. The instrument used a 4-point Likert scale to ensure consistency in interpretation and statistical analysis.

Before data collection, the instrument underwent expert-based content validation by a panel of three validators composed of two research statisticians and one business management professor. The validators reviewed the questionnaire in terms of relevance, clarity, appropriateness, construct alignment, wording, structure, and suitability for MSME respondents in Apayao. Their comments and recommendations were used to revise the wording, organization, and alignment of the items with the study objectives.

A content-validation checklist was used to guide the review of the instrument. However, no numerical content validity index was computed. Instead, content validity was established through expert judgment, qualitative comments, and item revision based on the validators' recommendations. Items that required improvement were revised before pilot testing. The revised instrument was pilot-tested with 30 MSME owners or operators who were not included in the actual sample. As shown in Table 1, the reliability coefficients ranged from 0.857 to 0.945, indicating good to excellent internal consistency reliability.

Table 1.
Reliability Coefficient

Domains	Cronbach's α	Sample Size	Interpretation
Level of Influence of Innovation Strategies	0.940	30	Excellent
Level of Resiliency	0.945	30	Excellent
Challenges Encountered	0.857	30	Good

Note. Cronbach's α values of .70 and above indicate acceptable internal consistency reliability.

The interpretation of the mean scores for innovation strategies and MSME resiliency was based on the scale presented in Table 2.

Table 2.
Likert Scale Interpretation for the Level of Influence of Innovation Strategies and MSME Resiliency

Scale	Mean	Influence of Innovation Strategies	MSME Resiliency
4	3.26-4.00	Highly Influential	Highly Resilient
3	2.51-3.25	Moderately Influential	Average Resilient
2	1.76-2.50	Slightly Influential	Low Resilient
1	1.00-1.75	Not Influential	Very Low

Note. The interpretations were used to determine the respondents' assessment of innovation strategies and MSME resiliency.

Data Collection Procedure

Permission to conduct the study was secured from the different Local Government Unit of Apayao before data gathering. The validated questionnaire was administered to qualified MSME owners and operators. Respondents were informed of the purpose of the study, the voluntary nature of participation, and the confidentiality of their responses. Completed questionnaires were checked for completeness before encoding and analysis. Data collection was conducted

from January to April 2026 through face-to-face administration of questionnaires across the seven municipalities of Apayao.

Treatment of Data

Frequency counts and percentages were used to summarize respondent and enterprise profiles. Weighted mean was used to determine the level of innovation strategies, MSME resiliency, and challenges encountered. Mean scores were interpreted using the study's 4-point scale. Pearson product-moment correlation was used to test significant relationships between innovation strategy domains and resiliency. Multiple linear regression was used to determine the predictive influence of innovation strategy domains on MSME resiliency. Open-ended responses were examined through content analysis to identify recurring themes and contextual insights.

All inferential analyses were tested at the 0.05 level of significance. Data were encoded and organized using Microsoft Excel, while statistical computations were performed using the Statistical Package for the Social Sciences (SPSS) v. 26.

Ethical Considerations

The study observed ethical principles of informed consent, confidentiality, anonymity, voluntary participation, risk minimization, and research integrity. Prior to data collection, the study underwent the appropriate institutional ethics review process. However, the specific ethics clearance protocol number and approval details were not disclosed in this article because these details were not released to the researcher and treated in accordance with institutional confidentiality procedures. Formal permission from the concerned local government units in Apayao and the Department of Trade and Industry–Apayao was also secured before the conduct of the study. Respondents were informed about the purpose of the research, the voluntary nature of their participation, and their right to withdraw from the study at any point without penalty. Physical and digital data were securely stored, and the results were reported honestly, accurately, and without manipulation.

RESULTS & DISCUSSION

This section presents the findings on innovation strategies and resiliency of MSMEs in Apayao. The discussion is organized according to the research questions on innovation strategies, resiliency by enterprise size, relationship and predictive influence, and challenges encountered in innovation adoption.

Level of Influence of Innovation Strategies of MSMEs in Apayao (Research Questions 1)

Table 3 presents the level of influence of innovation strategies employed by MSMEs in Apayao. The overall weighted mean of 3.29 indicates that innovation strategies were generally highly influential. Among the indicators, process improvement obtained the highest weighted mean of 3.44, followed by product innovation with a weighted mean of 3.38. Meanwhile, digitalization strategies and customer engagement tactics both obtained a weighted mean of 3.16, interpreted as moderately influential.

The findings indicate that MSMEs in Apayao relied more on practical and operational forms of innovation. Process improvement was the most influential because it directly supports productivity, cost control, quality consistency, and business continuity. Product innovation also played an important role by helping enterprises improve offerings, respond to customer needs, and strengthen market competitiveness. Recent studies explain that innovation strengthens SME resilience when enterprises improve internal routines, adapt to market changes, and redesign products or services during uncertain conditions (Dias et al., 2022; Koporcic et al., 2025).

Table 3.

Level of Influence of Innovation Strategies of MSMEs in Apayao

Indicators	WM	Descriptive Equivalent
Product Innovation	3.38	Highly Influential
Digitalization Strategies	3.16	Moderately Influential
Process Improvement	3.44	Highly Influential
Customer Engagement Tactics	3.16	Moderately Influential
Overall Weighted Mean	3.29	Highly Influential

Note. WM = weighted mean.

The moderate rating for digitalization and customer engagement suggests that these practices were present but not yet fully maximized. Digital tools may improve promotion, communication, payment systems, and recordkeeping, but their effectiveness depends on internet connectivity, digital skills, and organizational readiness. This is consistent with studies showing that digital transformation contributes to resilience when supported by learning capability, innovation, and business readiness (Khurana et al., 2022; Awad, 2024).

Level of Resiliency of MSMEs in Apayao (Research Questions 2)

Table 4 presents the level of resiliency of MSMEs in Apayao when grouped according to enterprise size. The results show that MSMEs obtained an overall weighted mean of 3.32, interpreted as highly resilient. Among the enterprise groups, small enterprises recorded the highest weighted mean of 3.36, followed by medium enterprises with 3.33 and microenterprises with 3.27.

This result implies that MSMEs in Apayao were generally capable of sustaining operations, adjusting to difficulties, and recovering from disruptions. Small enterprises may have shown slightly stronger resiliency because they often have better systems, customer networks, and resource access than microenterprises. However, the high rating across all groups suggests that local enterprises relied on flexibility, practical decision-making, customer familiarity, and local coping strategies. Resiliency, therefore, should not be viewed only as survival but as the capacity to adapt, learn, and improve after disruptions (Koporcic et al., 2025).

Table 4.

Level of Resiliency of MSMEs in Apayao

Indicators	WM	Descriptive Equivalent
Micro Enterprises	3.27	Highly Resilient
Small Enterprises	3.36	Highly Resilient
Medium Enterprises	3.33	Highly Resilient
Overall Weighted Mean	3.32	Highly Resilient

Note. WM = weighted mean.

Relationship Between Innovation Strategies and Resiliency (Research Questions 3)

Table 5 presents the relationship between innovation strategies and MSME resiliency. The results show that all innovation strategy domains had positive and statistically significant relationships with resiliency. Process improvement had the strongest relationship with MSME resiliency, $r = .618, p < .001$, followed by product innovation, $r = .574, p < .001$; digitalization, $r = .514, p < .001$; and customer engagement tactics, $r = .483, p < .001$. The overall innovation strategies score was also positively and significantly related to MSME resiliency, $r = .654, p < .001$.

The overall innovation strategies score was also significantly related to resiliency ($r = 0.654, p < .001$). These findings show that MSMEs with stronger innovation practices tended to be more resilient. Process improvement contributed to resiliency by improving efficiency, reducing waste, and supporting operational continuity. Product innovation helped enterprises remain competitive by adjusting products to customer needs and market conditions. Digitalization supported communication, promotion, and recordkeeping, while customer engagement helped maintain trust, repeat purchases, and market retention. Together, these strategies strengthened the ability of MSMEs to withstand and respond to business disruptions.

Innovation may therefore function as a long-term competitive advantage because it allows MSMEs to sustain productivity while remaining responsive to changing market conditions. Dynamic capabilities and adaptive innovation strengthen organizational competitiveness and long-term enterprise sustainability. Product innovation also showed a strong relationship with resiliency, indicating that enterprises that adjust their products and services may be better able to respond to changing customer preferences. The significant correlations for digitalization and customer engagement further support previous findings that digital tools, customer relationships, and market responsiveness can help SMEs cope with crisis conditions (Adam & Alarifi, 2021; Santos et al., 2023).

Table 5.*Pearson Correlation Between Innovation Strategies and Resiliency of MSMEs*

Indicators	Pearson <i>r</i>	<i>p</i> -value	Decision
Product Innovation	0.574	0.000	Significant
Digitalization	0.514	0.000	Significant
Process Improvement	0.618	0.000	Significant
Customer Engagement Tactics	0.483	0.000	Significant
Overall Innovation Strategies	0.654	0.000	Significant

Note. Correlation is significant at $\alpha = .05$, two-tailed. r = Pearson correlation coefficient.

Table 6 presents the regression analysis on the predictive influence of innovation strategy domains on MSME resiliency. The regression model was statistically significant, $F(4, 156) = 30.40$, $p < .001$, and explained 43.8% of the variance in resiliency, $R^2 = .438$, adjusted $R^2 = .424$. Among the predictors, process improvement emerged as the strongest significant predictor of MSME resiliency, $\beta = .290$, $p = .006$, followed by product innovation, $\beta = .208$, $p = .024$, and customer engagement, $\beta = .159$, $p = .034$. Digitalization showed a positive but non-significant predictive effect on resiliency, $\beta = .122$, $p = .146$.

These findings suggest that operational discipline is a key driver of MSME resiliency in Apayao. Enterprises that improve workflows, monitor costs, maintain product or service quality, and manage resources efficiently are more likely to sustain operations during disruptions. Product innovation strengthens long-term competitiveness by enabling businesses to remain responsive to customer needs and market changes, while customer engagement contributes to market retention through trust, loyalty, and sustained customer relationships. Meanwhile, the non-significant predictive effect of digitalization suggests that digital tools may require stronger infrastructure, digital literacy, financial readiness, and organizational learning before they can exert a stronger direct influence on MSME resiliency (Awad & Martín-Rojas, 2024; Hokmabadi et al., 2024; Khurana et al., 2022; Sagala & Ōri, 2025).

Table 6.*Multiple Linear Regression Analysis of Innovation Strategy Domains Predicting MSME Resiliency*

Predictor	<i>B</i> (Unstd.)	<i>SE</i>	β (Std.)	<i>t</i>	<i>p</i> -value
(Constant)	1.106	0.232	-	4.764	0.000
Product Innovation	0.170	0.075	0.208	2.277	0.024*
Digitalization	0.073	0.050	0.122	1.460	0.146
Process Improvement	0.241	0.086	0.290	2.806	0.006**
Customer Engagement	0.160	0.075	0.159	2.136	0.034*

Note. $R = .662$, $R^2 = .438$, adjusted $R^2 = .424$, $F(4, 156) = 30.40$, $p < .001$. Dependent variable: overall resiliency score. B = unstandardized coefficient; SE = standard error; β = standardized coefficient.

Challenges Encountered by MSMEs in Apayao in Adopting Innovation (Research Questions 4)

Table 7 presents the challenges encountered by MSMEs in Apayao in adopting innovation strategies. The results show that these challenges were moderately encountered, as reflected in the overall weighted mean of 2.89. Among the identified barriers, high transportation and logistics costs ranked first, with a weighted mean of 3.03. This was followed by limited access to financial capital and credit, $WM = 2.92$; limited access to skilled and dependable workers, $WM = 2.88$; inadequate internet connectivity and digital infrastructure, $WM = 2.84$; and difficulty adapting to new technologies and digital tools, $WM = 2.77$.

These findings indicate that innovation adoption in Apayao is shaped not only by business owners' willingness to innovate but also by logistical, financial, technological, and capability-related barriers. Such constraints may limit investments in product development, equipment, training, inventory, digital tools, and market expansion. This supports recent studies emphasizing that SME resilience depends on financial capacity, digital readiness, organizational learning, external support, and adaptive operational capability (Adam & Alarifi, 2021; Awad & Martín-Rojas, 2024; Hokmabadi

et al., 2024; Khurana et al., 2022).

Table 7.

Challenges Encountered by MSMEs in Apayao in Adopting Innovation

Challenges	WM	Descriptive Equivalent	Rank
Limited access to financial capital and credit restricts the ability to expand and innovate.	2.92	Moderately Encountered	2
Inadequate internet connectivity and digital infrastructure hinder business operations.	2.84	Moderately Encountered	4
High transportation and logistics costs reduce profitability and market access.	3.03	Moderately Encountered	1
Difficulty adapting to new technologies and digital tools affects business efficiency.	2.77	Moderately Encountered	5
Limited access to skilled and dependable workers impacts overall business performance.	2.88	Moderately Encountered	3
Overall Weighted Mean	2.89	Moderately Encountered	

Note. WM = weighted mean.

The qualitative responses in Table 8 reinforced the quantitative results. Financial assistance and credit access emerged as the dominant theme, followed by training and technical assistance, market access and promotion, and policy or regulatory support. These results imply that MSME resilience requires an enabling ecosystem involving local government units, national agencies, educational institutions, financial organizations, and private partners. Institutional support, market linkages, and capability-building programs are important because innovation becomes more effective when enterprise-level efforts are supported by external resources and a responsive business environment (Adam & Alarifi, 2021; Dias et al., 2022; Kaporcic et al., 2025).

These challenges also explain why digitalization, although significantly correlated with resiliency, did not become a significant predictor in the regression model. Digital tools can support promotion, communication, payment systems, and recordkeeping, but their effect may be limited when owners lack stable connectivity, devices, digital skills, financial resources, and readiness to integrate technology into daily operations. Thus, digitalization may remain useful but less influential than process improvement and product innovation when rural enterprises continue to face basic operational and infrastructure constraints (Awad & Martín-Rojas, 2024; Hokmabadi et al., 2024; Sagala & Óri, 2025).

Table 8.

Most Common Challenges in Adopting Innovation Strategies

Challenges	Descriptive Equivalent
Financial assistance and credit access	Dominant theme; respondents emphasized the need for low-interest loans, subsidies, and tax relief.
Training and technical assistance	Owners sought digital transformation training and skills programs from Department of Trade and Industry (DTI), Technical Education and Skills Development Authority (TESDA), and schools.
Market access and promotion	Respondents needed government-led promotion, trade fairs, and digital marketplaces beyond local reach.
Policy and regulatory support	Some respondents called for clearer policies, business transparency, and disaster support programs.

Implications for Business Practice and Policy

The findings imply that innovation support for MSMEs should be practical, gradual, and responsive to local business conditions. Since process improvement emerged as the strongest predictor of resiliency, training programs

should prioritize operational tools such as workflow mapping, production scheduling, inventory monitoring, quality checking, and cost tracking. These practices can improve productivity, reduce inefficiencies, and strengthen operational continuity even without large capital investment. Recent studies similarly emphasized that SME resilience improves when enterprises strengthen internal routines, adaptive capability, and operational flexibility during uncertain conditions (Koporci et al., 2025; Hokmabadi et al., 2024).

Product innovation should also be strengthened through coaching on packaging, product diversification, branding, market testing, and the use of local materials. For Apayao MSMEs, product development may be linked with agriculture-based enterprises, local food processing, crafts, and community-based products. This approach can improve market differentiation while preserving local identity and resource-based enterprise opportunities. Innovation-driven product development helps MSMEs remain responsive to customer preferences and sustain competitiveness in changing markets (Dias et al., 2022; Flaminiano, 2024).

Customer engagement should be treated as a strategic management practice rather than an informal activity. MSMEs may benefit from systematic feedback collection, customer records, after-sales communication, loyalty practices, and digital customer interaction. These activities can help enterprises maintain demand, strengthen trust, and improve customer retention during periods of uncertainty. Recent customer engagement literature emphasized that strong customer relationships contribute to business continuity, market stability, and long-term value creation (Hollebeek, 2022; Lim et al., 2022).

Digitalization should be introduced gradually and should focus on tools that directly improve business operations. For micro and small enterprises, initial digital practices may include social media promotion, mobile payments, online customer messaging, and basic digital recordkeeping. More advanced systems may be adopted once owners have adequate skills, infrastructure, and organizational readiness. This staged approach prevents digitalization from becoming an operational burden and allows technology adoption to contribute more effectively to resilience and competitiveness (Awad & Martín-Rojas, 2024; Sagala & Óri, 2025).

Policy interventions should address the structural barriers identified in the study. Financing programs, transport and logistics support, internet connectivity improvement, digital skills training, and market linkage initiatives should be coordinated rather than implemented separately. A coordinated support system can help ensure that innovation strategies are not only adopted but also sustained and translated into measurable improvements in MSME resiliency. Recent resilience studies emphasized that institutional support, infrastructure development, and inclusive access to resources are essential conditions for sustainable MSME innovation and rural enterprise resilience (Adam & Alarifi, 2021; Koporci et al., 2025).

Conclusions

The study concluded that innovation strategies significantly contributed to the resiliency and operational sustainability of MSMEs in the Province of Apayao. Process improvement emerged as the strongest predictor of resiliency, indicating that efficient operations, workflow optimization, and quality management were essential for enterprise continuity and adaptive capacity. Product innovation enhanced market responsiveness by enabling enterprises to diversify offerings and respond to changing customer preferences, while customer engagement strengthened trust, loyalty, and demand stability. Although digitalization was positively associated with resiliency, its effectiveness depended on infrastructure availability, digital skills, and institutional support. Overall, the findings demonstrated that innovation-based capabilities strengthened organizational adaptability, competitiveness, and long-term business sustainability among MSMEs operating in geographically constrained environments.

Recommendations

MSME owners and operators may institutionalize simple but consistent process improvement practices such as inventory monitoring, quality checking, cost control, workflow organization, and customer feedback systems. They may also continue developing products that reflect customer needs, local market trends, and available resources. Gradual digital adoption through social media platforms, mobile payment systems, online customer communication, and digital recordkeeping may be paired with skills training to improve operations, sales, and customer engagement.

Government agencies, local government units, financial institutions, and development partners may provide accessible financing, low-interest loans, innovation grants, technical training, logistics assistance, and market linkage programs. Support initiatives may prioritize process improvement, product development, digital skills, financial management, and infrastructure enhancement according to enterprise size and operational capacity.

Local enterprise development offices may organize coaching sessions on operational planning, product packaging, online marketing, customer relationship management, and basic accounting practices. Partnerships with

educational institutions, TESDA, DTI, and private organizations may help strengthen enterprise mentoring and digital capability-building initiatives.

Future researchers may examine innovation adoption and MSME resiliency across other rural provinces, business sectors, and geographic contexts. Longitudinal and comparative studies may further explore the influence of entrepreneurial orientation, digital readiness, institutional support, financial literacy, and market network strength on enterprise sustainability and organizational resilience.

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