

Harnessing Artificial Intelligence Tools to Enhance Food Microbusinesses in Pangasinan: Opportunities, Challenges, and Strategic Approaches

Jeanlyn Vallejos Domingo¹

¹ College of Technology and Business, Pangasinan State University, Asingan Pangasinan 2439, Philippines
Doctor of Business Administration,
Email ID : jeanlynvdomingo@psu.edu.ph
ORCID: <https://orcid.org/0009-0008-2029-4110>

Abstract

This research assesses the use of Artificial Intelligence (AI) tools to improve the operations of food microbusinesses in Pangasinan, Philippines. Despite the importance of food microbusinesses for local economic development and job creation, few have entered even the early stages of digital transformation. A descriptive research design was used to examine 200 food microbusiness owners in four major cities (Alaminos, Dagupan, San Carlos, and Urdaneta) to determine awareness, readiness, challenges, and strategic needs regarding AI tool adoption. Data was collected using a validated survey questionnaire and analyzed using frequency, percentage, and weighted mean. The findings show that while respondents generally seem eager to adopt AI applications, they seem to have low knowledge and experience using AI-driven tools such as ChatGPT, Canva AI, and Microsoft Copilot. Barriers included inadequate technical skills, little training support, and expensive subscription pricing. At the same time, respondents did see AI's potential to improve marketing, productivity, and customer service. The study recommends that capacity-building take a specific focus, that affordable access to AI platforms could be an immediate goal, and that investment in AI use by microbusinesses is maintained by government and institutional support mechanisms to encourage equitable digital adoption by food microbusinesses. The outcomes from this study are misleading for policymakers, educators & business development agencies to support sustainable, appropriate, and technology-enabled microenterprise development.....

Keywords Artificial Intelligence, food microbusiness, digital readiness, AI adoption, Pangasinan...

INTRODUCTION

Background of the Study

The rise of Artificial Intelligence (AI) has significantly transformed business environments around the world. AI facilitates data-driven decision making, automation and customer engagement strategies that were historically limited to larger enterprises. In the past few years, AI tools have been more available to smaller businesses, providing useful applications in marketing, design, analytics and operations. For food microbusinesses - for whom competition, innovation, and customer loyalty are key - the use of AI is an effective option to promote improved productivity and resilience.

In the Philippines, micro, small, and medium enterprises (MSMEs) comprised approximately 99.5 percent of all business establishments (Department of Trade and Industry [DTI], 2023). Many food-related microbusinesses are often significant contributors to local economic activity, employment and household income. In Pangasinan, a province known for its lively food culture and enterprising attitude, many small food businesses continue to run and operate in traditional business methods. These businesses show evidence of creativity and adaptability, but their limited ability to adopt new technology, such as AI, is largely due to funding, education and infrastructure challenges.

The COVID-19 pandemic highlighted the importance of digital readiness for microenterprises. Mobility restrictions and changing consumer behavior made technology adoption vital for business continuity.- AI tools that support marketing and communication, such as generative design applications (e.g., Canva AI), conversational agents (e.g., ChatGPT), and data processing assistants (e.g., Microsoft Copilot, Google Sheets AI) are affordable ways to improve marketing and communication processes and aid in decision-making. However, little is known about microbusiness owners' readiness to use these AI tools to their potential, especially in provinces like Pangasinan.

Problem Statement



While previous studies have reviewed digital transformation in MSMEs, there is limited research on how food microbusinesses in regional areas adopt AI tools into their business operations. Food microbusinesses encounter many challenges including limited finances, little to no prior training and limited exposure to advanced digital technologies as well. To understand their readiness, barriers and strategic priorities in developing an approach to digital transformation, is also needed in an era of localized digital transformation support for small businesses.

The value of this study is to benchmark food microbusinesses in Pangasinan to understand their readiness and challenges in adopting AI tools in their business operations. It will carry out the following research questions:

What is the demographic profile of food microbusiness owners in terms of age, sex, educational attainment, business type, and years of operation?

How do respondents assess their level of interest and readiness in adopting AI tools?

What challenges do they encounter in terms of knowledge, skills, financial resources, and technological access?

What strategies and forms of support are considered most effective in promoting AI adoption among food microbusinesses?

Based on the findings, which AI tools are most suitable for initial training and integration in microbusiness operations?

This work contributes to the growing body research on digital inclusion and sustainable entrepreneurship by documenting practical strategies that contribute to the empowerment of microbusinesses through the use of AI tools.

Significance of the Study

This study presents useful implications for various stakeholders. It informs policymakers and local government units on areas that would benefit from improvements to digital literacy and training programs. It can inform the development of extension programs and curriculum modules pertaining to AI literacy for entrepreneurs for educators and academic institutions. It provides business owners with a framework for understanding how AI tools can improve competitiveness, productivity, and customer engagement. Finally, it provides empirical evidence for researchers to test AI-driven entrepreneurship further in emerging economies.

Theoretical and Conceptual Framework

This paper is based on the premise that food microbusinesses' use of Artificial Intelligence (AI) tools is determined by their readiness, perceived usefulness of the technology, accessibility of the technology, and the challenges that arise for them to implement it. The framework is derived from the Technology Readiness and Acceptance Model (TRAM) (Parasuraman & Colby, 2015; Davis 1989), which is further augmented by incorporating key constructs from the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) framework (Venkatesh et al., 2003). Taken together, they provide a richer analytical lens to understand behavioural intention and actual technology usage among microentrepreneurs.

In the context of the study, AI Readiness speaks to the state of food microbusinesses' preparedness for implementing AI in terms of digital literacy, understanding, and willingness to use AI. In line with TAM, Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) pertain to the extent to which business owners see that the AI tools (ChatGPT, Canva AI, Google Sheets AI, Microsoft Copilot) can enhance their efficiency, marketing and customer engagement.

In accordance with UTAUT, Facilitating Conditions (e.g., technology access, reliable internet, affordable devices) and Effort Expectancy (ease of learning, ease of using AI tools) are significant factors in adoption behavior. Conversely, Challenges (e.g., limited financial capital, knowledge, and technical barriers) which are factors that constrain the likelihood of adoption.

Lastly, Training and Institutional Support are enabling constructs that influence readiness, enhance perceptions of usefulness and ease of use, and overcome challenges. When these factors come together, they enhance the Adoption of AI Tools, as seen through food microbusinesses' active use of AI applications for decision making, marketing, and daily business operations

Literature Review

The rapid growth of Artificial Intelligence (AI) in different industries has opened up new opportunities in productivity, operational efficiency, and customer engagement. Although the use of AI is well-researched among large firms, the interest of micro, small, and medium enterprises (MSMEs) has only recently begun to emerge. However, this has occurred more slowly compared to larger firms due to more restrictive structures and limited resources. There is substantial literature on frameworks for technology adoption that can help explain improved outcomes of perceived usefulness, perceived ease of use, facilitating conditions, and digital readiness leading to behavioral intentions and use of the technology (Davis, 1989; Venkatesh et al., 2003; Parasuraman & Colby, 2015).

Evidence suggests that the adoption of AI can be beneficial for MSMEs in practice, improving marketing reach, customer connection, and increasing data-driven decision-making in other areas of inventory and operations (Alfian et al., 2020; Dey et al., 2023; Zhu et al., 2021). For example, in supply chain settings, AI-assisted systems allow SMEs to improve operation optimization and resiliency, which shows the interest of digital marketing tools by microbusinesses to extend the reach of their customers outside traditional geographic limitations (Yaiprasert & Hidayanto, 2023; Silva et al., 2021). These results are consistent with research that finds micro and small firms tend to follow a path of tools for marketing and for content generation in the early stages of their digital journey (Amankwah Amoah et al., 2024; Benvenuti et al., 2023).

Yet, adoption is not universal due to constraints, including low digital literacy, cost, lack of infrastructure, and uncertainty around ROI (Arfanuzzaman, 2021; Hangl et al., 2023; Dibbern et al., 2024). Other studies mention concerns of the workforce, including fears of unemployment or job displacement and lack of training as factors that slow adoption of AI into business processes (Colombo et al., 2019; Babashahi et al., 2024). In low-income, developing countries, such as the Philippines, the lack of supporting infrastructure and institutional supports make it difficult for widespread adoption (Silva et al., 2022; Newman et al., 2021).

Food microbusinesses (for example, street vendors, home-based sellers, and small eateries) are less investigated relative to the literature around AI adoption. Although a small number of papers explore SMEs adoption of digital tools in the food industry (Hersleth et al., 2023; Fernández Rovira et al., 2020), it is less common to look at AI-specific adoption. Food microbusinesses present different social dynamics: informal, low-capital labor intensive, rely more on social media and digital platforms for sales over enterprise IT systems (Bresciani et al., 2021; Battisti et al., 2021). This research will fill this gap by looking at food microbusinesses in Pangasinan, Philippines, and exploring the AI tools of ChatGPT, Canva AI, Google Sheets AI, and Microsoft Copilot and familiarity, perceived benefits, and support needs in terms of marketing, inventory management, customer support, productivity.

Training and institutional support consistently arise as enablers of AI adoption (Tovar & Piedra, 2023; Hangl et al., 2023). University-led intervention programs and public-private partnerships are improving SMEs digital readiness, while mentoring and coaching aid adoption (Guo et al., 2021; Bresciani et al., 2021). This study's findings, including highly rated interest in AI training (WM $\approx$ 3.75) and rated importance of education (WM = 4.26) similarly reflect these global tendencies, and suggest that structured learning experiences are needed for microbusinesses.

AI adoption in SMEs often follows an additive pattern: starting with marketing and content tools and eventually graduating to operational applications, like inventory and production optimization (Cooper, 2024; Dey et al., 2023). The current study provides supporting evidence for this pattern noted moderate adoption for marketing tools but lower adoption for inventory management. Scholars suggest providing structured low-barrier entry with already familiar tools, like Canva or ChatGPT, before adopting a full AI system (Benvenuti et al., 2023; Amankwah Amoah et al., 2024).

Costs and access are considerable hurdles, particularly in developing areas. Mobile data costs, reliability of connectivity, affordable devices, and localized language features are important determinants of AI uptake (Alfian et al., 2020; Yaiprasert & Hidayanto, 2023). Much like the present study, participants ranked cost and infrastructure hurdles both exist with an above moderately high amount (WM $\approx$ 4.07). If AI adoption is to be useful for food microbusinesses, any development of strategy for adoption must contend with training as well as access needs for those using technological intervention.

Research Gap and Contribution

Despite the extensive literature on SME digitalization and AI adoption, there is a clear gap in knowledge specific to the food microbusiness context in provincial developing-country settings. Much of the prior research look at SMEs as an aggregate class, or focuses on manufacturing/services in urban centres. There is limited understanding of how specific, accessible AI tools, training, and support can be adapted for microbusinesses operating in low-resource contexts. This study fills this gap by providing empirical data from four cities in Pangasinan, Philippines, on food microbusiness operations, measuring familiarity and use of specific tools, mapping perceived benefits by function (marketing, inventory, service, productivity), and assessing tool and other local support/training/technology needs unique to the local food microbusiness context. Within this study, we build on the literature on AI adoption in MSMEs by a) focusing on micro rather than small firms, b) focusing on the food sector, c) measuring specific tool uptake as opposed to a generic digitalization stage, and d) providing implications for training, policy and extension frameworks

Methods

Research Design

A descriptive research design was utilized in this study to investigate the readiness, challenges, and strategic needs of food microbusinesses in Pangasinan in implementing Artificial Intelligence (AI) tools. A descriptive design was determined to be the best fit and approach for demonstrating the characteristics of the population of interest without the exertion of manipulating variables. Descriptive research allows researchers to give an accurate

description of the conditions in which they occur naturally, and is especially appropriate for community-based research to provide valid evidence that policy and program decisions can be based on (Creswell & Creswell, 2018).

Respondents of the Study

The respondents consisted of 200 food microbusiness owners from four major cities in Pangasinan (Alaminos, Dagupan, San Carlos, and Urdaneta). The study sites were selected based on the vitality of the local food industry and the diversity of entrepreneurial contexts. Respondents included owners of small eateries, bakeries, food producers from home, and vendors of street food. This inclusion captured a representative view of the food microenterprise sector of the province.

Sampling Procedure

Since there is no comprehensive registry of food microbusinesses, the study applied a purposive-convenience sampling method to include food microbusiness owners who could be accessed and were actively producing or selling food and were willing to participate, while accepting that the sample would not obtain a complete population sampling. Each of the four cities contributed 50 respondents to balance representation in the regions of the study, with each region making up a fourth of the overall sample size.

Etikan, Musa, and Alkassim (2016) suggest that purposive-convenience sampling is useful when respondent data is limited when descriptive studies are conducting.

Research Instrument

A structured survey questionnaire served as the main data-gathering tool. It consisted of three major sections:

Business Profile – demographic and operational characteristics of the respondents.

AI Awareness and Usage – familiarity with and readiness to use selected AI tools.

Challenges and Support Needs – barriers to adoption and strategies for integration.

To assess the content validity, three experts in business management and research examined the questionnaire to ensure that the questions were relevant and clear in content and language. The questionnaire was piloted using 20 microbusiness owners in order to improve the instrument. The Cronbach's alpha in the pilot study was 0.89, indicating that the items were in high internal consistency.

Data Gathering Procedure

Before beginning data collection, formal approval was sought from the municipal and city governments in each of the chosen areas. Data collection comprised both in-person interviews with respondents, as well as online distribution through Google Forms to adhere to different levels of digital access. Participants were informed about the purpose of the study and assured of the confidentiality of their responses. Informed consent was acquired prior to participation in the study, as an ethical standard for all human-subjects research.

Data Analysis

The data collected were organized, encoded, and analyzed using descriptive statistics of frequency, percentage, and weighted mean. Printed and digital questionnaires were combined to make data consistent. Missing responses, comprising less than one percent of the total entries, were disregarded as per the recommendation of Tabachnick and Fidell (2019).

Weighted means were interpreted using the following scale:

4.21–5.00 = Very High / Strongly Agree

3.41–4.20 = High / Agree

2.61–3.40 = Moderate / Neutral

1.81–2.60 = Low / Disagree

1.00–1.80 = Very Low / Strongly Disagree

This analytical framework facilitated an objective assessment of the respondents' familiarity, readiness, perceived challenges, and strategic priorities regarding AI adoption.

Results, Analysis and Discussion

The research took place with a sample of 200 food microbusiness owners, specifically from Alaminos, Dagupan, San Carlos, and Urdaneta. The majority (81%) were small eatery or carinderia owners, followed by street food vendors (9.5%), home food sellers (4%), and bakeries (3.5%) (see Table 1). Over half (51.5%) had been in business for 1-3 years, indicating a relative youth and dynamism in the sector.

In terms of digital tools, 63.5% indicated that they were using social media or mobile applications for marketing, orders, or transactions, while 36.5% had not used any digital tools. This demonstrates some recognition of digital opportunities, yet more structured digital capacity was warranted. These patterns align with the literature on micro and small food enterprises in developing economies, indicating moderate adoption of digital tools, particularly for

marketing or customer engagement, and the need to provide training and institutional support to maximize the potential of digital (Hersleth et al. 2023; Silva et al. 2021; Yaiprasert & Hidayanto, 2023).

Table 1

Profile of Food Microbusiness Owners in Pangasinan (n = 200)

Category	Frequency	Percentage (%)
Eatery/Carinderia Owners	162	81.0
Street Food Vendors	19	9.5
Home-Based Food Sellers	8	4.0
Bakery Operators	7	3.5
Total	200	100.0

Note. Respondents were drawn from Alaminos, Dagupan, San Carlos, and Urdaneta cities.

Familiarity and Use of AI Tools

Table 2 shows an overall factor of weighted mean (WM) of 2.27 by respondents indicated low familiarity with AI tools. The specific AI platforms, ChatGPT (WM = 2.43) and Canva AI (WM = 2.33) had the highest familiarity, and Google Sheets AI (WM = 2.22) and Microsoft Copilot (WM = 2.18) had the lowest familiarity. This is a general trend, suggesting respondents were more familiar with user-friendly AI platforms based on creativity, rather than AI technology that focused on analytical and productivity purposes. This is a pattern of use noted in small businesses and mentioned that often AI adoption begins with accessible digital technologies (Amankwah Amoah et al., 2024; Benvenuti et al., 2023; Cooper, 2024). The factor of use was a similar trend, with respondents noting the use of AI for marketing and promotion (WM = 2.62) compared to operational purposes, (e.g. inventory management, or customer service) which were used less (overall WM = 2.17).

Prior studies have noted that with the initiation of AI adoption in micro and small enterprises, AI applications are primarily used for marketing and plan making purposes, where benefits are visible and immediate, than for operational purpose, which requires more digital readiness and training, etc. (Alfian et al., 2020; Yaiprasert & Hidayanto, 2023; Silva et al., 2021).

Table 2

Familiarity of Respondents with Selected AI Tools (n = 200)

AI Tool	Weighted Mean	Interpretation
ChatGPT	2.43	Low Familiarity
Canva AI	2.33	Low Familiarity
Google Sheets AI	2.22	Low Familiarity
Microsoft Copilot	2.18	Low Familiarity
Meta Business Suite (AI)	2.20	Low Familiarity
Overall Weighted Mean	2.27	Low Familiarity

Note. Scale: 1.00–1.80 = Very Low; 1.81–2.60 = Low; 2.61–3.40 = Moderate; 3.41–4.20 = High; 4.21–5.00 = Very High.

Respondents indicated lack of awareness, perceived difficulty, and costly subscription fees were the main reasons AI tools were not in use ($WM = 2.77$). These barriers are in line with previous studies that found digital literacy, perceived complexity, and cost are key influences on early AI adoption in micro and small enterprises (Hangl et al., 2023; Babashahi et al., 2024; Silva et al., 2021). It is surprising that poor internet access ($WM = 2.40$) was not a significant barrier; it indicates barriers are mainly due to gaps in knowledge and familiarity rather than infrastructure. (Alfian et al., 2020; Dey et al., 2023).

Perceived Benefits of AI Tools

Even with limited knowledge, the responders agreed with the ability of AI to increase marketing effectiveness, customer engagement, and productivity for their business. Table 3 illustrates that respondents' assessment of perceived benefits yielded an overall weighted mean of 3.87 (High). Respondents thought AI tools can create promotional content, automate responses and assist with operation tasks. These findings are in line with existing research identifying that AI technology adoption in micro and small enterprises leads to improvements in marketing effectiveness, engagement with customers, and decision-making procedures (Amankwah Amoah et al., 2024; Alfian et al., 2020; Yaiprasert & Hidayanto, 2023; Cooper, 2024).

Table 3

Perceived Benefits of AI Tools (n = 200)

Benefit Area	Weighted Mean	Interpretation
Improves marketing and promotions	3.95	High Benefit
Enhances customer service	3.89	High Benefit
Increases operational efficiency	3.90	High Benefit
Reduces manual workload	3.88	High Benefit
Improves inventory and sales tracking	3.76	High Benefit
Overall Weighted Mean	3.87	High Benefit

Note. Scale: 1.00–1.80 = Very Low; 1.81–2.60 = Low; 2.61–3.40 = Moderate; 3.41–4.20 = High; 4.21–5.00 = Very High.

The findings show that even people who are not part of the technical profession are aware of AI's transformative potential. Respondents acknowledged AI's significant contribution in design and marketing (Canva AI and ChatGPT which provide quick and visible results). The above findings support previous research that suggests the adoption of AI technology in micro and small enterprises enhances creativity, operational efficiency, and competitiveness, specifically in marketing and content generation activities (Amankwah Amoah et al., 2024; Benvenuti et al., 2023; Cooper, 2024; Yaiprasert & Hidayanto, 2023).

Challenges in AI Adoption

The challenges that respondents perceived in AI adoptions are presented in Table 4, which has an overall weighted mean of 3.79 (High). The two challenges rated the highest was lacking training or being guided by an expert ($WM = 3.95$) and having difficulty understanding AI tools ($WM = 3.77$). These results are consistent with the literature that identifies limited digital literacy and lack of support, as the most significant barriers to the adoption of AI and technology in micro and small enterprises (Hangl et al., 2023; Babashahi et al., 2024; Benvenuti et al., 2023).

High subscription fees ($WM = 3.86$) and data costs ($WM = 4.07$), were also among the most cited barriers, indicating affordability and connectivity remain relevant barriers (Alfian et al., 2020; Yaiprasert & Hidayanto, 2023). Respondents also cited barriers such as language ($WM = 4.04$) and low confidence ($WM = 3.65$), signifying that there is a need for culturally and linguistically appropriate AI training programs to support adoption in the context of food microbusinesses (Benvenuti et al., 2023; Amankwah Amoah et al., 2024).

Table 4

Challenges Encountered in AI Adoption (n = 200)

Challenge	Weighted Mean	Interpretation
Lack of training or expert guidance	3.95	High Challenge
Difficulty understanding AI tools	3.77	High Challenge
High subscription/service cost	3.86	High Challenge
High data consumption	4.07	Very High Challenge
Language or technical barriers	4.04	Very High Challenge
Low confidence in using AI tools	3.65	High Challenge
Perception that AI is only for large firms	3.52	High Challenge
Overall Weighted Mean	3.79	High Challenge

Note. Scale: 1.00–1.80 = Very Low; 1.81–2.60 = Low; 2.61–3.40 = Moderate; 3.41–4.20 = High; 4.21–5.00 = Very High.

The findings support the conclusion that barriers based on knowledge, skills, and education are greater than infrastructural barriers. Previous research on AI adoption in micro and small enterprises indicates perceived ease of use, digital literacy, and self-efficacy are significantly influential on the decision to adopt the technology (Hangl et al., 2023; Benvenuti et al., 2023; Amankwah Amoah et al., 2024). Thus, it is important to address the cognitive and skills barriers through applied training and education at the community level for effective integration of AI in food microbusinesses.

Strategies and Support for AI Integration

The participants underlined the more pressing requirements of training and education (WM = 4.26), access to technology (WM = 4.21), and funding (WM = 4.02) as core enablers of AI adoption (Refer conceptualized and summarized in Table 5). They recognized that training workshops, mentorship, and local tutorials are methods of generating digital transformation.

This is consistent with UNCTAD 2023, which calls for partnerships between government and academia to promote AI literacy among microentrepreneurs. The participants in this study also supported initiatives like workshops that focus on free AI techniques (WM = 4.41) and affordability to access AI tools (WM = 4.34), highlighting the level of supported capacity building to advance inclusive innovation.

Table 5

Proposed Support and Strategies for AI Adoption (n = 200)

Strategy/Support Area	Weighted Mean	Interpretation
Conduct free AI training workshops	4.41	Very High Priority
Provide affordable access to AI tools	4.34	Very High Priority
Offer mentorship and technical support	4.28	Very High Priority

Strategy/Support Area	Weighted Mean	Interpretation
Enhance technology infrastructure	4.21	High Priority
Provide financial grants or subsidies	4.02	High Priority
Overall Weighted Mean	4.25	Very High Priority

Note. Scale: 1.00–1.80 = Very Low; 1.81–2.60 = Low; 2.61–3.40 = Moderate; 3.41–4.20 = High; 4.21–5.00 = Very High.

This study examined the readiness, challenges, and strategic needs of food microbusinesses in Pangasinan in adopting Artificial Intelligence (AI) tools for business operations. The results revealed that although microentrepreneurs exhibit strong interest and awareness of AI's potential, their actual usage remains limited. Familiarity with AI tools such as ChatGPT, Canva AI, and Microsoft Copilot was generally low, with applications primarily confined to marketing and promotional tasks rather than core operational processes.

The findings highlighted that knowledge and skills gaps are the most significant barriers to AI adoption, followed by cost-related factors and language or technical difficulties. Despite these challenges, respondents expressed optimism regarding AI's capacity to improve marketing efficiency, customer satisfaction, and productivity. They identified training, mentorship, and affordable access to AI platforms as essential components of a supportive digital ecosystem for small businesses.

Conclusion and Recommendations

Conclusion

This study focused on the readiness, challenges, and strategic needs among food microbusinesses in Pangasinan for the adoption of Artificial Intelligence (AI) tools into real business applications. The results showed microentrepreneurs have a high level of interest and awareness of AI tools use but are not using it in practice. In general, the participants are not overly familiar with using AI tools like ChatGPT, Canva AI, or Microsoft Copilot, and such applications seemed limited to more marketing and promotional functions rather than into operational processes.

The study found that knowledge and skills were the biggest barriers to implementing AI, followed by affordability and language and/or technical issues. Despite these roadblocks, participants expressed optimism that AI could help improve marketing effectiveness, customer satisfaction, and productivity. The participants also discussed training, mentorship, and affordable access to AI platforms were factors of a useful supportive digital ecosystem for small businesses.

In summary, the research found that although food microenterprises in Pangasinan have not yet reached a technologically ready state, there is considerable scope for AI integration. Human capacity building through ongoing educational provision and accessible AI programs is vital to enabling inclusive digital transformation in the micro-enterprise sector. Proper development of human capacity and AI programs will lead to adopted AI technologies ultimately fostering innovation, competitiveness, and resilience among food microenterprises, and contribute to wider economic growth and sustainable development.

Recommendations

Based on the study's findings, the following recommendations are proposed for stakeholders seeking to promote AI adoption among microbusinesses:

For Government and Policy Makers:

Create AI literacy and digital skills programs aligned with the needs of microentrepreneurs, in partnership with local government units (LGUs) and national agencies, including the Department of Trade and Industry (DTI) and the Department of Information and Communications Technology (DICT), can develop community-based AI training and subsidies, to support access to digital tools.

For Educational Institutions:

Incorporate AI-related content into entrepreneurship, marketing, and business management courses. Universities and colleges can also leverage extension programs to provide practical AI applications - design automation, customer analytics, and digital marketing for small businesses.

For Microbusiness Owners:

Continually educate yourself with free or inexpensive online AI or digital transformation courses. Entrepreneurs should start using the easiest available tools (e.g., Canva AI, ChatGPT) and build on tools with data-driven content that can create efficiency and better decisions.

For the Private Sector and Industry Partners:

Develop mentorship networks and partnerships that can furnish AI resources and tutorials and discounts on tools for microentrepreneurs. Technology companies can also act as advocates for inclusive innovation, particularly by providing user-friendly interfaces and local language support for Filipino users.

For Future Researchers:

Undertake longitudinal and comparative studies to investigate AI use across microenterprise sectors and spaces. Qualitative research could also probe into behavioural, cultural, and psychological factors impacting technology adoption among entrepreneurs.

Executing these recommendations can expedite the responsible and inclusive introduction of AI technologies among food microbusinesses in Pangasinan and similar contexts. By working collaboratively across the government, academia, and industry, microentrepreneurs will be able to use AI not only as a tool for efficiency, but also as a vector for innovation, sustainability, and social empowerment...

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