Translating Digital Marketing and E-commerce Skills into Business Performance: Decoding the Mediating Role of Digital Adoption in Poultry Microenterprises

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Abstract: - The current research investigates the mediating role of Digital Skills Training and Digital Adoption in the relationship between the Business Performance of community entrepreneurs in Barangay 176-C, Bagong Silang, Caloocan City. To achieve this goal, a sample of 300 individuals will be selected, and a quantitative descriptive-correlational design will be applied in the research. Consequently, Partial Least Squares Structural Equation Modeling (PLS-SEM) will be utilized to examine the connection between Digital Skills Training, Digital Adoption and Business Performance. The results reveal that Digital Skills Training has a strong positive effect on Digital Adoption ($\beta = 0.834$) and Business Performance ($\beta = 0.389$) and that Digital Adoption also has a positive effect on Business Performance ($\beta = 0.521$). The results show that Digital Adoption can be regarded as partial mediating in the research because the model supports the "training-adoption-performance" concept ($\beta = 0.434$). In conclusion, the results of the study highlight the necessity of having practical digital skills training that leads to better Digital Adoption, which in its turn ensures better Business Performance. The research adds a new piece of knowledge regarding the connection between training and performance and broadens the empirical basis of studies that analyze community extension programs and digital livelihoods in developing countries.

Key-Words: - Digital Marketing, Electronic Commerce, Digital Transformation, Business Performance, Microenterprise Development, Digital Adoption.

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1 Introduction

Rapid digital transformation is changing the landscape of business operations; entrepreneurs can now widen market coverage and enhance operational efficiency and profitability [1]. Digital platforms, social media, and electronic money (e-wallets) are important resources, especially for small-scale and informal entrepreneurs [2]. Although the resources are available, many low-income urban communities have not been able to use these resources effectively [3]. The residents of Barangay 176-C, Bagong Silang, Caloocan City, have problems regarding digital skills and, as a result, have poor digital integration and irregular business performance [4].

Digital skills training (including online selling and social media marketing) and mobile application use are surrounded by the right extension programs to address the digital divide at Bulacan State University - Sarmiento Campus [5]. These programs strive to alleviate the conditions of the community they are addressing; however, the impact of these programs is often assessed by the number of participants and how much knowledge has been gained, rather than by the actual behavioral change of the participants and the measurable impact of the programs on the community [6].This brings us to the concern of whether digital skills training can improve the quality of entrepreneurship [7].

Most studies on digital entrepreneurship tackle digital skills training and business performance in isolation, ignoring how they connect [8]. There is little empirical research on how digital skills training impacts business performance through digital adoption [9]. Additionally, existing studies focus more on the constraint of digital technology, rather than the effective, sustained use and application of skills [10].This research gap calls for a focus on the "training–adoption–performance" pathway for grassroots entrepreneurs within the developing country context because of the preponderance of structural constraints [11].

2 Literature Review

The adoption of digital technologies by small and informal businesses has changed the way they operate. With the use of digital technologies, businesses can operate efficiently and reach a wider market, resulting in better business outcomes [12]. In this regard, Digital Skills Training (DST), Digital Adoption (DA), and Business Performance (BP) are the main parameters that help define the impact of digital transformation and determine the economic consequences. Although some studies have focused on these parameters, in particular on informal entrepreneurship and on grassroots and community entrepreneurship, the relationship between these parameters is underexplored.

Digital Skills Training aids entrepreneurs in building the ability to use digital services, marketing tools and financial technologies and consequently leads to the adoption of digital technologies and the enhancement of business activities [13]. Professional development interventions encompass more than just technical-ability. Motivation and the belief in one's ability to apply the skills learned are vital for the tools to be applied in practice [14]. Despite the importance of digital skills training, on its own, it does not ensure better performance; its impact is dependent on how the skills learned are put into practice [15]. This means that digital skills training has both direct and indirect impacts on performance, and the main determinant of performance is the outcome of the skills adopted.

Digital Adoption connects training to business performance by reflecting how business owners adopt digital technologies [16]. There are positive impacts on efficiency and customer engagement and a subsequent widening of the market as a result of adoption of online platforms, digital payment systems, and digital communication tools [17]. However, many entrepreneurs still do not adopt digital technologies, mainly due to insufficient digital literacy and financial constraints, as well as reluctance to innovate [18]. These findings support the premise that digital adoption improves business performance. The proliferation of Digital Adoption (DA) improves skill development and performance through the actual utilization of the technology [19]. This perspective reflects capability-building and technology adoption theories, in that, for any impact to be realized, behavioral adoption and the application of the technology must be actualized [20]. While there is increasing research interest, this integrated relationship is still unexplored in the context of developing countries and using advanced analytics such as PLS-SEM [21]. especially in the case of grassroots entrepreneurs. This supports the need for research to analyze how DST, DA, and BP interact in contexts where digital interventions are constrained by structure and are undertaken primarily in communities.

Hypotheses:
H1: Digital Skills Training (DST) has a significant positive effect on Digital Adoption (DA).
H2: Digital Adoption (DA) has a significant positive effect on Business Performance (BP).
H3: Digital Skills Training (DST) has a significant positive effect on Business Performance (BP).
H4: Digital Adoption (DA) significantly mediates the relationship between Digital Skills Training (DST) and Business Performance (BP).

3 Research Method

To understand the relation between Digital Skills Training (DST), Digital Adoption (DA) and Business Performance (BP) in the context of a community-based research approach [22]. this study uses a quantitative approach. The descriptive-correlational research design is used to describe the respondent and to determine the relationship between variables- direct and mediating [23]. The design is suitable for developing empirical evidence of the impact of digital interventions on livelihood outcomes.

The study is carried out in Barangay 176-C Bagong Silang, Caloocan City, Metro Manila, Philippines which is a community of small-scale entrepreneurs and informal livelihood activities [24]. The population is 300 community members who are involved in or interested in any income generating activities from which samples of the respondents are purposively selected to be relevant to the study objectives [25]. Data is gathered using a structured survey questionnaire based on a five-point Likert scale that has items selected to measure Digital Skills Training (DST), Digital Technology Use (DA), and Digital Business Outcomes (BP) [26]. The instrument is validated by expert validation to guarantee content validity.

Data collection is carried out by means of face to face survey in line with a coordinated and structured approach of data distribution and data preparation [27]. Informed consent and maintaining respondent confidentiality and anonymity, and using data for academic purposes are observed [28].

*Structural and Mediation Model Specification***.** The hypothesized mediation model was formally specified as:

$$DA_i = \alpha_0 + aDST_i + \varepsilon_{1i},$$

$$BP_i = \beta_0 + c'DST_i + bDA_i + \varepsilon_{2i},$$

where $a$represents the effect of Digital Skills Training on Digital Adoption, $b$represents the effect of Digital Adoption on Business Performance, and c'represents the direct effect of Digital Skills Training on Business Performance after accounting for Digital Adoption. The indirect and total effects were defined as:

$$IE = ab$$

and

$$TE = c' + ab.$$

Based on the standardized estimates, the indirect effect was:

$$IE = (0.834)(0.521) = 0.4345 \approx 0.434,$$

while the total effect was:

$$TE = 0.389 + 0.434 = 0.823.$$

Because the sampling distribution of the product abmay be asymmetric, the significance of the indirect effect was evaluated through nonparametric bootstrapping rather than relying on the normality assumption of the Sobel test.

The model was re-estimated using $B = 5{,}000$ bootstrap samples drawn with replacement from the original observations. If $\hat{\theta}^{*(r)}$denotes the estimated indirect effect from bootstrap sample r, its bootstrap standard error was computed as:

$$SE_{\text{boot}}(\hat{\theta}) = \sqrt{\frac{1}{B-1}\sum_{r=1}^{B}\left(\hat{\theta}^{*(r)} - \bar{\hat{\theta}^{*}}\right)^2},$$

where:

$$\bar{\hat{\theta}^{*}} = \frac{1}{B}\sum_{r=1}^{B}\hat{\theta}^{*(r)}.$$

The bootstrap procedure produced an indirect-effect estimate of 0.434, a standard error of 0.044, and $t = 9.973$, $p < 0.001$. The reported t-statistic was calculated by SmartPLS using the unrounded estimates. Bootstrapping is appropriate for mediation because it does not require the indirect effect to follow a normal sampling distribution.

Rationale for PLS-SEM. Rationale for PLS-SEM. The PLS-SEM and Covariance-based SEM are related but different analytical methods. The covariation-based SEM calculates a common-factor model and focuses on reproducing the empirical covariance matrix and assessing the global model fit. PLS-SEM, on the other hand, estimates variance-based relationships and emphasizes prediction and the explained variance of endogenous constructs. The choice of PLS-SEM was made to determine the predictive relationship of DST, DA, BP, as well as to examine the mediation effect of DA. However, the decision is not without its caveats: covariance-based SEM might offer superior parameter estimation efficiency when the distributional and model-specification assumptions are met, while traditional PLS estimates may be impacted by finite-sample bias or attenuation when the constructs are strictly considered common factors. Therefore, the results are not to be considered as proof of the superiority of PLS-SEM over covariance-based SEM in general.

The characteristics of the respondents were summarized by descriptive statistics (frequency, percentage, mean and standard deviation), as well as the construction of scores. To test the hypothesized direct and indirect relationships between Digital Skills Training (DST), Digital Adoption (DA), and Business Performance (BP), Partial Least Squares Structural Equation Modeling (PLS-SEM) was used. Rich validated and reliable data with Cronbach's Alpha, composite reliability, average variance extracted (AVE) and the heterotrait–monotrait ratio (HTMT) [29]. Inner variance inflation factors (VIFs) were examined to assess collinearity among the predictor constructs. Bootstrapping with 5,000 subsamples was used to determine the significance of direct and indirect effects. Analyses were performed using IBM SPSS Statistics version 30 and SmartPLS 4.1 [30].

4 Findings

Table 1 presents the respondents' sources of livelihood. Table 2 summarizes their types of work. Table 3 shows their age distribution. Table 4 presents their educational attainment. Table 5 summarizes their monthly income. Table 6 shows their preferred livelihood training programs. The respondents are primarily self-employed, run small businesses, or engage in informal work. This points to an employment structure that is entrepreneurial and flexible. Most of the respondents are active economically, which is an indication of a high level of likely digital engagement. The presence of differing educational attainment and low income levels indicates a disparity in digital preparedness and access to resources. However, a strong preference for digital agribusiness and entrepreneurship training indicates a high level of engagement with digital livelihood opportunities.

Table 1. Source of Livelihood

Source of Livelihood	Frequency	Percentage
Poultry Farming (broiler/layer/native chicken)	45	15.00%
Other Agriculture (crop farming, livestock, gardening)	30	10.00%
Small Business Owner / Entrepreneur	60	20.00%
Online Selling / E-commerce	30	10.00%
Vendor / Retail (market vendor, sari-sari store)	30	10.00%
Wage Employment (private company / service worker)	36	12.00%
Government Employment	9	3.00%
Skilled Work (electrician, mechanic, carpenter, technician)	15	5.00%
Freelance / Gig Work (online jobs, digital services)	12	4.00%
Unemployed (seeking livelihood opportunities)	18	6.00%
Household-based income (family business support)	9	3.00%
Remittance-based income (OFW support)	3	1.00%
Others	3	1.00%
Total	**300**	**100.00%**

Source: Created by the author.

Table 2. Type of Work

Type of Work	Frequency	Percentage
Self-Employed / Entrepreneur	75	25.00%
Family Business Worker (unpaid or shared income)	30	10.00%
Full-Time Employee (Private Sector)	36	12.00%
Full-Time Employee (Government)	9	3.00%
Part-Time Employee	15	5.00%
Freelance / Gig Worker (online jobs, project-based work)	12	4.00%
Seasonal Worker (agriculture, contractual, project-based)	18	6.00%
Daily Wage / Casual Worker (laborer, construction, helper)	24	8.00%
Informal Worker (vendor, driver, small-scale services)	36	12.00%
Unemployed	15	5.00%
Student	9	3.00%
Homemaker / Household Manager	12	4.00%
Retired / Pensioner	6	2.00%
Others:	3	1.00%
Total	**300**	**100.00%**

Source: Created by the author.

Table 3. Age

Age	Frequency	Percentage
18–24 years old	60	20.00%
25–34 years old	90	30.00%
35–44 years old	75	25.00%
45–54 years old	45	15.00%
55 years old and above	30	10.00%
Total	**300**	**100.00%**

Source: Created by the author.

Table 4. Educational Attainment

Educational Attainment	Frequency	Percentage
No Formal Education	9	3.00%
Elementary Level (not completed)	18	6.00%
Elementary Graduate	30	10.00%
Junior High School Level (not completed)	27	9.00%
Junior High School Graduate	45	15.00%
Senior High School Level (not completed)	21	7.00%
Senior High School Graduate	60	20.00%
Vocational/Technical Course (TESDA or equivalent)	30	10.00%
College Level (not completed)	24	8.00%
College Graduate	30	10.00%
Postgraduate (Master's/Doctorate)	3	1.00%
Others	3	1.00%
Total	**300**	**100.00%**

Source: Created by the author.

Table 5. Monthly Income

Monthly Income	Frequency	Percentage
No Income	30	10.00%
Less than ₱5,000	45	15.00%
₱5,001 – ₱10,000	60	20.00%
₱10,001 – ₱15,000	54	18.00%
₱15,001 – ₱20,000	36	12.00%
₱20,001 – ₱25,000	24	8.00%
₱25,001 – ₱30,000	15	5.00%
₱30,001 – ₱40,000	12	4.00%
₱40,001 – ₱50,000	9	3.00%
Above ₱50,000	6	2.00%
Prefer not to say	9	3.00%
Total	**300**	**100.00%**

Source: Created by the author.

Table 6. Preferred Livelihood Trainings

Preferred Livelihood Trainings	Frequency	Percentage
Digital Agribusiness: E-Marketing and Financial Literacy for Poultry Entrepreneurs	120	40.00%
Food Processing and Food Business	54	18.00%
Entrepreneurship and Business Skills	45	15.00%
Technical and Vocational Skills	36	12.00%
Personal Services and Home-Based Livelihood	24	8.00%
Other Skills Development	18	6.00%
Others	3	1.00%
Total	**300**	**100%**

Source: Created by the author.

Table 7 presents the respondents' assessment of Digital Skills Training. The overall mean result (3.85, Agree) shows that generally digital training programs help to increase the knowledge and skills of the participants, especially in online selling and digital marketing. The marginalised confidence in the application of skills, however, indicates that training has not sufficiently been translated into practical skills, which indicates the need for more hands-on and application based learning approaches.

Table 7. Assessment of Respondents' Digital Skills Training (DST)

Digital Skills Training (DST)	Mean	Verbal Interpretation
I received sufficient training on how to sell products online (e.g., Facebook Marketplace, Shopee).	3.78	Agree
The training improved my skills in using social media for business purposes.	3.92	Agree
I learned how to use digital tools (e.g., mobile apps, e-wallets) effectively.	3.85	Agree
The training enhanced my understanding of online marketing strategies.	3.88	Agree
I feel confident in applying the digital skills I learned from the training.	3.80	Agree
Total	**3.85**	**Agree**

Note: 1.00 – 1.80 = Strongly Disagree; 1.81 – 2.60 = Disagree; 2.61 – 3.40 = Neutral; 3.41 – 4.20 = Agree; 4.21 – 5.00 = Strongly Agree
Source: Created by the author.

Table 8 presents the respondents' assessment of Digital Adoption. Overall mean (3.78, Agree) indicates moderate to high level of digital adoption, specifically in communicating and transactive use. The relatively low share of digital tools used for operational management, however, suggests that digitization would not be carried out in a comprehensive manner but rather be more focused on the front-end functions.

Table 8. Assessment of Respondents' Digital Adoption (DA)

Digital Adoption (DA)	Mean	Verbal Interpretation
I actively use online platforms to promote and sell my products.	3.74	Agree
I use digital payment systems (e.g., GCash, Maya, online banking) in my transactions.	3.89	Agree
I regularly communicate with customers through online channels (e.g., Messenger, chat apps).	3.95	Agree
I manage my business operations using digital tools (e.g., inventory, orders).	3.62	Agree
I prefer digital methods over traditional ways in running my business.	3.70	Agree
Total	**3.78**	**Agree**

Note: 1.00 – 1.80 = Strongly Disagree; 1.81 – 2.60 = Disagree; 2.61 – 3.40 = Neutral; 3.41 – 4.20 = Agree; 4.21 – 5.00 = Strongly Agree
Source: Created by the author.

Table 9. Assessment of Respondents' Business Performance (BP)

Business Performance (BP)	Mean	Verbal Interpretation
My sales have increased after using digital platforms.	3.68	Agree
My business has gained more customers through online marketing.	3.75	Agree
My income has improved due to digital business practices.	3.66	Agree
My business operations have become more efficient.	3.72	Agree
My overall business performance has improved over time.	3.70	Agree
Total	**3.70**	**Agree**

Note: 1.00 – 1.80 = Strongly Disagree; 1.81 – 2.60 = Disagree; 2.61 – 3.40 = Neutral; 3.41 – 4.20 = Agree; 4.21 – 5.00 = Strongly Agree
Source: Created by the author.

Table 9 presents the respondents' assessment of Business Performance. The overall mean (3.70, Agree) shows that respondents experience improvements in business outcomes, particularly in

customer acquisition and operational efficiency. However, the modest gains in income suggest that while digitalization enhances business activities, it has not yet resulted in substantial financial growth, indicating the need for complementary strategies such as financial management and market expansion.

Table 10 presents the construct reliability and convergent validity results. The results confirm strong internal consistency and convergent validity, indicating that the constructs (DST, DA, BP) are reliably measured. This ensures that the indicators accurately capture the intended theoretical concepts, providing a solid foundation for structural analysis.

During measurement-model assessment, indicators DST2, DST5, DA2, DA5, BP2, and BP5 were removed because their outer loadings were below the adopted minimum criterion of 0.60. Accordingly, the descriptive assessments in Table 7, Table 8 and Table 9 present all five originally administered items per construct, whereas the final PLS-SEM measurement model and Figure 1 present only the three retained indicators per construct. The retained indicators, together with the resulting composite reliability and average variance extracted values, demonstrated satisfactory construct reliability and convergent validity.

Table 10. Construct Reliability and Validity

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
Business Performance	0.742	0.751	0.812	0.552
Digital Adoption	0.735	0.748	0.806	0.541
Digital Skills Training	0.701	0.715	0.82	0.576

Note: DST = Digital Skills Training; DA = Digital Adoption; BP = Business Performance.
Source: Created by the author.

Table 11 presents the heterotrait–monotrait ratios used to assess discriminant validity. The HTMT values are within acceptable thresholds, confirming that DST, DA, and BP are distinct constructs. This supports the conceptual separation of skills, adoption behavior, and performance outcomes, validating the multi-dimensional structure of the model.

Table 11. Discriminant Validity – Heterotrait-Monotrait Ratio (HTMT)

Constructs	Business Performance (BP)	Digital Adoption (DA)	Digital Skills Training (DST)
Business Performance (BP)	-	0.82	0.78
Digital Adoption (DA)		-	0.84
Digital Skills Training (DST)			-

Note: DST = Digital Skills Training; DA = Digital Adoption; BP = Business Performance.
Source: Created by the author.

Collinearity Assessment. Inner-model collinearity was assessed using the variance inflation factor. The VIF for Digital Skills Training as the sole predictor of Digital Adoption was 1.000. For Business Performance, Digital Skills Training and Digital Adoption each had an estimated inner VIF of 3.285. These values were below the threshold of 5.00, indicating that multicollinearity was not severe enough to compromise the structural estimates. Although the DST→DA coefficient was high (β = 0.834), it represents a structural path coefficient and does not, by itself, establish problematic multicollinearity.

Structural Model Results. Figure 1 presents the standardized path coefficients and coefficients of determination (R^2). The model explains 69.5% of the variance in Digital Adoption and 76.1% of the variance in Business Performance.

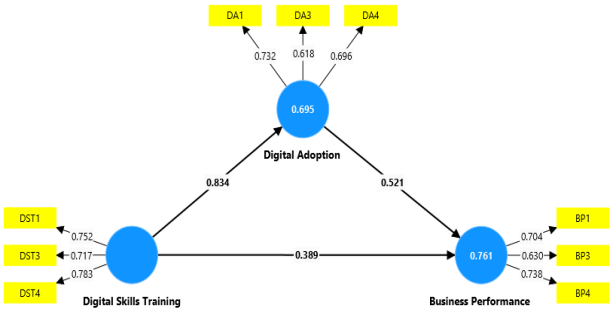


Fig. 1: Structural Model of Digital Skills Training, Digital Adoption, and Business Performance (PLS-SEM Results)
Source: Created by the author.

Table 12 presents the R^2 and adjusted R^2 values for Digital Adoption and Business Performance. The high R^2 values indicate strong explanatory power of the model, demonstrating that Digital Skills Training and Digital Adoption collectively account for a substantial portion of the variance in Business Performance. This suggests that the model has strong predictive relevance in explaining entrepreneurial outcomes.

Table 12. R-square – Overview

	R-square	R-square adjusted
Business Performance	0.761	0.760
Digital Adoption	0.695	0.694

Source: Created by the author.

Table 13 presents the direct path coefficients and their bootstrap significance tests. All relationships are positive and significant in the hypothesized model. Digital Skills Training has a highly influential impact on Digital Adoption, and Digital Adoption and Digital Skills Training both have influential effects on Business Performance. The stronger effect of adoption versus direct training suggests that improvements in performance are more likely to be influenced by the actual use of digital tools, rather than knowledge.

Although the R^2values for DA and BP were relatively high, they represent in-sample explanatory power and should not automatically be interpreted as evidence of equivalent out-of-sample predictive performance. The adjusted R^2values were nearly identical to the corresponding unadjusted values—0.694 versus 0.695 for DA and 0.760 versus 0.761 for BP—indicating minimal shrinkage after accounting for the number of predictors. Nevertheless, the model was not evaluated using an independent validation sample; therefore, the possibility of sample-specific explanatory performance cannot be completely excluded.

Table 13. Path Coefficients – Mean, STDEV, T values, p values

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
DA → BP	0.521	0.522	0.05	10.439	< 0.001
DST → BP	0.389	0.389	0.05	7.854	< 0.001
DST → DA	0.834	0.834	0.02	41.782	< 0.001

Note: DST = Digital Skills Training; DA = Digital Adoption; BP = Business Performance.
Sig. = significance level ($p < 0.001$)
Source: Created by the author.

Table 14 presents the specific indirect effect of Digital Skills Training on Business Performance through Digital Adoption. The results of the Digital Skills Training show that, although participants acquired digital skills, the main business outcome was achieved when the skills motivated actual use of digital tools, not just the acquisition of digital skills. It is understood that skills are only valuable in their application. Therefore, it is imperative, that hands-on training and follow-up support, and provision of digital means, is the more effective means of sustaining and enhancing business growth.

Table 14. Specific Indirect Effects – Mean, STDEV, T values, p values

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
DST → DA → BP	0.434	0.435	0.044	9.973	< 0.001

Note: DST = Digital Skills Training; DA = Digital Adoption; BP = Business Performance.
Sig. = significance level ($p < 0.001$)
Source: Created by the author.

The results support the "training-adoption-performance" framework by showing that digital capability development largely influences entrepreneurial outcomes through behavioral change. Digital Skills Training (DST) has a considerable effect on Digital Adoption (DA), so we see that in low-income contexts, digital transformation is primarily about the development of skills and the confidence of individuals, so the opportunity is transformed into actual practice. Furthermore, the effect of DA on Business Performance (BP) shows that value is not generated from training, but from the appropriate and effective use of digital tools in real-world business transactions. This also broadens the current scope of thinking about the adoption of a digital platform and establishes the ease of performance and the extent to which it is adopted and used [31]. This also enriches and adds value to digital entrepreneurship, as adoption is the main link connecting the development of human capital to the achievement of economic goals.

The presence of both direct and indirect effects also indicates that training has an independent effect on performance, and that the larger effect occurs after digital adoption, which in turn indicates that training–adoption–performance is a sequential process. This gives more theoretical backing to the implementation of human capital and technology adoption in grassroots entrepreneur environment [32].From a practical standpoint, the results show that digital training should focus more on the development of skills than just knowledge. The combined use of practice, mentoring, and digital resources is needed to maintain engagement in business activities. Such an effort is necessary to transform the short-term capability gains into long-term sustainability and to enhance technology-based livelihoods [33].

5 Conclusions

Digital capability development is a necessary component of the advancement of entrepreneurship.

The value of digital training is found in the output of trained employees using the technology. The results of this study provide a basis for understanding digital entrepreneurship by supporting the training–adoption–performance framework and identifying sustained adoption as the means to transform digital training into an economic outcome. Digital training must prioritize practical application to improve the quality of life of resource-constrained communities.
Digital Skills Training must be enhanced by instructing participants to use digital tools in a business setting. Digital Skills Training must be broadened to include digital marketing, e-commerce, and financial technologies. Continued Adoption must be ensured by providing training mentorship and supportive services and resources, such as Internet access and digital devices, beyond the training. Additional services and resources must be targeted for those who have limited income and resources to overcome barriers to adoption. Closely aligned with the Training and services is the practical application and supportive infrastructure to ensure the sustainable development of entrepreneurship.

6 Limitation and Further Research

The population relative to this study will limit the findings' applicability to varying geographical and socioeconomic positions. Further, the limitations of purposive sampling and the use of a cross-sectional research design restrict the establishment of temporal relationships. While the indirect effect of Digital Skills Training on Business Performance through Digital Adoption was established, the nature of cross-sectional mediation means that no such temporal ordering exists, and the results should be interpreted as containing theoretically complementary relationships rather than be definitive. Additionally, all constructs were based on a single self-reported assessment. The remaining self-report items were also cross-sectional. The PLS-SEM measurement model indicated good reliability and validity, but the cross-sectional self-report design may have been affected by common method, social-desirability, and recall biases. Thus, the relationships reported should be interpreted with due caution. The study is limited to three variables. In addition, the other possible variables (e.g., access to infrastructure, government support, and market conditions) are excluded. The cross-sectional design also does not eliminate reverse causality and omitted variable endogeneity. Joint effects may be influencing Digital Adoption and impacting Business Performance. To improve causal understanding, several alternative research approaches, such as longitudinal research and multiple-source designs, should be used. It may also be helpful to combine self-reported data with other indicators, such as digital platform metrics and actual sales, to measure potential Business Performance.

Researchers are incorporating additional variables such as digital infrastructure, financial access, innovative potential, and supportive policies to develop more sophisticated designs. Future studies may consider endogeneity using various techniques, such as appropriate control variables, temporally ordered data, or instrumental/control variable approaches, as long as valid identification conditions can be met. In addition, other qualitative or mixed methods research may add to our understanding of the challenges and experiences of entrepreneurs with respect to the adoption of digital technology. More studies may also explore other industries/sectors and try to determine where the Training–Adoption–Performance framework may be applicable. Finally, future studies may focus on the impact of Digital Skills Training on Business Performance due to Digital Adoption, and may attempt to explore the moderating impact of income, prior digital experience, and digital infrastructure. In this context, conditional-process analysis would attempt to study the training–adoption–performance framework in the context of different levels of resources and experience.

Declaration of Generative AI and AI-assisted Technologies in the Writing Process

During the preparation of this work, the author(s) utilized artificial intelligence (AI) technologies solely for the purpose of linguistic refinement and grammatical correction. Following the application of these tools, the author(s) comprehensively reviewed, verified, and edited the resulting text. The author(s) maintain full accountability and responsibility for the accuracy, integrity, and final content of the publication.

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Conflict of Interest

The author has no conflict of interest to declare relative to the content of this study.

Ethical Considerations

The ethical standards in research ensure voluntary informed consent, protection of participants' rights, and confidentiality, and informed consent was maintained throughout the research process of this study. The study protocol was approved by the Ethics Review Committee of the Bulacan State University (BulSU-ERC) under Protocol Code BulSUERC-2026-0187-01. Ethical approval was granted before the data collection, and all the research procedures were done according to the ethical standards on research involving human participants.

All research procedures were done according to the ethical standards on research involving human participants and in compliance with R.A.10173.

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