International Journal of Economics, Business and Innovation Research
https://e-journal.citakonsultindo.or.id/index.php/IJEBIR
E-ISSN : 2964-0865
IJEBIR

Assessing the effectiveness of Digital Entrepreneurship Academy (DEA) training on MSME technology adoption in West Java

Firdaus Yunanto Prabowo[1*], Salfitrie Roos Maryunani[2]

[1,2]Master of Business Administration Program, Institut Teknologi Bandung, Indonesia

Email: ofiprabowo@gmail.com[1*] , salfitrie_rm@sbm-itb.ac.id[2]
*Penulis Korespondensi: ofiprabowo@gmail.com

Abstract

Micro, Small, and Medium Enterprises (MSMEs) are a key driver of Indonesia's economy, yet the extent to which government-funded digital-capacity programs translate into sustained technology adoption and real business improvement remains unclear. This study evaluates the Digital Entrepreneurship Academy (DEA), a training program run by BLSDM Komdigi Bandung, assessing its effectiveness in promoting digital technology adoption among MSMEs in West Java through Kirkpatrick's Four Levels of Training Evaluation: Reaction, Learning, Behaviour (adoption), and Results, extended with facilitating and hindering factors. Using a quantitative survey of 262 MSME owners and managers who participated in the 2025 DEA program, data were analyzed through reliability testing, descriptive statistics, correlation, and multiple regression across two models. All seven constructs were reliable (Cronbach's Alpha 0.808–0.950) and all items valid. Participants reported high reactions (mean = 4.47) and learning (mean = 4.27), and positive business outcomes (mean = 3.90), but digital adoption (mean = 3.35) was the only level rated merely moderate. Regression shows that adoption is driven not by satisfaction but by facilitating factors (β = 0.42) and learning (β = 0.23). Adoption in turn significantly improves business outcomes (β = 0.35). Because adoption is the program's weakest result but strongest lever on outcomes, the study recommends pivoting the curriculum toward applied execution, integrating financing-ecosystem partners to address capital barriers, and restructuring post-training support into milestone-based accountability.

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Keywords: MSME digitalisation; technology adoption; training effectiveness; Digital Entrepreneurship Academy; Kirkpatrick Model.

BACKGROUND

Indonesia is undergoing one of the most rapid digital transformations in the world, with its digital economy reaching an estimated gross merchandise value of around US$90 billion in 2024 and projected to grow to at least US$180 billion by 2030. Within this economy, Micro, Small, and Medium Enterprises (MSMEs) play a foundational role, accounting for about 99% of all business units and contributing roughly 61.1% of national GDP. However, a large proportion continue to operate informally and with limited digital capability, prompting the Indonesian government to pursue MSME digitalisation with a target of onboarding 30 million MSMEs into the digital ecosystem by 2024.

In West Java, which hosts an estimated 7.05 million MSMEs, the government delivers the Digital Entrepreneurship Academy (DEA) to equip MSMEs with digital skills. The DEA is delivered by BPSDMP Kominfo (BLSDM Komdigi) Bandung. Despite considerable investment, a critical gap remains: existing evaluations often focus on output indicators like participant numbers and satisfaction scores, but rarely examine whether MSMEs actually adopt and continue using digital tools (such as point-of-sale systems, e-commerce platforms, and digital payment methods) in their day-to-day operations.

This gap between training learning and real-world behavioral adoption is the central concern of this study. Thus, this study aims to evaluate the DEA programme's effectiveness comprehensively and identify the factors that enable or hinder sustained digital adoption among MSMEs in West Java.

LITERATURE REVIEW

Kirkpatrick's Four Levels of Training Evaluation Model

The primary theoretical lens for this research is Kirkpatrick's Four Levels of Training Evaluation Model, providing a systematic approach to assessing training effectiveness.

- Level 1 (Reaction): Assesses participants' immediate feelings, satisfaction, and perceived relevance of the training.
- Level 2 (Learning): Measures the acquisition of intended knowledge, skills, and changes in attitude, explicitly evaluating improvements in digital literacy.

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- Level 3 (Behavior): Evaluates the actual application of knowledge in work activities, specifically the adoption and integration of digital tools into MSME operations.
- Level 4 (Results): Measures the tangible outcomes or impacts on the business, such as increased sales, efficiency, and competitiveness.

Supporting Theories

This study is also supported by **Diffusion of Innovation Theory (Rogers, 2003)**, which explains how perceived benefits and complexity influence adoption success, and **Human Capital Theory**, which views training as an investment in people's digital knowledge and skills to create long-term value for MSMEs.

Conceptual Framework

Based on the theories above, the study examines two main models. The first examines whether Reaction, Learning, and Facilitating/Hindering factors predict Digital Technology Adoption. The second examines whether Digital Technology Adoption predicts Business Outcomes.

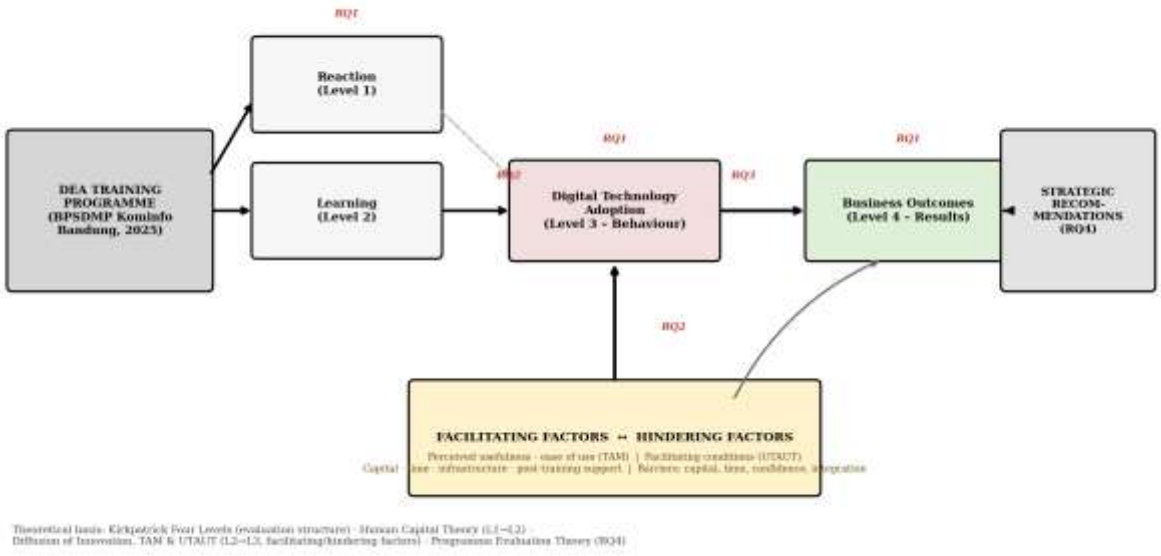


Figure 1. Conceptual Framework

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RESEARCH METHOD

Research Design and Data Collection

This study employs a quantitative survey-based research design to evaluate the DEA training program. Primary data was collected using a structured closed-ended questionnaire utilizing a five-point Likert scale, distributed to MSME owners and/or managers who participated in the 2025 DEA training programme in West Java.

Population and Sample

Using Slovin's formula with a 5% margin of error on a population of 1,580 participants, the required minimum sample size was approximately 320. The final valid sample gathered was 262 respondents (a response rate of 16.6%), yielding a margin of error of about 5.64%, which is adequate for inferential analyses

Analysis Method

Data analysis was conducted using statistical software for descriptive statistics, validity (corrected item-total correlation), and reliability (Cronbach's Alpha) testing. Multiple regression analysis was employed for hypothesis testing across two models after classical assumption tests (normality, multicollinearity, heteroscedasticity, linearity) were fulfilled.

RESULTS AND DISCUSSION

Validity and Reliability Test

Construct validity was assessed using the corrected item-total correlation, confirming all 32 items as valid (r-count > r-table). Internal consistency was confirmed with Cronbach's Alpha values ranging from 0.808 to 0.950, comfortably exceeding the 0.70 acceptable threshold for all seven constructs.

Descriptive Analysis across Kirkpatrick Levels

The descriptive findings reveal a clear gradient across the Kirkpatrick levels.

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Table 1. Descriptive statistics of composite construct scores (n = 262)

Construct (Kirkpatrick Level)	Mean	SD	Category
Reaction (Level 1)	4.47	0.52	High
Learning (Level 2)	4.27	0.58	High
Adoption (Level 3)	3.35	0.69	Moderate
Business Outcomes (Level 4)	3.90	0.61	High
Facilitating Factors	4.17	0.63	High
Hindering Factors (reversed)	2.49	0.67	Moderate

Participants reacted very positively to the training (Level 1) and reported substantial gains in digital skills and confidence (Level 2). However, Adoption (Level 3) was the only level rated merely moderate (3.35), confirming a pronounced behavioral gap. Item-level analysis revealed that while communication (WhatsApp Business, 3.95) and digital payments (QRIS, 3.83) were highly adopted, operational back-office tools like Point-of-Sale/cashier apps (2.21) and digital record-keeping (3.10) lagged significantly. The most strongly felt barriers were capital limitations (3.94) and time (3.77).

Regression Analysis – Model 1: Predictors of Digital Technology Adoption

Model 1 tests predictors of adoption (Level 3). The classical assumptions were satisfied (mild heteroscedasticity was resolved with robust standard errors).

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Table 2. Multiple regression results – Model 1 (DV: Adoption)
(Adjusted R^2 = 0.325; F = 21.908; Sig. < .001)

Predictor	β	t	Sig.
Reaction	-0.023	-0.261	0.794
Learning	0.230	3.074	0.002
Facilitating Factors	0.421	6.063	< .001
Hindering Factors	-0.062	-1.201	0.231
Mentoring (control)	-0.074	-1.450	0.148

The model shows that digital technology adoption is driven primarily by **Facilitating Factors** (β = 0.421) and **Learning** (β = 0.230). Satisfaction (Reaction) alone does not predict adoption. This implies that learning translates into adoption only when participants possess the enabling conditions (capital, time, infrastructure).

Regression Analysis – Model 2: Adoption and Business Outcomes

Model 2 tests predictors of Business Outcomes (Level 4), satisfying all classical assumptions

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Table 3. Multiple regression results – Model 2 (DV: Business Outcomes) (Adjusted R^2 = 0.477; F = 60.558; Sig. < .001)

Predictor	β	t	Sig.
Digital Technology Adoption	0.349	6.365	< .001
Learning	0.261	4.787	< .001
Facilitating Factors	0.220	3.824	< .001

Digital technology adoption is the strongest predictor (β = 0.349) of business outcomes. This confirms that adoption is not merely correlated with performance but is its strongest single predictor. Improving MSME digital adoption (Level 3) is a direct, evidence-backed lever for improving tangible business results (Level 4).

The Knowing-Doing Gap (RQ1)

The findings answer RQ1 by showing that the Digital Entrepreneurship Academy (DEA) is effective at the reaction and learning levels and generates perceived business outcomes, but remains less effective at the behavioural (adoption) level. The most important descriptive finding is the 0.92-point decline from Learning (4.27) to Adoption (3.35), indicating that although participants perceived the training as relevant, gained digital knowledge and skills, and developed greater confidence, these improvements were not fully translated into changes in business practices. From the perspective of Human Capital Theory, the increase in knowledge and confidence reflects an accumulation of digital competencies that should enhance productive capacity; however, the persistence of the behavioural gap suggests that possessing knowledge and confidence alone is insufficient to ensure practical implementation. This finding is consistent with previous studies showing that training programs generally produce stronger effects on reaction and learning than on behavioural change and organisational outcomes (McKay et al., 2024). Similarly, Legesse et al. (2020) found that while 93.1% of participants reported improved knowledge and skills, only 65.6% successfully transferred

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these competencies into workplace practice, whereas Alsalamah and Callinan (2020) also highlighted the consistently strong performance of Level 1 outcomes across Kirkpatrick-based training evaluations.

The item-level analysis further explains that the behavioural gap is primarily driven by differences in the ease of adopting digital technologies rather than by participants' willingness to change. Interpreted through Diffusion of Innovation theory (Rogers, 2003), digital communication and payment tools are more readily adopted because they exhibit low complexity, high compatibility with existing MSME routines, and high trialability. In contrast, technologies such as point-of-sale systems and digital bookkeeping require substantial changes to daily business operations, making them more difficult to implement despite participants' positive attitudes toward the training. Although the perceived business outcomes (3.90) exceeded the adoption score, this does not represent a contradiction, as benefits are realised primarily by participants who successfully implement the acquired knowledge. Moreover, Model 2 indicates that learning and facilitating factors contribute directly to business outcomes beyond their indirect effect through adoption. Overall, the DEA generates meaningful business value, but the realised impact remains below the level implied by participant satisfaction, reflecting the same pattern of attenuated higher-level training effects reported by McKay et al. (2024).

Drivers of Adopting and Outcomes (RQ2 and RQ3)

The discussion of the two models highlights three main findings. First, Reaction does not independently predict digital adoption once Learning is considered ($\beta = -0.023$, $p = .794$), indicating that participants who enjoy and positively evaluate the training do not necessarily apply what they have learned in practice. This finding supports the view that satisfaction alone is insufficient to produce behavioural change. As explained by Alvarez, Salas, and Garofano (2004), positive post-training reactions are associated with learning and transfer but require additional conditions before they translate into actual behaviour. The strong correlation between Reaction and Learning ($r = 0.731$) further suggests that the influence of participants' positive perceptions is largely captured through the learning process itself. In contrast, Learning significantly predicts adoption ($\beta = 0.230$, $p = .002$), supporting Human Capital Theory that acquiring digital competencies increases the likelihood of technology use.

Second, the strongest determinant of adoption is the facilitating factors ($\beta = 0.421$, $p < .001$), demonstrating that knowledge alone is necessary but insufficient without adequate resources and support. Consistent with UTAUT (Venkatesh et al., 2003),

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facilitating conditions directly influence use behaviour, while item-level analysis shows that structural barriers such as capital (3.94) and time (3.77) are perceived as more significant than personal confidence (3.10). This finding aligns with Legesse et al. (2020), who identified inadequate facilities and support as major obstacles to transferring training into practice. Moreover, facilitating factors significantly improve both technology adoption and business outcomes (Model 2, β = 0.220, $p < .001$), extending previous transfer literature (Alvarez et al., 2004; McKay et al., 2024) by demonstrating that an enabling environment not only supports learning transfer but also directly enhances business performance. Meanwhile, hindering factors do not significantly predict outcomes after adoption, learning, and facilitating conditions are included, suggesting that their effects operate indirectly by reducing adoption rather than directly influencing performance.

Finally, the findings are consistent with and extend recent evidence from Indonesia. Lilya and Pasaribu (2024) found that digital literacy alone did not directly increase e-commerce adoption, with digital training and mentoring fully mediating its effect. Similarly, the present study shows that learning promotes adoption only when accompanied by facilitating factors, while the 14-day mentoring group alone is insufficient to increase adoption. The results also support Anatan and Nur (2023), who identified financial and operational constraints as key barriers to MSME digital readiness. Furthermore, the positive relationship between digital adoption and business performance is consistent with Kilay et al. (2022), Muafi et al. (2023), and Affandi et al. (2024), who demonstrated that digital technologies, supportive business environments, and infrastructure contribute significantly to MSME performance. By integrating the Kirkpatrick model with mediation analysis, the present study provides a clearer explanation of the mechanisms through which training, enabling conditions, and digital adoption contribute to improved business outcomes.

Mediation Analysis

Table 4. Mediation analysis – indirect effects through Digital Technology Adoption

Path	a (X→AD)	b (AD→RS)	Indirect (a×b)	Sobel z	Sig.	VAF
Learning → Adoption → Business Outcomes	0.275 (SE 0.089)	0.311 (SE 0.049)	0.086	2.78	p = .005	23.5%

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Path	a (X→AD)	b (AD→RS)	Indirect (a×b)	Sobel z	Sig.	VAF
Facilitating Factors → Adoption → Business Outcomes	0.461 (SE 0.076)	0.311 (SE 0.049)	0.143	4.39	p < .001	40.0%

Note: VAF = variance accounted for, i.e. the proportion of the total standardised effect transmitted through Adoption. 95% confidence intervals for the indirect effects: Learning [0.025, 0.146]; Facilitating Factors [0.079, 0.208]. Neither interval contains zero.

The mediation analysis shows that both indirect effects are significant, while the direct effects of Learning (β = 0.261, *p* < .001) and Facilitating Factors (β = 0.220, *p* < .001) on business outcomes also remain significant. This indicates partial mediation, meaning that digital adoption serves as an important mechanism through which training and enabling conditions improve business performance, although it is not the only pathway. These findings emphasize that technology adoption is a meaningful transmission channel rather than merely a statistical association, making Level 3 (Behaviour/Adoption) a critical target for intervention. However, the two mediation paths differ in strength: approximately 40% of the effect of facilitating factors on business outcomes operates through digital adoption, compared with 23.5% of the effect of learning. This suggests that improvements in capital, time, and infrastructure enhance business performance largely by enabling the practical use of digital technologies, whereas learning also contributes through broader managerial knowledge such as business planning, entrepreneurship, and business formalization.

Despite the importance of digital adoption, the mediation is only partial, indicating that a substantial proportion of the effects of learning and facilitating factors on business performance occurs through other mechanisms beyond the adoption of digital tools. Therefore, increasing digital adoption should be viewed as one important pathway, rather than the sole route, for improving MSME performance. Nevertheless, these findings should be interpreted with caution because the Sobel test assumes a normally distributed indirect effect, making bootstrap confidence intervals a recommended robustness check. Furthermore, the cross-sectional design measures the mediator and outcome simultaneously, meaning that the mediation analysis provides statistical evidence consistent with the proposed causal relationships but does not establish definitive temporal causality.

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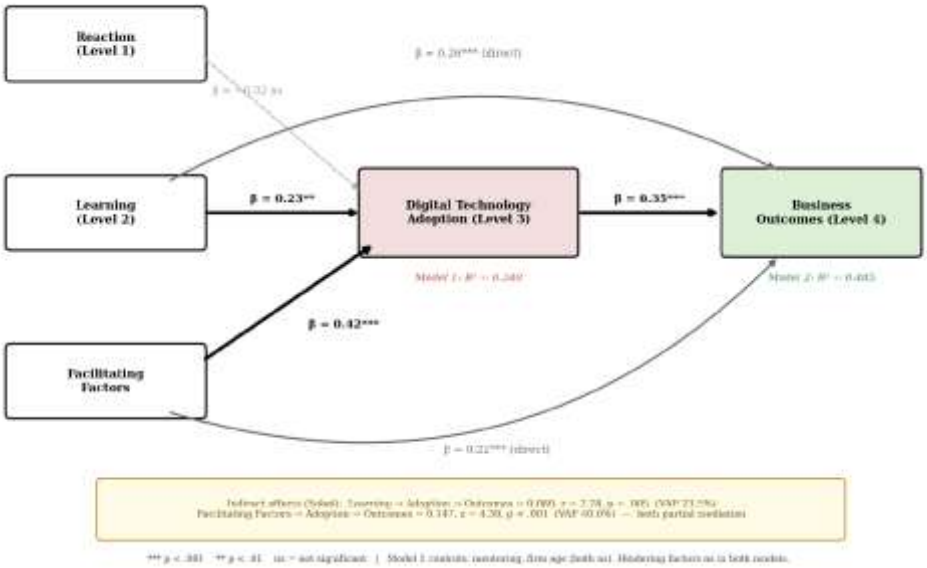


Figure 2. Path diagram of Model 1 and Model 2 with standardised coefficients and indirect effects (n = 262)

Consolidated Findings

Table 5. Summary of Results by Research Question

RQ	Question	Evidence	Answer
RQ1	Outcomes across the four levels?	RE 4.47; LE 4.27; AD 3.35; RS 3.90 (Table IV.4)	Effective at L1, L2, and L4; L3 only moderate — the sole level not rated high
RQ2	What predicts adoption?	FF β = 0.421***; LE β = 0.230**; RE β = −0.023 ns; HF, mentoring, firm age ns (Table IV.9; R^2 = 0.340)	Facilitating factors and learning — not satisfaction
RQ3	Does adoption predict outcomes?	AD β = 0.349***; LE β = 0.261***; FF β = 0.220***; HF ns (Table IV.11; Adj. R^2 = 0.477)	Yes; adoption is the strongest single predictor, but FF also acts directly

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RQ	Question	Evidence	Answer
—	Is adoption a mechanism?	Indirect effects significant; VAF 23.5% (LE) and 40.0% (FF); direct effects remain significant (Table IV.12)	Partial mediation — adoption transmits part, not all, of the effect
RQ4	What follows for policy?	Synthesis of the above plus item-level barriers (capital 3.94; POS 2.21)	Three strategic pillars (IV.3)

The implication reframes the programme's objective. The goal should shift from training more participants to ensuring that participants have the environment required to implement what they learn. Concretely, this means embedding applied execution in the curriculum, breaking the structural barrier of capital through ecosystem partnerships, and restructuring post-training support so that it compels the behaviour the classroom alone cannot.

CONCLUSION AND RECOMMENDATION

Conclusion

The DEA programme is highly effective at generating positive reactions and learning, and the digital adoption it fosters demonstrably improves MSME business outcomes. However, its central weakness lies at the behavioral level (Level 3), which is the only stage rated as moderate. Adoption is driven fundamentally by enabling facilitating conditions and concrete learning, rather than by training satisfaction, and current post-training support structures do not effectively close this gap.

Recommendation

Because adoption is the strongest lever on business performance, strategic interventions should specifically target Level 3.

1. **Embed applied execution:** Pivot the curriculum from theory to required execution, ensuring each participant activates at least two digital tools (prioritizing POS and bookkeeping) during the training.

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2. **Integrate Ecosystem Partners:** Since capital limitations are the dominant barrier, the program should partner with regional development banks (e.g., bank bjb) to integrate KUR micro-financing schemes directly into the training.
3. **Restructure Post-Training Support:** Shift mentoring from a passive, reassurance-based model to a milestone-based accountability system with weekly check-ins to compel behavioral execution.

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