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Improving the Digital Marketing Capacity of MSME Actors through Practice-Based Marketplace Training in Balongdowo Village, Sidoarjo, Indonesia

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ABSTRACT Digital marketing support for micro-, small-, and medium-sized enterprises (MSMEs) is often delivered as uniform training, even though participants differ substantially in their baseline capabilities. This community-based program evaluation mapped the digital readiness of MSME actors in Balongdowo Village, Sidoarjo, Indonesia, and translated the findings into a staged marketplace-assistance strategy. The study was embedded in the 2026 Community Partnership Program entitled "Optimalisasi Transformasi Digital UMKM di Desa Balongdowo: Peningkatan Kapasitas, Inovasi Produk, dan Akses Pasar," implemented by Poltekkes Kemenkes Surabaya with the Balongdowo Village Government from May to October 2026. The core seminar and marketplace workshop was held on 10 June 2026 and included registration and baseline assessment, practical digital-marketing instruction, marketplace demonstration, hands-on product-content practice, discussion, post-test administration, and follow-up mentoring. Anonymized baseline participant records were analyzed descriptively using frequencies, percentages, and measures of central tendency and dispersion. Thirty-three participants were included. Their mean age was 38.8 years (SD 10.9; range 24-60), 63.6% were women, and 63.6% operated food businesses. Monthly business income was below IDR 2 million for 90.9% of participants. Although 45.5% reported operating an online business, only 36.4% had a commercial account or platform presence; 18.2% used Shopee, 9.1% used TikTok, and 9.1% reported an affiliate-oriented account. Only 18.2% reported business or platform affiliation. The findings demonstrate progressive attrition from online presence to platform formalization and network embeddedness. A presence-platform-network continuum is therefore proposed to tailor assistance: foundational account creation and digital safety for non-users, structured storefront and transaction-management support for informal online sellers, and content, promotion, affiliate, and peer-mentor strategies for platform-active participants. Because participant-linked pre-post scores and longitudinal platform outcomes were not available, no claim of training effectiveness is made.

INDEX TERMS Digital readiness, MSMEs, marketplace adoption, community engagement, rural entrepreneurship.

I. INTRODUCTION

Micro-, small-, and medium-sized enterprises (MSMEs) play a central role in local livelihoods, household income generation, and the circulation of goods and services in Indonesian communities [1]. Their capacity to use digital channels has become increasingly important as product discovery, customer communication, payment, and order fulfillment shift toward platform-mediated environments. National e-commerce statistics continue to document substantial business activity through digital channels, but aggregate growth does not imply that all microenterprises possess comparable capabilities, resources, or confidence to

participate effectively [2]. Digital inclusion at the enterprise level therefore requires more than access to a smartphone or social media account; it also involves the ability to formalize a commercial presence, maintain product information, manage transactions, respond to customers, and connect to wider business networks [3].

International evidence similarly shows that smaller firms often lag behind larger enterprises in digital adoption because of constrained skills, limited financial and managerial resources, uncertainty about benefits, and difficulties integrating new tools into routine operations [4]. The Organisation for Economic Co-operation and

Development has emphasized that the digital gap among SMEs persists and that capability-building must accompany technology access[5]. Research on SME digitalization further indicates that adoption is not a single event but an incremental process shaped by organizational readiness, perceived usefulness, external support, and the fit between technology and business practices [6].

Studies in Indonesia have identified owner characteristics, perceived benefits, technology readiness, and external environmental pressures as relevant to e-commerce adoption among MSMEs. Contextual factors also influence whether e-business use translates into improved performance, underscoring the need to examine local business conditions rather than assuming that platform registration alone produces [7][8]. In rural and semi-rural settings, the adoption pathway may be particularly uneven: some business owners use messaging applications informally, others maintain social media pages, and a smaller group manages marketplace storefronts or participates in affiliate and business networks [9].

Balongdowo Village has a distinctive local-enterprise base linked to marine products, particularly household-scale processing of kupang and related foods [10]. Program planning documents identified that many products were still marketed through nearby shops and traditional markets, which restricted their reach beyond the local area[11][12]. The same documents identified limited use of e-commerce and an underdeveloped village information portal as practical barriers to wider promotion. These conditions made Balongdowo an appropriate setting for a community partnership program integrating digital marketing, marketplace practice, multimedia product preparation, and village-level digital infrastructure.

The 2026 program was designed as a six-month partnership between Poltekkes Kemenkes Surabaya and the Balongdowo Village Government. Its wider scope comprised two related tracks: development of digital marketing and e-commerce capabilities for MSMEs, and support for a village information portal. The present manuscript focuses specifically on the marketplace-readiness track. Community service programs commonly rely on seminars, demonstrations, and hands-on assistance; experiential learning is especially relevant because participants can observe a task, practice it using their own product, receive feedback, and revise their work (Kolb, 1984). However, the credibility and practical value of such programs depend on matching learning tasks to participants' starting points rather than assuming uniform digital capability.

The objective of this study was to characterize the demographic, business, and digital-readiness profile of MSME participants in the Balongdowo community partnership program and to translate that profile into differentiated assistance priorities. The study addressed three questions[13][14]: (1) What were the principal demographic and business characteristics of participating MSME actors? (2) How many participants had progressed from online activity to commercial platform use and affiliation? and (3)

How could the observed readiness pattern inform the sequencing of marketplace training and mentoring? By answering these questions, the manuscript aims to strengthen the empirical basis, transparency, and transferability of community-service reporting[15][16].

II. METHOD AND IMPLEMENTATION

A. METHOD

This study used a descriptive cross-sectional program-evaluation design embedded within a Community Partnership Program (PKM) for MSME actors in Balongdowo Village, Candi District, Sidoarjo Regency, East Java, Indonesia. The program, entitled "Optimalisasi Transformasi Digital UMKM di Desa Balongdowo: Peningkatan Kapasitas, Inovasi Produk, dan Akses Pasar," was implemented by Poltekkes Kemenkes Surabaya in partnership with the Balongdowo Village Government from May to October 2026. The core seminar and workshop was conducted on 10 June 2026 in the PKK Room of the Balongdowo Village Hall. The design was selected because the analytical dataset captured participants' characteristics and baseline digital practices at one point in time; it was not designed as a controlled trial, and no causal inference regarding knowledge, sales, or platform performance was attempted [17][18].

B. IMPLEMENTATION

Participants were local MSME actors who attended the community engagement activity and completed the participant profile form. Eligibility criteria were[19]: (1) being an owner, co-owner, or active manager of a micro- or small-scale business; (2) residing in or operating a business in the program's service area; and (3) providing sufficient profile information for analysis. Participation in the activity was voluntary. The analytical dataset contained 33 anonymized participant codes. Because recruitment was community-based and attendance-driven, the sample should be considered non-probability and is not intended to statistically represent all MSMEs in Sidoarjo Regency.



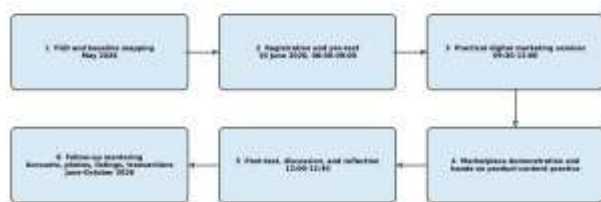
FIGURE 1. Opening Ceremony and Formal Handover of Equipment to Balongdowo Village Authorities

The marketplace track followed an applied sequence derived from the program proposal and implementation rundown. First, the team conducted an FGD and needs assessment with local MSME actors, home-industry

operators, village personnel, and community cadres [20]. Second, the workshop day began with participant registration and a scheduled pre-test from 08:00 to 09:00, followed by an opening session led by the community-service team and the Acting Head of Balongdowo Village.

Third, a practical digital marketing seminar and marketplace workshop was delivered from 09:30 to 12:00 by Siti Masfufah, SE, with Dr. Triwiyanto serving as program lead. Demonstrations and hands-on activities addressed account access, product photography, product titles and descriptions, prices, stock, upload procedures, customer communication, and transaction handling. Fourth, a post-test was scheduled from 12:00 to 12:30, followed by reflection and closing. Fifth, mentoring by lecturers and students was planned through October 2026 to support account registration, multimedia preparation, product listing, transaction procedures, and evaluation of sustained e-commerce use. The broader program also included assistance for a village information portal. An administrative handover record dated 10 May 2026 identified a printer as supporting equipment for village-level digital administration; its model and monetary value were not specified in the available record[21].

Although the implementation rundown included pre-test and post-test administration, participant-linked test scores were not included in the analytical dataset supplied for the present manuscript. Accordingly, this report evaluates baseline digital readiness and program-targeting implications only; it does not estimate short-term learning gains or longer-term business effects.



This manuscript has been published by the community service team; participants and community are not involved in the present study.

FIGURE 2. Flow of the Balongdowo community-based digital marketing and marketplace program

The implementation of the program consisted of several structured stages. **FIGURE 1**, the first stage involved preparation activities, including coordination with village authorities, participant identification, development of training materials and evaluation instruments, preparation of supporting facilities such as internet access, and instructions for participants to bring smartphones and product samples or photos.

The second stage was the pre-test, which was conducted to measure participants' initial knowledge regarding marketplace functions, product content preparation, product photography, naming and description of products, pricing, stock management, promotion, and customer service [22]. The test consisted of 20 multiple-choice questions, where correct answers were scored 1 and incorrect answers were scored 0, and the final score was converted into a scale of 0–100 using a standardized formula.



FIGURE 3. Digital Marketing Seminar and Theoretical Training Session for MSME Actors

The third stage was a digital marketing seminar, which provided participants with theoretical knowledge on digital marketing concepts, benefits of marketplaces for MSMEs, selection of appropriate platforms, characteristics of professional online stores, pricing strategies, and the importance of promotion and customer service[22]. This was followed by a marketplace demonstration session, where the facilitator showed step-by-step procedures for account setup, store profile configuration, product categorization, photo uploading, product naming, product description writing, pricing, stock setting, and order management [23].



FIGURE 4. Hands-on Marketplace Workshop and Mentoring Session for MSME Product Content

In the fifth stage, participants engaged in hands-on practice using their own products under direct guidance from the community service team and student assistants. Activities included product photography, improvement of product naming and descriptions, price determination, stock input, and product uploading to online marketplaces. Participant performance was documented using a structured skills observation sheet. The sixth stage involved discussion and problem-solving sessions, which addressed practical challenges such as limited digital devices, forgotten passwords, internet connectivity issues, low-quality product photos, pricing difficulties, shipping cost estimation, stock management, and customer communication[18].

A post-test was then administered using the same or equivalent instrument as the pre-test to evaluate immediate changes in participants' knowledge. Finally, mentoring activities were conducted both directly and through online communication groups to support participants in improving product content, activating marketplace accounts, uploading

products, resolving technical issues, and monitoring store activity [18].

Evaluation of the program was carried out using three instruments, namely a 20-item knowledge test, a skills observation checklist, and a participant satisfaction questionnaire measured using a Likert scale. Data analysis included descriptive statistics such as frequency [22], percentage, mean, and standard deviation. Where appropriate, inferential analysis such as paired t-test or Wilcoxon test was used to compare pre-test and post-test results. Key performance indicators included participation rate, improvement in knowledge scores, achievement of practical skills, marketplace account activation, product upload success, and participant satisfaction.

Ethical considerations were strictly observed. Participants were informed about the objectives of the program and participated voluntarily. All personal data were kept confidential, and documentation was used only with participant consent. The collected data were used solely for evaluation and scientific publication purposes.

III. RESULTS

A. CHARACTERISTICS OF PARTICIPANTS

The verified dataset comprised 33 participant records with unique codes. The mean participant age was 38.8 years (SD 10.9), the median was 35 years (interquartile range 33–45), and ages ranged from 24 to 60 years. Nearly half of participants were aged 30–39 years (48.5%). Women represented 63.6% of the sample, while men represented 36.4%. Educational attainment was relatively balanced: 54.5% had completed senior high school and 45.5% reported higher education. The demographic distribution is presented in TABLE 1.

TABLE 1.
Demographic characteristics of community program participants (N = 33)

Characteristic	Category/statistic	n	% or value
Age, years	Mean ± SD		38.8 ± 10.9
	Median (IQR)		35 (33–45)
	Minimum–maximum		24–60
Age group, years	20–29	6	18.2
	30–39	16	48.5
	40–49	5	15.2
	50–59	5	15.2
	≥60	1	3.0
Gender	Female	21	63.6
	Male	12	36.4
Education	Senior high school	18	54.5

Characteristic	Category/statistic	n	% or value
	Higher education	15	45.5

B. BUSINESS CHARACTERISTICS

Food-related enterprises dominated the participant group, accounting for 21 of 33 businesses (63.6%). The remaining businesses were evenly distributed across non-food retail, repair or service workshops, construction services, and wedding souvenirs or accessories, with three participants (9.1%) in each category. Reported business duration ranged from six months to 15 years, indicating that the program brought together both early-stage and established entrepreneurs. The most frequently reported duration was three years (27.3%), followed by six years (18.2%).

The income profile indicated limited financial scale. Eighteen participants (54.5%) reported monthly business income of IDR 500,000–1,000,000, 12 participants (36.4%) reported IDR 1,000,001–2,000,000, and only three participants (9.1%) reported more than IDR 2,000,000. Thus, 90.9% operated within the two lowest reported income categories. This distribution is relevant for program design because recommendations requiring paid advertising, specialized equipment, or subscription-based tools may be unrealistic unless accompanied by low-cost alternatives and clear evidence of value.

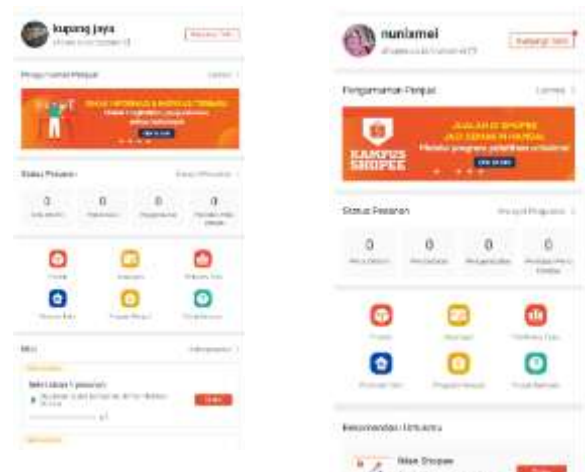


FIGURE 5. Shopee seller dashboard showing store performance and order management overview.

TABLE 2.
Business characteristics of participants (N = 33)

Characteristic	Category	n	%
Business type	Food	21	63.6
	Non-food retail	3	9.1
	Repair/service workshop	3	9.1
	Construction services	3	9.1

Characteristic	Category	n	%
	Wedding souvenirs/accessories	3	9.1
Business duration	6 months	3	9.1
	1 year	3	9.1
	3 years	9	27.3
	6 years	6	18.2
	7 years	3	9.1
	Started in 2019	3	9.1
	13 years	3	9.1
	15 years	3	9.1
Monthly business income	IDR 500,000–1,000,000	18	54.5
	IDR 1,000,001–2,000,000	12	36.4
	> IDR 2,000,000	3	9.1

TABLE 2 summarizes business characteristics. based tools may be unrealistic unless accompanied by low-cost alternatives and clear evidence of value. **TABLE 2** summarizes business characteristics.

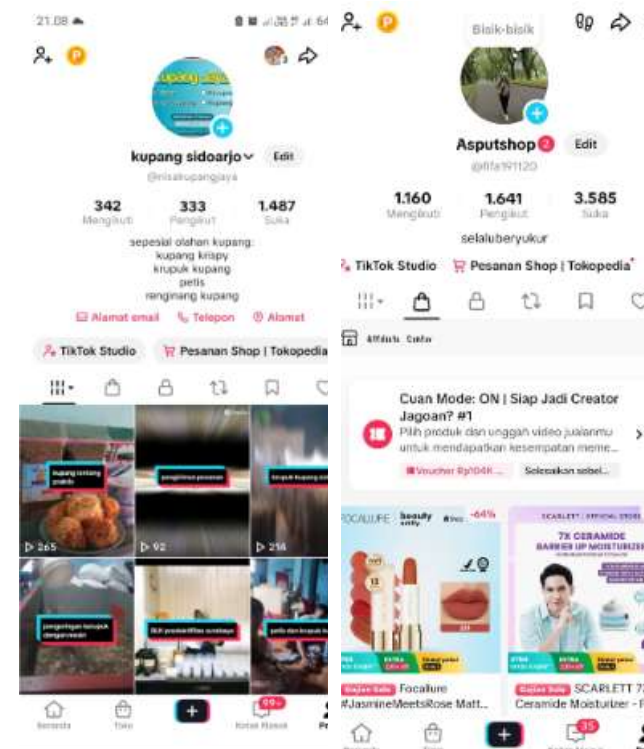


FIGURE 6. TikTok profile showcasing content, followers, engagement, and personal branding page

C. DIGITAL READINESS: ONLINE PRESENCE, PLATFORM FORMALIZATION, AND AFFILIATION

Fifteen participants (45.5%) reported operating an online business, whereas 18 (54.5%) did not. A smaller proportion 12 participants (36.4%) reported having any commercial account or platform presence. Specifically, six participants (18.2%) reported Shopee, three (9.1%) reported TikTok, and three (9.1%) reported a Shopee/Facebook affiliate-oriented account. The remaining 21 participants (63.6%) reported no commercial account. Only six participants (18.2%) reported affiliation or membership, while 27 (81.8%) reported none (**TABLE 3**).

Cross-classification clarified the relationship between informal online activity and platform adoption. Twelve participants (36.4%) simultaneously reported an online business and a commercial account. Three participants (9.1%) reported operating online without a commercial account, suggesting reliance on informal channels such as messaging or personal social media. Eighteen participants (54.5%) reported neither an online business nor a commercial account. No participant reported a commercial account while denying online-business activity. The observed sequence therefore shows progressive attrition from online presence (45.5%) to platform formalization (36.4%) and affiliation (18.2%).

TABLE 5.

Baseline Digital Readiness Indicators and Platform Formalization Status of MSMEs in Balongdowo (N = 33)

Indicator	Category	n	%
Online business	Yes	15	45.5
	No	18	54.5
Commercial account/platform	No commercial account	21	63.6
	Shopee	6	18.2
	TikTok	3	9.1
	Shopee/Facebook affiliate	3	9.1
Affiliation/membership	Yes	6	18.2
	No	27	81.8
Online business × account	Online + account	12	36.4
	Online + no account	3	9.1
	Not online + no account	18	54.5
	Not online + account	0	0.0

D. PROGRAM-TARGETING IMPLICATIONS OF THE READINESS CONTINUUM

The readiness distribution supports three differentiated assistance pathways. The foundational group participants with neither an online business nor a commercial account comprised 54.5% of the sample and required support with account creation, password management, digital safety, basic customer communication, and preparation of minimum product information. The transition group participants operating online without a commercial account represented 9.1% and required assistance in moving from informal selling toward a structured storefront, including product categorization, stock and price management, and order procedures. The platform-active group participants with both online activity and an account represented 36.4% and could receive more advanced assistance in content optimization, response time, conversion tracking, promotions, fulfillment, and customer retention. Across all groups, the low affiliation rate suggested a need for peer learning, local business networks, and mentor-supported follow-up.

These pathways were not tested as treatment arms. Rather, they were derived from the verified baseline pattern to prevent a one-size-fits-all implementation strategy. Their practical value lies in allocating facilitator time and learning tasks according to observable starting conditions. Future iterations can prospectively assign participants to readiness-based modules and assess whether such matching improves account activation, listing completion, transaction activity, and sustained use.



Figure 7. Delivery of Digital Marketing and Marketplace Materials

IV. DISCUSSION

A. PRINCIPAL FINDINGS

This study identified a substantial gap between basic online participation and deeper digital-business integration among MSME actors attending a community program in Balongdowo Village. Fewer than half reported operating online, slightly more than one-third had a commercial account or platform presence, and fewer than one-fifth reported affiliation or membership. The pattern was not simply a lack of internet exposure. Three participants sold

online without a commercial account, indicating that informal digital selling can precede marketplace formalization. The principal practical finding is therefore a readiness gradient rather than a binary divide between “digital” and “non-digital” enterprises.

The demographic and business profile adds context to this gradient. Most participants were women, food enterprises predominated, and more than 90% were in monthly income categories below IDR 2 million. These characteristics imply that recommended digital practices must be low-cost, mobile-friendly, and compatible with time-constrained owner-management. For food businesses, rapid product turnover, visual presentation, delivery radius, freshness, and customer response may be more immediately relevant than complex analytics. For service businesses, portfolio evidence, location, trust signals, and inquiry management may require different examples. Program content should therefore be segmented not only by digital readiness but also by business model.

A. INTERPRETING READINESS THROUGH TECHNOLOGY

The findings are consistent with the technology organization environment (TOE) framework, which explains organizational technology adoption through the interaction of technological characteristics, internal organizational conditions, and the external environment (Tornatzky & Fleischer, 1990). At the technology level, participants may perceive marketplaces as complex or difficult to maintain. At the organizational level, microenterprises often depend on one owner who simultaneously produces, sells, records transactions, and manages family responsibilities. At the environmental level, customer expectations, peer use, platform rules, logistics, and institutional support affect adoption. A community program can influence all three domains by simplifying procedures, building internal skills, and creating a supportive peer and mentoring environment.

The results also support an incremental view of SME digital transformation. Systematic reviews emphasize that successful transformation frequently begins with a realistic baseline, progresses through manageable stages, and requires continuous learning rather than a single technology handover (Loo et al., 2025; Sagala & Óri, 2024). The presence-platform-network continuum translates this principle into a field-friendly diagnostic. Online presence captures initial market-facing activity; platform formalization indicates a more structured commercial interface; and network embeddedness reflects access to peer, affiliate, or institutional relationships that may sustain learning and opportunity. The continuum should not be interpreted as strictly linear for every business, but it helps facilitators recognize where bottlenecks occur.

Previous Indonesian studies have linked e-commerce adoption to perceived benefits, owner readiness, technology resources, and external support (Rahayu & Day, 2015, 2017). The current descriptive data cannot test those relationships, yet the attrition between stages suggests several plausible barriers that future evaluation should

measure directly: perceived complexity, confidence, device and connectivity constraints, time availability, platform trust, transaction literacy, logistics, and expectations of financial return. Measuring these determinants would allow the program to move from descriptive targeting to explanatory evaluation.

B. WHY HANDS-ON, READINESS-MATCHED COMMUNITY ASSISTANCE MATTERS

The documented implementation sequence in Balongdowo registration and baseline assessment, practical seminar, marketplace demonstration, product-content practice, discussion, post-test administration, and planned follow-up mentoring provides an experiential structure in which abstract digital-marketing concepts are translated into immediate business tasks. For participants without accounts, the relevant experience is safe registration and completion of a basic profile. For platform users, it is the preparation of a complete listing, price and stock management, response to simulated orders, and review of simple engagement indicators. Matching tasks to readiness reduces the risk that beginners become overwhelmed while more experienced participants disengage from material they have already mastered.

The low level of affiliation is particularly important. Digital capability is often treated as an individual attribute, but sustained use can depend on access to people who answer questions, demonstrate new practices, and normalize experimentation. Peer mentors from the platform-active group could support account setup and troubleshooting for less-ready participants. Local business associations, village institutions, universities, and marketplace partners could coordinate periodic clinics rather than relying on a single training day. This network approach may be especially useful when platform interfaces and policies change faster than printed training materials.

A staged implementation model could use four operational milestones. The first milestone is account activation and digital safety. The second is completion of a minimum viable storefront with product photograph, title, description, price, stock, and contact information. The third is operational readiness, demonstrated through order simulation, customer response, payment understanding, and fulfillment planning. The fourth is growth readiness, including content testing, promotion, repeat-customer strategies, simple metrics, and affiliation. These milestones are observable and therefore more suitable for follow-up than attendance alone.

C. IMPLICATIONS FOR EVALUATION AND SUSTAINABILITY

The present analysis demonstrates why community-service reporting should distinguish program outputs from outcomes. Attendance, account creation, and completed product listings are immediate outputs. Knowledge, confidence, and usability are proximal outcomes. Sustained platform activity, transaction volume, customer acquisition, and income are longer-term outcomes. A future evaluation should collect participant-linked baseline and post-training

measures, verify account activation, and conduct follow-up at one, three, and six months. Where feasible, platform evidence such as active listings, response rate, or transaction records should complement self-report.

A stronger design could use a stepped-wedge or matched-comparison approach when withholding assistance is not ethically or operationally appropriate. Participants could receive readiness-matched modules in phases, allowing comparison of early and later implementation while ultimately providing assistance to all. Qualitative interviews would help explain why some participants activate accounts but do not maintain them. Cost documentation would also improve transferability by showing facilitator hours, equipment requirements, connectivity costs, and the intensity of mentoring required per readiness group.

For sustainability, responsibility should gradually shift from external facilitators to local actors. A train-the-mentor model could identify participants who already manage commercial accounts and support them to become peer facilitators. Standard operating guides should remain short, visual, and mobile-accessible. Program partners should also define an escalation pathway for problems involving account security, fraudulent messages, payment disputes, and platform policy. Such safeguards are necessary because encouraging digital participation without risk literacy may expose novice users to avoidable harm.

D. STRENGTHS AND LIMITATIONS

A strength of this study is that it reconstructs the analysis from the raw participant worksheet and transparently separates observed indicators from interpretive framing. It provides reproducible tables, visualizations, and a program-targeting logic that can be applied in future implementation. The analysis also avoids equating attendance with effectiveness and does not claim knowledge, sales, or income improvement without outcome data.

Several limitations require careful consideration. First, the sample was small, attendance-based, and drawn from one village, which limits generalizability. Second, variables were self-reported and were not independently verified against active storefronts or transaction records. Third, although the event rundown scheduled pre-test and post-test administration, participant-linked scores were not included in the analytical file; therefore, the effect of the seminar and workshop on knowledge could not be estimated[24]. Fourth, the dataset was cross-sectional and lacked longitudinal follow-up, so sustained platform activity, sales, customer acquisition, and income change could not be assessed. Fifth, the source worksheet contained repeated categorical response patterns across participant-code blocks and an inconsistent secondary age-cleaning sheet [25]. All unique codes were retained and ages were recalculated from raw entries, but the original registration forms or export process should be audited before final journal submission. Sixth, business duration was not consistently formatted, and one entry used a start year rather than elapsed duration. Finally, the three readiness indicators do not capture digital skills, intensity of use, content quality,

trust, logistics, financial literacy, or business performance. The proposed continuum should therefore be prospectively validated and expanded before being used as a formal assessment instrument.

V. CONCLUSION

The Balongdowo community-based assessment showed that digital readiness declined across three practical stages: 45.5% of participants reported operating an online business, 36.4% had a commercial account or platform presence, and 18.2% reported affiliation or membership. This gap indicates that exposure to online selling does not automatically translate into a structured marketplace presence or access to supportive business networks. The six-month partnership program should therefore sequence foundational account creation and digital safety, minimum storefront development, marketplace operations, product content and customer-management practice, and network-based growth. The presence-platform-network continuum offers a transparent basis for tailoring assistance, but it remains a descriptive planning heuristic. Future implementation should verify source data, retain participant-linked pre-post scores, document active platform use, and follow participants at one, three, and six months to determine whether readiness-matched mentoring improves sustained adoption and business performance.

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AUTHOR CONTRIBUTION

Triwiyanto Triwiyanto conceptualized the program, led the implementation team, and provided strategic oversight for the digital marketing and marketplace track. Sari Luthfiah contributed to the program design, methodological development, and critical revision of the manuscript. Bedjo Utomo managed the logistical coordination with village authorities and oversaw the hands-on demonstration sessions. Fairouz Azzahra Darmawan and Hafizh Ammar Wahyudi were responsible for field data collection, training facilitation, and technical support during the marketplace workshops. All authors have read and approved the final manuscript.

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