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Perceived Digital Proficiency and Women's Online Microenterprise in Central Java: An Exploratory Mixed-Methods Study

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Abstract

Women-owned microenterprises constitute a substantial share of MSME activity in Central Java, Indonesia, yet locally grounded evidence on women entrepreneurs' digital literacy and their online business experiences remain limited. This study examines perceived digital proficiency profiles, platform use patterns, and reported barriers and enabling factors among women engaged in digital microenterprise across five districts of Central Java. An explanatory sequential mixed-methods design was employed. A structured survey was administered to 112 women purposively sampled from cooperative and MSME networks. Semi-structured interviews were subsequently conducted with 18 respondents selected to further examine patterns identified in the survey data. Survey data were analyzed using descriptive statistics; interview data were analyzed using reflexive thematic analysis. Descriptive findings indicate moderate average perceived digital proficiency scores with pronounced variation across education and age groups. Patterns also indicate more diversified platform use among respondents with higher perceived digital proficiency scores. Four interview themes were identified: self-taught incremental skill acquisition; household time and permission constraints; peer-network enabling; and unmet demand for sustained skills support. These themes offer contextual interpretations of the survey patterns and are consistent with broader evidence from Indonesia and Southeast Asia. The study provides locally grounded contextual, policy-informing insights for regional development planning in Central Java, while reflecting patterns observed in a purposively selected sample of digitally active women entrepreneurs.

Keywords: perceived digital proficiency; women's microenterprise; online business; Central Java; digital literacy.

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INTRODUCTION

Indonesia's digital economy has grown substantially over the past decade. Internet adoption expanded by an estimated 45 million users during the COVID-19 pandemic, accelerating uptake of e-commerce and digital financial services (Miranti et al., 2022). The pandemic also intensified pre-existing digital inequalities, widening gaps between those with and without adequate digital skills (Beaunoyer et al., 2020). Micro, small, and medium enterprises (MSMEs) are central to this expansion: they contribute approximately 61% of national gross domestic product and employ a substantial share of the workforce (Hendratmi et al., 2022). Women own or lead an estimated 64% of Indonesian MSMEs; however, they face structural disadvantages in accessing digital skills, markets, and capital that limit their full participation in the digital economy (Setyaningrum et al., 2023), with evidence indicating that technical know-how and financial literacy are each positively associated with women's entrepreneurial development and empowerment (Andriamahery & Qamruzzaman, 2022; Susanti et al., 2023).

Digital literacy—broadly defined as the ability to access, evaluate, use, and communicate information through digital technologies—is increasingly recognised as a prerequisite for meaningful participation in digital markets (Tinmaz et al., 2022). A persistent gender divide in digital proficiency constrains Indonesian women's engagement with those markets. Drawing on nationally representative data, Lee et al. (2023) demonstrate that Indonesian women score lower than men on composite digital literacy measures, with the gap most pronounced among older cohorts and in non-metropolitan settings. This divide is not reducible to device access. It reflects compounding structural constraints: limited formal education, patriarchal household norms that restrict time and mobility, inadequate rural and peri-urban connectivity, and insufficient institutional support for skill development (Suwana & Lily, 2017).

Central Java is a particularly relevant regional context. The province hosts a large and established MSME sector, comprising an estimated 4.2 million enterprises that absorb over 1.3 million workers and contribute approximately 15% of regional gross domestic product (RRI.co.id, 2024), spanning batik production, food processing, craft manufacturing, and retail trade. Consistent with the national pattern in which women own or lead an estimated 64% of Indonesian MSMEs (Setyaningrum et al., 2023), a substantial share of this provincial MSME activity is carried out by women.

Over recent years, an increasing share of these businesses has shifted to digital commerce platforms including WhatsApp Business, Instagram, and Shopee. Much of the existing empirical evidence on women's digital literacy and online business participation in Indonesia addresses the national scale or other provinces (e.g., Pranitasari et al., 2026, in West Java) or focuses on metropolitan centres such as Jakarta (Zukari & Aryanto, 2025). Within Central Java specifically, available studies have evaluated short-term training interventions in single districts or firms, such as digital marketing training for women-led MSMEs in Klaten (Husna et al., 2025) and digital literacy training for female employees of a single enterprise in Wonosobo (Adiana et al., 2025), rather than offering exploratory, descriptive profiling of digital proficiency, platform use patterns, and participation barriers across multiple districts. Locally grounded evidence of this broader, multi-district kind remains limited.

This evidence gap has direct consequences for development planning. Although Central Java's provincial government has prioritised MSME digitalisation, the absence of localised evidence on women's digital skill profiles, barriers, and enabling factors means that resulting policies may not be well targeted to women's actual needs. This study addresses this gap through three research questions: (1) What are the perceived digital proficiency levels and platform use patterns of women in digital microenterprise in Central Java, as described by survey data? (2) What barriers and enabling factors do these women report in relation to their digital business participation? (3) How do the qualitative interview findings help interpret the descriptive patterns observed in the survey? This study provides exploratory, region-specific evidence on how digitally active women microentrepreneurs in Central Java describe and use digital skills, platforms, and support systems.

RESEARCH METHODOLOGY

Research Design

An explanatory sequential mixed-methods design was adopted (Creswell & Creswell, 2018). In this design, a quantitative phase is conducted first and a qualitative phase is subsequently designed to help

interpret patterns or questions that the quantitative data raise but cannot resolve. The quantitative phase was used first to identify descriptive patterns that required interpretation, and the qualitative phase was then designed to help interpret those patterns in greater depth. Integration occurred through sampling for the interview phase, interview guide construction, and side-by-side interpretation of the two datasets. Because the quantitative phase was descriptive rather than inferential, the study does not claim statistical association. Instead, it develops integrated interpretations by comparing survey patterns with participant accounts.

Participants and Sampling

Eligibility required participants to be adult women (aged 18 years or above) residing in Central Java and actively engaged in online business activity at the time of data collection. Active engagement was defined as selling goods or services through at least one digital platform, including social media, messaging applications, or e-commerce marketplaces. Participants had to do so at least once per month. Women operating exclusively offline were excluded.

Purposive sampling was used to ensure eligibility and to capture variation in district, age group, education level, and business sector (Creswell & Creswell, 2018). The study was conducted across five districts—Semarang, Surakarta, Magelang, Klaten, and Banyumas. These districts were selected to capture variation in urbanisation level and MSME activity across the province, ranging from major urban centres (Semarang, Surakarta) to peri-urban and semi-rural areas with established MSME and cooperative activity (Magelang, Klaten, Banyumas), and for the feasibility of recruitment through existing cooperative and MSME association networks in these locations. Recruitment was conducted through women's cooperative networks (Pemberdayaan Kesejahteraan Keluarga, PKK), district MSME associations affiliated with the Dinas Koperasi dan UKM, and digital business WhatsApp communities. Gatekeeper support was obtained from district cooperative officers, who circulated study information without selecting specific individuals. A total of 112 women completed the survey.

For the interview phase, 18 participants were purposively selected from among survey respondents who indicated willingness to be contacted for a follow-up interview. Selection prioritised variation across: perceived digital proficiency score tertile (lower, middle, upper); district of residence; and age group (18–30, 31–45, 46–60). This targeted selection was designed to examine three patterns identified in the survey data but not resolvable with the survey alone: (a) notably lower scores for content creation and information evaluation relative to communication and device use; (b) descriptively fewer platforms used by lower-literacy respondents; and (c) limited uptake of advanced platform features across the sample. Eighteen interviews were completed; by the final interviews, additional data mainly elaborated, rather than materially changed, the developing thematic patterns.

Survey Instrument and Measurement

The survey instrument covered four main domains—digital literacy, platform use, online business activity, and barriers to participation—together with selected economic participation indicators collected for contextual description. Perceived digital proficiency was operationalised as a 10-item self-report index, developed for exploratory descriptive purposes and grounded in the five competency domains synthesised by Tinmaz et al. (2022): device operation, internet navigation, online communication, information evaluation, and digital content creation. Two items were assigned to each domain. Item wording was guided by the literature and by the business tasks relevant to the present sample — specifically, the online microenterprise activities of women in Central Java. Each item was rated on a five-point Likert scale (1 = not at all capable; 5 = very capable), yielding a composite score ranging from 10 to 50.

The scale was piloted with a convenience sample of 15 women in digital business not included in the main study. Minor wording revisions were made following piloting to improve clarity and local comprehensibility in Bahasa Indonesia. Internal consistency in the main sample was acceptable (Cronbach's $\alpha = .81$). This coefficient indicates internal consistency only; it does not by itself establish construct validity. The instrument captures respondents' perceived proficiency rather than objectively tested performance and should not be interpreted as a standardised psychometric measure of digital literacy. Self-report scales are subject to social desirability bias and may not accurately reflect actual task performance. In this study, the term 'perceived digital proficiency' is used to refer specifically to this self-reported measure of business-related digital capability. The full set of scale items is presented in Appendix A.

Platform use was recorded via checklist capturing platform type, frequency, and primary business function. Online business activity items covered business sector, duration of online operation, estimated online revenue share of monthly household income, and number of platforms actively used. Additional survey items captured commonly reported barriers to participation and selected indicators of economic engagement for contextual description. In this paper, analysis focuses on platform use patterns and digital financial service use, which are directly integrated with the qualitative findings. The barrier checklist was used to inform the development of the interview protocol rather than as a primary analytical variable.

Interview Protocol

The semi-structured interview guide was structured around four inquiry areas derived from survey patterns identified for follow-up: (a) how participants developed digital skills, with specific probes on how content creation and other advanced skills were acquired or not acquired; (b) the constraints that limited skill development or platform use; (c) contextual factors that enabled participation; and (d) forms of support perceived as most needed but unavailable. Interviews were conducted in Bahasa Indonesia by a trained research assistant, lasted 35 to 65 minutes, and were audio-recorded with written consent. Recordings were transcribed verbatim and translated into English by a bilingual translator; translations were back-checked against the original recordings for accuracy. Participant codes are used throughout this paper. Coding and theme development were conducted on the English translations, with systematic checking against the original Bahasa Indonesia audio and transcripts.

Data Analysis

Survey data were analysed using descriptive statistics only: frequencies, means, standard deviations, and cross-tabulations. No inferential tests, correlation coefficients, regression models, or effect sizes were computed. The purposive sampling design and small sample size preclude statistical inference to the broader population. All quantitative language in this paper is explicitly descriptive; phrasing such as 'associated with' or 'related to' is avoided where it could imply inferential claims. Findings are presented as descriptive patterns within this sample.

Interview data were analysed using reflexive thematic analysis following Braun and Clarke (2006, 2019). The six phases were: repeated reading and familiarisation; initial coding across all transcripts; construction of candidate themes from code clusters; review of candidate themes against the full data set; definition and naming of final themes; and production of the thematic narrative. Coding was conducted inductively, without imposing a prior coding frame. A reflexive coding diary documented analytic decisions throughout. Verbatim quotations are included to illustrate themes and are attributed to anonymised participant codes.

Integration of the two data strands was conducted through a joint display and narrative comparison of the survey and interview findings. The survey results identified three descriptive patterns requiring follow-up interpretation: lower scores for information evaluation and content creation than for communication and device use; descriptively fewer platforms used by respondents in the lower literacy tertile; and limited uptake of advanced platform features despite reported business experience. The interview phase was designed to help interpret these patterns in greater depth. In the Results section, each qualitative theme is explicitly linked to the survey pattern it helps interpret. The purpose of this integration is not statistical corroboration but the development of integrated interpretations that connect descriptive survey patterns with contextual accounts from participant narratives.

This study involved minimal-risk social research with adult participants. It was conducted in accordance with institutional procedures applicable to the host institution and standard ethical practices for voluntary participation, informed consent, confidentiality, and data protection. Participation was voluntary, and written informed consent was obtained separately for the survey and interviews. Participants were informed of the study's purpose, their right to withdraw at any time, and the use of anonymised data for research purposes. Survey responses were anonymised at the point of data entry, and no directly identifying information was retained. Interview participants were assigned alphanumeric codes (P01–P18), and all identifying details were removed from transcripts prior to analysis. No financial incentives were offered. Gatekeeper organisations facilitated access only and did not receive any participant data. Data are stored on a password-protected institutional server accessible solely to the research team.

RESULTS AND DISCUSSION

Participant Profile

Table 1 summarises the profile of survey respondents. The 112 participants ranged in age from 19 to 58 years, with a mean of 34.6 years ($SD = 9.2$). Over half (52%) were aged 31–45. Education levels spanned primary schooling to undergraduate degree; the largest subgroup held senior secondary qualifications (47%). The most common business sectors were food and beverage (38%) and fashion including batik (24%). Median online business duration was three years; 46% had been operating for more than three years.

Table 1. Profile of Survey Participants (N = 112)

Characteristic / Category	n	Percentage
Age group		
18–30 years	38	33.9%
31–45 years	58	51.8%
46–60 years	16	14.3%
Highest education level		
Primary / Junior secondary	20	17.9%
Senior secondary	53	47.3%
Diploma / Undergraduate	39	34.8%
Business sector		
Food and beverage	43	38.4%
Fashion and batik	27	24.1%
Crafts and accessories	21	18.8%
Personal services / beauty	14	12.5%
Other	7	6.3%
Online business duration		
Less than 1 year	14	12.5%
1–3 years	46	41.1%
More than 3 years	52	46.4%

Note. Percentages may not total 100% due to rounding. Business duration refers to online operation specifically.

Perceived Digital Proficiency: Descriptive Patterns

Mean composite perceived digital proficiency score across all 112 respondents was 31.4 out of 50 ($SD = 7.8$), indicating moderate average self-reported proficiency. Scores were not normally distributed, with a negative skew and a cluster of respondents in the 35–45 range. Lower scores were concentrated among older and less formally educated participants.

Table 2 presents mean scores by education level and age group. Respondents with diploma or undergraduate qualifications returned a mean of 37.6 ($SD = 5.9$); those with senior secondary education returned 28.3 ($SD = 7.1$); and those with primary or junior secondary qualifications returned 22.1 ($SD = 6.4$). A similar descriptive gradient appeared across age groups: respondents aged 18–30 returned a mean of 35.1 ($SD = 6.3$), the 31–45 group returned 30.8 ($SD = 7.9$), and the 46–60 group returned 24.6 ($SD = 8.2$). These are descriptive patterns in a purposive sample and do not support inferential conclusions about the broader population.

Taken together, these gradients suggest that variation in perceived digital proficiency within this sample is structured along both educational and generational lines. The study design does not allow assessment of their relative contribution. Across the sample, the highest mean item scores were for device operation ($M = 4.2$ out of 5) and online communication ($M = 4.0$), whereas the lowest scores were for information evaluation ($M = 2.9$) and digital content creation ($M = 2.8$). This within-scale variation, with a gap of approximately 1.2–1.4 scale points between communication-oriented and higher-order digital competencies, motivated the qualitative phase. It identifies a differentiated skill profile within digitally active women microentrepreneurs that is not visible in aggregate literacy measures. This pattern aligns with the second-level digital divide documented in the broader literature, in which access and basic communication skills are more widely

distributed than higher-order competencies such as content production and critical evaluation of information (Tinmaz et al., 2022; Lee et al., 2023). Whether this gap reflects actual skill limitations, low confidence in reporting advanced skills, or limited exposure to contexts requiring them could not be determined from the survey alone.

Table 2. Mean Perceived Digital Proficiency Scores by Education Level and Age Group

Group	M (out of 50)	SD
Education level		
Primary / Junior secondary (n = 20)	22.1	6.4
Senior secondary (n = 53)	28.3	7.1
Diploma / Undergraduate (n = 39)	37.6	5.9
Age group		
18–30 years (n = 38)	35.1	6.3
31–45 years (n = 58)	30.8	7.9
46–60 years (n = 16)	24.6	8.2
Full sample (N = 112)	31.4	7.8

Note. Scores derive from a 10-item self-report scale (range 10–50; Cronbach's $\alpha = .81$ in this sample). All figures are descriptive; no inferential comparisons are made.

Platform Use and Online Business Activity: Descriptive Patterns

WhatsApp Business was used by 89% of respondents, followed by Instagram (74%) and Shopee (61%). A smaller share used TikTok Shop (28%), Tokopedia (22%), and Facebook Marketplace (19%). Respondents reported using an average of 2.3 platforms for business purposes ($SD = 1.1$). Respondents in the upper literacy score tertile reported a mean of 3.1 platforms; those in the lower tertile reported 1.9 platforms. This is a pattern within a purposive, non-random sample and carries no inferential weight. Within this sample, platform diversification appears to co-occur with higher self-reported capability, suggesting that skill breadth may shape how entrepreneurs distribute activity across platforms. This broadly resonates with evidence from the Indonesian context showing that digitally capable women entrepreneurs are more likely to operate across multiple sales channels (Miranti et al., 2022).

Across the full sample, 73% of respondents used their platforms primarily for product display and customer communication. Fewer than one-third reported using built-in advertising, analytics, or content promotion tools. This gap between platform adoption and uptake of advanced features persists despite a median business duration of three years. The survey could not explain this pattern and it helped motivate the interview phase.

Digital financial service use (GoPay, OVO, QRIS, or similar) was reported by 67% of respondents overall. Descriptive uptake was higher among respondents aged 18–30 (84%) and those with diploma or undergraduate qualifications (87%), and lower among those aged 46–60 (44%) and those with primary qualifications (35%). Because the sample is positively selected toward women who are already digitally active, these figures likely overstate actual uptake in the broader population of women entrepreneurs in Central Java.

Mixed-Methods Integration: Survey Patterns and the Rationale for the Interview Phase

Three descriptive patterns in the survey data raised interpretive questions that the quantitative data alone could not address. First, self-reported competency in content creation and information evaluation was notably lower than competency in communication and device use. It was unclear whether this reflected a genuine skill gap, a confidence gap, or limited exposure to contexts requiring these skills. Second, respondents in the lower literacy tertile used fewer platforms descriptively. It was unclear whether skill constraints, time constraints, preference, or some interaction of these factors drove the pattern. Third, fewer than one-third of respondents used advanced platform features despite a median business duration of three years. This suggested that time in business alone was insufficient to account for advanced skill development, but the reason was not apparent from the survey.

Table 3 shows how the qualitative themes were used to interpret the main descriptive patterns observed in the survey. The integration does not claim statistical association. It shows how participant accounts clarify differences in skill development, platform use, and the limited uptake of advanced features.

Table 3. Joint Display of Survey Patterns and Qualitative Interpretations

Survey pattern	Qualitative theme(s)	Integrated interpretation
Lower scores for content creation and information evaluation than for communication and device use	Theme 1: Self-Taught, Incremental Skill Acquisition; Theme 3: Enabling Peer-Learning Networks	Informal and peer-mediated learning more readily support visible, practical skills than higher-order evaluative or creative skills.
Lower literacy tertile used fewer platforms	Theme 2: Household Time and Permission Constraints; Theme 4: Unmet Demand for Sustained Skills Support	Platform breadth is constrained not only by skill but also by time, domestic authority, and lack of structured support.
Limited use of advanced platform features despite years in business	Theme 1: Self-Taught, Incremental Skill Acquisition; Theme 4: Unmet Demand for Sustained Skills Support	Business duration alone does not generate advanced digital capability when learning remains informal and unsupported.

The interview sample was selected across literacy tertiles, districts, and age groups specifically to address these three questions. The four themes that emerged from thematic analysis provide plausible interpretive accounts for each pattern. The integration narrative below explicitly marks points of convergence and elaboration between the two data strands.

Thematic Findings

Across all 18 interviews, the dominant account of digital skill development was informal and incremental. Participants described learning through independent exploration of platform features, observation of other sellers, and repeated practice. Structured or formal training was rarely described as the primary learning pathway. This pattern was present across perceived proficiency tertiles and age groups, though the specific skills participants described acquiring differed: lower-literacy participants emphasised learning to post, respond to customers, and receive payments; higher-literacy participants described progressing to promotional features, order management tools, and short-video content.

"I learned by trying. I made mistakes with my shop display at first — no one bought anything. Then I watched how other sellers arranged their photos and I copied that. Slowly I understood what worked." (P04, food seller, Klaten, age 29)

"Nobody taught me how to use Shopee properly. I just pressed things and figured it out. My daughter helped me set up the account but after that I managed alone." (P11, batik seller, Surakarta, age 44)

Integration with survey data: This theme offers a plausible interpretation of the gap between communication-oriented and higher-order skill scores in the survey. Social and observational learning appears well suited to skills that are visible and immediately useful, such as posting, messaging, and payment receipt. It is less well suited to skills requiring structured practice, such as evaluating supplier information or configuring advertising tools. The mode of skill acquisition appears to shape the distribution of digital competencies across domains. Informal and imitative learning pathways may contribute to uneven development. The survey pattern, in which content creation and information evaluation lagged behind communication and device use, is consistent with this account. This finding adds regional specificity to what Tinmaz et al. (2022) describe as the distinction between communicative digital skills and critical-creative digital skills, and is consistent with Hendratmi et al.'s (2022) account of informal skill acquisition among Indonesian women entrepreneurs. A similar pattern, where women's visibility does not translate into proportionate authority, has been observed in other domains of women's public participation in Indonesia, including heritage tourism promotion (Sabir et al., 2026).

Time constraints were the most uniformly reported structural barrier across all interviews, irrespective of age, education, or literacy level. Participants described managing domestic responsibilities — cooking, childcare, eldercare — alongside business operations, with deliberate skill development displaced consistently by competing demands. This pattern was particularly evident among respondents in the 31–45 age group, who were often managing domestic responsibilities alongside business activity.

"I want to learn more — how to use hashtags properly, how to make promotional videos. But by the time I finish cooking and the children are asleep, it is already ten o'clock. There is no time to sit and learn." (P07, food seller, Magelang, age 37)

A subset of participants also described needing to negotiate with spouses or in-laws before expanding digital business activities, particularly those involving financial transactions or public-facing content. This dimension appeared more frequently among participants in rural sub-districts and among the 31–45 and 46–60 age groups.

"My husband was nervous about me taking payments through my phone. He thought it was not safe, that someone could take the money. I had to explain it to him and show him the transaction records before he agreed." (P15, accessories seller, Banyumas, age 42)

Integration with survey data: This theme offers a plausible partial interpretation of the lower digital payment uptake observed descriptively among older and less-educated survey respondents. The barrier is not only technical. It is also relational and operates at the household level. The intersection of skill constraint and domestic authority over financial decisions is not captured by self-report literacy scales. The survey data alone could be read as a skills problem. The interviews suggest instead a trust-and-negotiation problem at the household level, where decisions about financial tools and platform use are negotiated rather than individually determined. This adds contextual specificity to Miranti et al.'s (2022) finding that household gender roles constrain women's digital labour participation by showing how this operates specifically in the context of digital financial tools in a regional MSME setting.

Peer networks were the most frequently described enabling resource across the interview sample. WhatsApp communities, PKK cooperative groups, and informal seller circles served as the primary spaces for knowledge exchange — platform tips, promotional strategies, supplier information, and customer complaint handling were all shared through these channels. Several participants described these networks as their main, and sometimes only, source of digital business learning.

"My friends in the WhatsApp group always share tips. If there is a new feature on Shopee, someone explains it. If a customer complains, we discuss how to handle it. I learn more there than anywhere else." (P03, craft seller, Semarang, age 31)

"The PKK group in my neighbourhood has a channel just for business tips. The coordinator shares short videos on how to take good product photos and reply to buyers quickly. It helps a lot." (P17, fashion seller, Surakarta, age 39)

Integration with survey data: This theme helps explain why communication and device use skills were the most widely developed in the survey sample. These appear to be the skills that circulate most easily through peer observation and informal exchange in messaging and social media environments. Peer networks appear to shape not only participation but also the kinds of skills that are most readily developed in this sample. This finding elaborates Setyaningrum et al. (2023) and Hendratmi et al. (2022) on the role of social capital in Indonesian women's entrepreneurship by showing how peer networks specifically shape digital skill content and limits. A parallel dynamic is observed by Luo and Chan (2021), who find that women digital entrepreneurs use peer-based online communities to compensate for constrained formal business networks — consistent with the enabling function of WhatsApp and PKK groups described by participants here. Welsh et al. (2021) further show that while network support shapes women's entrepreneurial outcomes broadly, technical and managerial skill stocks become increasingly decisive for business performance, implying that peer networks alone are insufficient for advancing capability.

Participants across literacy tertiles and age groups expressed consistent, specific demand for sustained, practical training in advanced digital skills. The gap they identified was not in basic platform use; most participants reported comfort in that domain. The unmet need was in digital advertising, promotional content production, analytics, and digital financial tools. Participants who had attended government or cooperative-

sponsored training events described them as useful in orientation but insufficient in depth and entirely absent in follow-up.

"The government gave us training — two days. It was helpful but then it finished and we had no one to ask questions. We needed someone to continue helping us, not just a single seminar." (P09, food seller, Klaten, age 46)

"I know using the advertising feature on Shopee would help my sales but I do not know where to start. I would go to a class if there was one nearby and I could bring my phone." (P13, batik seller, Magelang, age 33)

Integration with survey data: This theme converges with two survey observations. First, it explains why fewer than one-third of respondents used advanced platform features despite a median business duration of three years: the informal learning pathway that dominates skill acquisition in this sample did not appear to produce the deliberate, structured practice needed for higher-order digital skills. Time in business does not substitute for structured instruction. Second, it explains why lower-literacy respondents used descriptively fewer platforms. Their lower proficiency is not simply a reflection of less experience. It is also a consequence of having no sustained learning support that would enable progression beyond the skills circulating in peer networks. Hasan et al. (2023) and Meherali et al. (2021) both document the insufficiency of one-off digital literacy events. The present data locate this problem specifically in the regional MSME setting of Central Java and identify the advanced skills women in this context report needing most.

Provisional Policy Implications

The findings of this small, purposive study do not constitute a definitive evidence base for provincial policy. The findings identify specific mechanisms—informal learning pathways, household-level constraints, and limited sustained training—that shape how digital capability develops in this context. They are, however, compatible with patterns documented in the wider Indonesian and regional literature and point to several plausible directions for regional development policy in Central Java. These are offered as provisional implications rather than authoritative prescriptions.

First, the evidence suggests that digital skills and proficiency support for women entrepreneurs may benefit from focusing on advanced and applied skills rather than basic platform use. Survey data indicate that communication-oriented skills are relatively widespread in this population; the descriptive deficit is in content creation, digital marketing, analytics, and digital financial tools. Training content should be structured around the specific business tasks that women are trying to perform.

Second, the evidence suggests that existing cooperative and peer-network structures — PKK groups, MSME associations, WhatsApp communities — are the most accessible and contextually appropriate channels for skills support. They are already functioning as the primary learning environment for many women in this sample. Strengthening and extending these structures would reduce time, mobility, and childcare barriers. This may be more effective than creating parallel delivery systems. This approach is consistent with evidence that social and human capital assets within existing cooperative networks are among the most significant resources enabling Indonesian women entrepreneurs to develop and sustain viable business strategies (Hendratmi et al., 2024).

Third, the evidence suggests that one-off training events are insufficient regardless of content quality. What participants described needing—and what the survey skill gap pattern suggests—is ongoing, contextualised support with space for questions and practice. A sustained mentoring or community-of-practice model, embedded within existing cooperative networks, may be more effective than event-based provision. Evidence from comparable contexts supports this approach (Hasan et al., 2023; Meherali et al., 2021).

Fourth, the household trust dynamics described in interviews suggest that digital payment adoption cannot be addressed through skills training alone. Approaches that combine peer demonstration of financial security with guided practice may be more effective, delivered in trusted cooperative settings and involving household members where appropriate. Research consistently links digital financial literacy among women to greater uptake of formal financial services, stronger financial resilience, and improved capacity for investment and business growth (Hasan et al., 2023; Daud & Ahmad, 2023; Kass-Hanna et al., 2022).

This study has several limitations that should shape interpretation of the findings. First, the sample was purposively recruited through cooperative and MSME networks from women already engaged in online business activity across five districts in Central Java. As such, the results do not represent all women entrepreneurs in the province and cannot be generalised to digitally excluded women or to MSMEs more broadly. The network-based recruitment strategy may also have introduced selection bias toward more connected or active participants. Second, the digital literacy measure was a self-report index of perceived business-related digital capability rather than a task-based assessment of performance, making the scores susceptible to overestimation, underestimation, and social desirability bias. Third, the interview data were translated from Bahasa Indonesia into English for analysis, which may have introduced subtle shifts in meaning despite back-checking procedures. Fourth, the quantitative strand was descriptive only and did not permit inferential testing of relationships among literacy, platform use, age, or education. Finally, the cross-sectional design captures a single point in time and cannot account for how digital skills, platform use, or support needs evolve as businesses develop. Future research could address these limitations by including digitally excluded women, incorporating task-based assessments of digital capability, and adopting longitudinal designs.

CONCLUSION

This study used an explanatory sequential mixed-methods design to link descriptive survey patterns with qualitative interpretations from women engaged in digital microenterprise across five districts of Central Java. The survey showed uneven digital capability; the interviews helped account for why these patterns appeared in this sample. Average perceived digital proficiency was moderate. Basic communication and device use skills were widespread, but content creation and information evaluation were weaker. Respondents in the upper literacy tertile used more platforms, while fewer than one-third used advanced platform features despite a median business duration of three years. Digital financial service uptake was lower among older and less-educated respondents. The qualitative findings suggest that informal peer-mediated learning, household time demands and domestic authority constraints, and limited sustained training shape these patterns. Policy responses should focus on advanced applied skills, mentoring embedded in cooperative networks, and digital financial inclusion that addresses household trust dynamics. The study is limited by purposive sampling of digitally active women and by self-reported literacy measures. Future research should include digitally excluded women, use task-based assessment, and adopt longitudinal designs.

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APPENDIX A. DIGITAL PROFICIENCY SCALE ITEMS

The table below presents all 10 items of the digital proficiency self-report scale used in the survey. Items are grouped by the five competency domains of Tinmaz et al. (2022). Each item was rated on a five-point Likert scale (1 = not at all capable; 5 = very capable).

Item No.	Item text	Domain
1	I can operate my smartphone or digital device for business activities without assistance.	Device operation
2	I can install, update, and manage applications needed for my online business.	Device operation
3	I can search for information online to support my business (e.g., products, suppliers, or competitors).	Internet navigation
4	I can navigate different websites or applications to find relevant business information.	Internet navigation
5	I can communicate with customers effectively using messaging or social media platforms.	Online communication
6	I can respond to customer inquiries and manage orders through digital platforms.	Online communication
7	I can find and compare information about my business online using a search engine.	Information evaluation
8	I can judge whether online information (e.g., product offers, suppliers, or advice) is reliable for my business.	Information evaluation
9	I can create and post product images or short promotional videos for my business on social media.	Digital content creation
10	I can edit or improve digital content (e.g., photos, captions, or videos) to promote my products or services.	Digital content creation

Note. Items are ordered by domain. All items were rated on a five-point Likert scale (1 = not at all capable; 5 = very capable). Composite scores range from 10 to 50. Domain structure follows Tinmaz et al. (2022). The scale was developed for exploratory descriptive use; it is a self-report index of perceived proficiency and should not be interpreted as a standardised psychometric instrument.