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A gender-sensitive sustainable model of digital and financial inclusion for women-led MSMEs in Indonesia Q1

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This study aims to analyze the state of digitalization and financial inclusion among women-owned MSMEs in Indonesia and to formulate a relevant empowerment model to promote gender equality. The study employed a mixed methods approach, distributing questionnaires to 250 women MSME owners in West Java, complemented by in-depth interviews and focus group discussions (FGDs) with financial institutions, local governments, and women's entrepreneur associations. The results indicate a gap between awareness and practice of digitalization and access to financial inclusion. Although women MSME owners have a high level of awareness of the benefits of digital technology and formal financial services, their implementation remains limited due to limited practical skills, time, mentoring, and structural barriers related to business legality and asset ownership. These findings indicate that digital and financial literacy alone are insufficient to drive changes in business behavior without the support of an inclusive and gender-sensitive ecosystem. Based on these findings, this study formulates a Model for Empowering Women MSMEs Based on Digitalization and Financial Inclusion, consisting of four stages: strengthening literacy as a foundation, providing practical training and mentoring, expanding business networks and collaboration, and enhancing social and economic impact. This model provides a conceptual contribution by emphasizing the importance of a phased and socially context-based approach in promoting digital and financial inclusion for women-owned MSMEs. Q7 Q8

KEYWORDS
digitalization, empowerment, financial inclusion, gender equality, women's MSMEs Q9

1 Introduction Q10

MSMEs play a strategic role as the main driver of the people's economy in Indonesia (Baderi, 2025). This sector not only serves as the backbone of job creation but also makes Q11 a significant contribution to improving public welfare. The Indonesian government has demonstrated a strong commitment to encouraging MSME growth through various strategic policies and programs aimed at increasing competitiveness, expanding access to financing, and accelerating the digitalization process in various sectors (Falguni, 2025).

Research conducted by the Institute for Development of Economics and Finance (INDEF) on conventional MSMEs that then switched to utilizing digitalization in their businesses, experienced an average annual turnover increase of up to 50% and could increase the number of employees by an average of two people (INDEF, 2024). Approximately 58% of MSMEs in Indonesia have not yet utilized digital technology

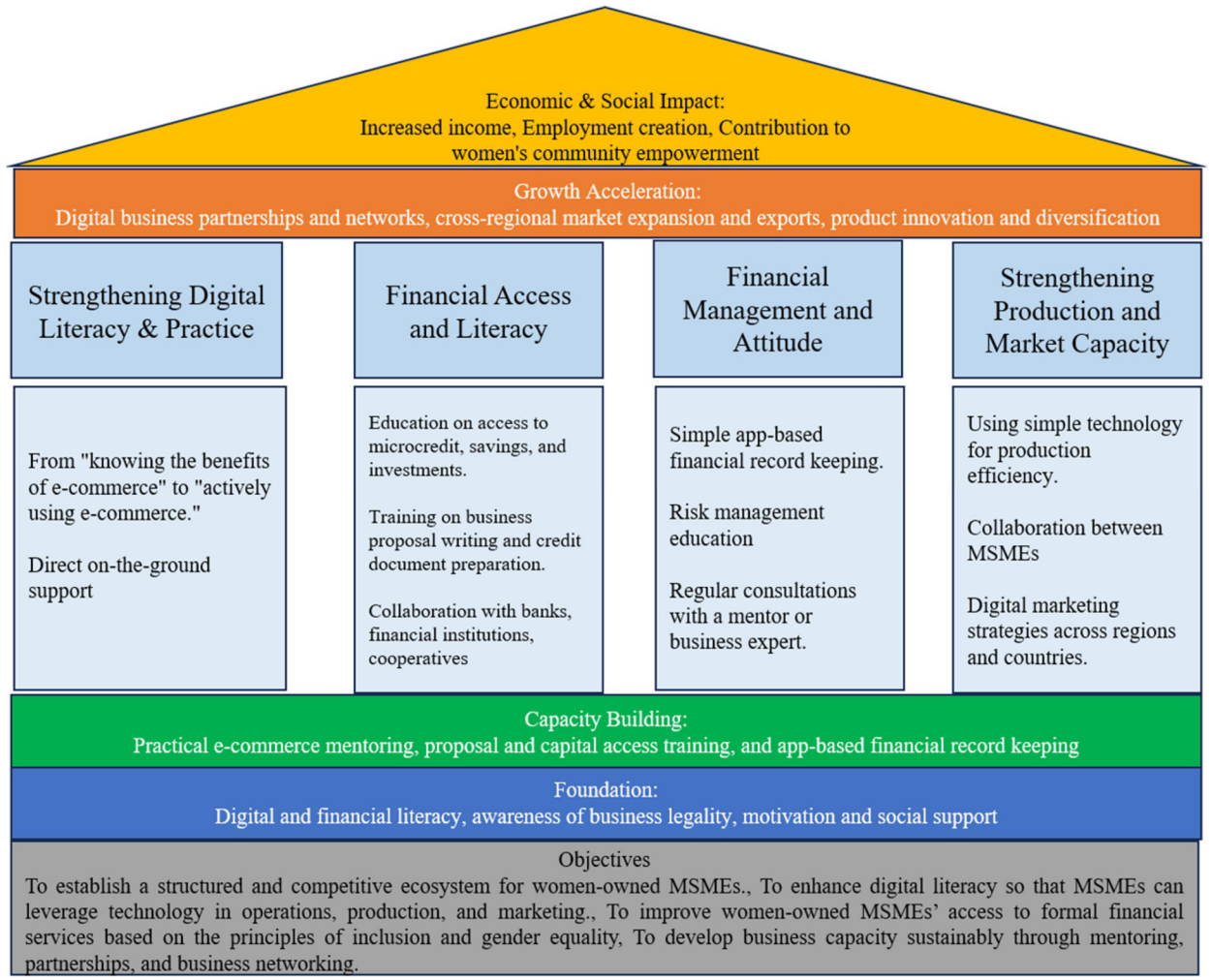


FIGURE 1
Model of Empowerment of Women's MSMEs.

(Kementrian Pendayagunaan Aparatur Negara dan Reformasi Birokrasi, 2024). The government targets the acceleration of MSME digitalization and increase the competitiveness of business actors in the digital era (Anwar, 2024). However, efforts to achieve this still face various challenges in the field, so the adoption of digital technology is not carried out evenly and sustainably.

The development of MSME digitalization has accelerated following the pandemic and the transformation of the global digital economy. Recent reports indicate that global economic growth and digital transformation continue to drive changes in business structures and financial access (OECD, 2026; World Bank, 2026). In this context, various studies confirm that digital integration and financial inclusion are key factors in sustainably enhancing MSME competitiveness (OECD, 2024; World Bank, 2024).

Financial inclusion for MSMEs is crucial for further business development, increased productivity, and survival amidst increasingly fierce market competition. Approximately 68% of MSMEs in Indonesia still face limitations in accessing formal financing, due to factors such as lack of collateral, low financial literacy, and limited digital infrastructure (Saputra, 2024). This indicates that financial inclusion policies have not been able to reach all MSMEs, particularly micro-enterprises and those managed by women.

The number of female MSME owners in Indonesia is increasing, currently accounting for 64.5% of MSMEs (Maharani, 2024; Fauzan, 2024; Zuhdi, 2024). A survey conducted by the Boston Consulting Group revealed that female MSME owners face various challenges, including limited capital, social constraints, and limited business knowledge (Tobing et al., 2024). UN Women reports that one in three women globally are micro-entrepreneurs, yet women earn lower average profits than men. This is due to the gap in access to equal financing, training, and business networks, in addition to the traditional roles that are still attached to women, which often limit the time and energy needed to develop a business (Maharani, 2024; Azcona et al., 2023).

Women play a dominant role in the MSME sector in Indonesia (Fauzan, 2024; Zuhdi, 2024). Empowering women's MSMEs is becoming increasingly important, especially in this era of growing digitalization and financial inclusion (Pranitasari et al., 2025, 2026). Digitalization can open new opportunities for women MSMEs to expand their markets, improve business

efficiency, and accelerate business growth. Financial inclusion allows women entrepreneurs to gain access to formal financial services that can help them develop their businesses more sustainably. However, structural and social barriers remain, preventing women MSMEs from optimally benefiting from digitalization and financial inclusion.

The research questions in this study are: 1) what are the conditions and challenges faced by women MSMEs in utilizing digital technology in their business operations? 2) what are the conditions and challenges faced by women MSMEs in accessing formal financing and digital financial services? 3) what is the empowerment model for women MSMEs based on digitalization and financial inclusion to enable them to be more independent, competitive, and contribute to economic development, thereby increasing gender equality in the business world.

The problem-solving approach in this research is: 1) analyzing the situation and challenges faced by female MSMEs, 2) examining the conditions and challenges faced by female MSMEs in accessing formal financing, and 3) formulating an empowerment model based on digitalization and financial inclusion to strengthen gender equality in the business world.

Several previous researchers have conducted research on the digitalization and financial inclusion of MSMEs (Alom et al., 2025; Asmara et al., 2025; Ayem et al., 2024; Heliani and Novitasari, 2023; Octavina and Rita, 2021; Richard et al., 2024; Satyadewi et al., 2023; Setyorini et al., 2016; Soekarno et al., 2020), most of these studies still discuss the linear relationship between increasing digital and financial literacy with empowerment and financial performance. This approach fails to examine the social and gender contexts that influence the ability of women-owned MSMEs to adopt technology and utilize formal financial services. Consequently, increased awareness and knowledge are not matched by tangible changes in business practices.

Several studies indicate that the number of women-owned MSMEs is quite high, but their profitability and business growth tend to be lower than those of men-owned MSMEs (Nainggolan, 2016; Supriatna et al., 2023; Tobing et al., 2024; Wiryaningtyas et al., 2022). Digitalization and financial inclusion are increasing in the business world, but women MSMEs still experience access disparities (Tobing et al., 2024). This indicates a mismatch between policy approaches and empowerment programs and the real needs of women MSMEs, who face limited asset ownership, the burden of dual roles, and unequal access to information.

The above discussion clearly demonstrates a research gap: the limited number of empirical studies specifically examining how digitalization and financial inclusion are implemented by women MSMEs and the social and structural factors that influence them. Research that formulates a model for empowering women's MSMEs based on digitalization and financial inclusion is still very limited in Indonesia.

Based on this gap, this study aims to analyze the conditions and challenges faced by women's MSMEs in utilizing digital technology and accessing formal financial services, and to formulate a model for empowering women's MSMEs based on digitalization and financial inclusion. This research is expected to provide theoretical contributions by enriching the literature on empowering women's MSMEs, methodological contributions using a mixed methods approach, and practical contributions to the formulation of more inclusive and sustainable empowerment policies and programs.

2 Literatur review

Extensive research has been conducted on digitalization in MSMEs, particularly on e-commerce, social media, and financial applications. Several studies have shown that digitalization can improve operational efficiency, expand markets, and drive MSME turnover growth. Among them Barragan and Becker (2025) found that SMEs that implement digitalization in their businesses experience higher productivity and turnover. da Silva et al. (2025) also concluded that the level of digitalization maturity of MSMEs is consistent with increased labor productivity and export performance. This suggests that digitalization is a factor that can improve production and market efficiency. Higón and Bonvin (2024) explained that SMEs that implement digitalization have a greater opportunity to penetrate foreign markets. Sagala and Őri (2024) summarized the key factors for successful digitalization of SMEs, namely the use of digital technology in operations, the adoption of digital systems in management, and training/mentoring.

Several studies have identified barriers to the digitalization process for MSMEs, particularly those managed by women. Kumar et al. (2024) explain that the main barriers are a lack of technological proficiency, inadequate infrastructure, costs, and resistance to change. Yuwono et al. (2024) dd that inadequate ICT knowledge and a reluctance to change are key barriers for MSMEs adopting technology. Alam et al. (2022) describe a more significant barrier as gender norms, and McDonagh et al. (2024) conclude that this is due to a lack of access to resources and social expectations.

Financial inclusion demonstrates that access to formal financial services is closely linked to business sustainability. MSMEs managed by women tend to face credit constraints such as stringent collateral requirements, high transaction costs, and the risk of loan rejection (Seema and Shehzad, 2021). Research Q12 by Setiawan et al. (2024) found that low digital financial literacy, trust in fintech, and inadequate bookkeeping are factors that reduce women's opportunities to access formal capital (Kara and Li, 2025). Research conducted by Asah and Hove-Sibanda (2025); Harini et al. (2023); Pranitasari et al. (2022, 2024, 2026); Sherwani et al. (2024) also concluded that a lack of information and institutional bias hinder women's informal businesses from using formal financial services.

This research is based on several key theoretical foundations. First, the Resource-Based View (RBV) explains that the competitive advantage of MSMEs is determined by internal capabilities such as digital literacy, competence, and financial management (Barney, 1991). Second, the Technology Acceptance Model (TAM) is used to understand how female MSMEs accept and use digital technology based on perceived usefulness and ease of use (Davis, 1989). Third, Financial Inclusion Theory emphasizes the importance of access to formal financial services in improving business well-being and sustainability (Demirgüç-Kunt et al., 2018; Ozili, 2021). Fourth,

Gender and Development Theory explains that women face structural and social barriers that affect access to economic resources and business opportunities (Kabeer, 1999; Moser, 1993). By integrating these four theories, this research develops a model for empowering women's MSMEs that is not only based on individual capacity but also considers structural and social factors.

Although various studies have addressed digitalization and financial inclusion separately, there are still limitations in integrating these two aspects in the context of women-owned MSMEs. Furthermore, most research focuses on the linear relationship between literacy and performance, without considering social and gender factors. Therefore, this study fills this gap by developing a holistic, contextual, and stage-based empowerment model.

3 Methods

This study employed a convergent parallel mixed methods design, in which quantitative and qualitative data were collected simultaneously, analyzed separately, and then combined to gain a more comprehensive understanding (Creswell and Clark, 2017). This design was chosen based on the need to simultaneously understand the general patterns of quantitative data and the experiences, perceptions, and social context of women's MSMEs, which cannot be fully understood using a quantitative approach alone. Therefore, the study is expected to provide a more comprehensive picture of the conditions of women's MSMEs and the development of an appropriate empowerment model.

The study population was approximately 1,500 women's MSMEs assisted by the Indonesian Association of Entrepreneurial Professionals (APPWI). The sample size was determined by considering a table (Krejcie and Morgan, 1970) that recommends 250 respondents as an adequate number for a population of more than 1,000. Selection was conducted using purposive sampling, with the criteria being active women's MSMEs, having operated more than one business, and having participated in mentoring programs. This was to ensure representativeness of APPWI's women's MSMEs for the research objectives.

The research data consisted of 1) Primary data, obtained through a) questionnaires to measure digital literacy, financial inclusion, MSME performance, and empowerment indicators; b) in-depth interviews with 20 selected female MSME owners to explore their experiences, challenges, and adaptation strategies in running their businesses; c) Focus Group Discussions (FGDs) with representatives of banks, local governments, MSME facilitators, and policymakers to obtain information on programs and implementation for MSME empowerment. 2) Secondary data, obtained from government reports, international institutions, and academic literature related to MSMEs, gender, digitalization, and financial inclusion.

The research instruments in this study were developed based on validated measurement scales used in previous research. Digital literacy was measured using concepts developed by Ng (2012) serta Deursen and Dijk (2014). Financial literacy was measured using the frameworks of the OECD (2020) and Lusardi and Mitchell (2014). Financial behavior was measured using indicators developed by Xiao and Dew (2011), while financial attitudes were measured using the Theory of Planned Behavior by Ajzen (1991). Financial inclusion was measured using indicators developed by Demirgüç-Kunt et al. (2018), and MSME performance was measured using a subjective approach as proposed by Dess and Robinson (1984). All items in this study were measured using a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree).

Quantitative data were analyzed using SPSS software. The results of the analysis were used to provide an overview of the level of readiness and empowerment of women-owned MSMEs in facing digital transformation. Qualitative data from interviews and FGDs were analyzed using a thematic approach through grouping themes and extracting meaning, to identify issues, challenges, and practices by women's MSMEs. Furthermore, the results of the quantitative and qualitative analysis were integrated at the interpretation stage through a process of comparison and complementarity to gain understanding. Based on the results of this integration, this study formulated a model for empowering women's MSMEs based on digitalization and financial inclusion that was empirically developed according to field findings and the needs of women's MSMEs and institutional support. It is hoped that the resulting model will be applicable and relevant to be able to promote gender equality and strengthen women's MSMEs.

4 Results and discussion

4.1 Respondent characteristics

The characteristics of women-led MSMEs in this study were diverse in terms of age, education, marital status, household role, type of business, and operational conditions (Table 1).

A majority of respondents were in the productive age group of 30–49 years (52.8%), with women aged 40–49 years being the most represented (30.0%), followed by those aged 50 and above (26.4%). This finding highlights that women-led MSMEs are not only driven by younger generations but also by more mature women who remain active contributors to household and community economies. Consequently, empowerment models based on digitalization and financial inclusion need to consider age-specific approaches: younger women tend to be more adaptive to technology, while older women often require gradual, user-friendly learning methods supported by continuous mentoring, as emphasized in prior studies (Beneito-Montagut et al., 2022; Kang et al., 2023; Molina-López et al., 2021; Olsson and Bernhard, 2021).

In terms of education, most respondents had attained Diploma/Bachelor's degrees (46.8%) or senior high school/vocational qualifications (36.0%), indicating that 82.8% of women entrepreneurs possess adequate formal education. This suggests a strong capacity to absorb digital and financial literacy. However, differentiated strategies are needed: highly educated groups are more ready for innovation, digital marketing strategies, and business expansion, while women with lower education levels require practical mentoring and basic training

Q28 TABLE 1 Respondent characteristics.

Variable	Category	Percent
Age	<30 years	20.8%
	30–39 years	22.8%
	40–49 years	30.0%
	≥50 years	26.4%
Education	<High School	17.2%
	High School/Vocational	36.0%
	Diploma/Bachelor's	46.8%
Marital status	Single	18.0%
	Married	72.0%
	Widowed	10.0%
Household role	Head of Household	43.2%
	Non-head of Household	56.8%
Dependents	With dependents	82.8%
	No dependents	17.2%
Years in business	<5 years	50.4%
	5–10 years	32.8%
	11–20 years	10.8%
	>20 years	6.0%
Monthly gross revenue	<IDR 25,000,000	76.0%
	IDR 25,000,000–200,000,000	17.2%
	>IDR 200,000,000	6.8%
Business license	Licensed	61.2%
	Unlicensed	38.8%
Source of capital	Personal savings	48.4%
	Cooperative/bank loans	35.2%
	Family/friends	8.0%
	Government support	5.6%
	Others	2.8%
Number of workers	None	32.0%
	1–4 workers	52.4%
	5–19 workers	8.8%
	20–99 workers	6.8%

to effectively adopt technology and manage finances (Marlina et al., 2025; Savitri et al., 2024; Tojir et al., 2025).

The majority of respondents were married (72.0%), reflecting their dual roles as wives, mothers, and entrepreneurs, with household welfare being a primary motivation. Interestingly, 18.0% of respondents were single, which reflects a shift in mindset where entrepreneurship is increasingly seen as a viable and independent career path for women. This finding is critical for designing empowerment initiatives that support married women in balancing domestic and productive roles, while also encouraging young women to pursue entrepreneurship as a path to independence.

A significant proportion of respondents were heads of household (43.2%), indicating that many women bear the dual responsibility of being primary breadwinners and family caregivers. Moreover, 82.8% had dependents, underlining that women-led MSMEs are often strongly motivated by household financial needs. These results affirm that empowerment through digitalization and financial inclusion should focus on enhancing business efficiency, thereby enabling women to balance multiple roles while reinforcing household and community economic resilience (Purba et al., 2025; Riandika and Mulyani, 2025; Supriyanto and Mufrihah, 2019).

In terms of business type, most women entrepreneurs operated in the food and beverage sector (54.8%), given its relatively low capital requirements, stable demand, and fast turnover (Easybiz, 2023). The second-largest sector was services (20.8%), which leveraged skills such as salon and laundry services, followed by crafts, online businesses, and creative ventures (8.8%). Retail (8.4%) and fashion (7.2%) were less represented. These findings demonstrate that women entrepreneurs are not confined to traditional sectors, but are increasingly engaging in innovation and leveraging digital opportunities to expand market reach.

Regarding business longevity, 50.4% of enterprises had been operating for less than five years, reflecting a growing interest in entrepreneurship in recent years. Meanwhile, 32.8% had been established for 5–10 years, demonstrating medium-term resilience. Overall, 83.2% of businesses were still in the early stages (< 10 years), emphasizing the need for intensive mentoring to ensure sustainability through better capital management, market expansion, and competitiveness. Prior research highlights that digitalization, financial inclusion, and literacy are critical for enterprise growth and resilience (Destiari, 2024; Dzulkepli, 2021; Muhammad et al., 2021a, 2021b; Murwenie et al., 2025; Sharif et al., 2023).

In terms of financial performance, most women-led MSMEs generated monthly gross revenues below IDR 25 million (76.0%), underscoring their classification as micro- and small-scale enterprises with a strong household orientation. Meanwhile, 17.2% were in the medium segment, and 6.8% achieved revenues above IDR 200 million, serving as evidence that women entrepreneurs can scale successfully through innovation, networking, and digital adoption. These findings reaffirm the importance of empowerment programs that expand market access, facilitate access to capital, and drive sustainable income growth for household and community welfare.

Regarding legality, 61.2% of respondents already possessed business licenses, indicating growing awareness of the benefits of legality for legal protection, financing access, and market expansion. This finding echoes prior evidence that procedural complexity and information gaps discourage formalization among women entrepreneurs (Ramani et al., 2016; Saha et al., 2023), despite the well-documented benefits of registration for finance and market access (World Bank; IFC). However, 38.8% remained unlicensed due to limited information, perceptions of bureaucratic complexity, or the assumption that their businesses were too small. This highlights the need for simplified licensing processes and capacity-building initiatives to encourage greater compliance and improve competitiveness (Herlambang and Rahman Hakim, 2023; Ulya and Sukmana, 2021).

In terms of financing, nearly half of women-led MSMEs (48.4%) relied on personal savings, reflecting independence but limiting growth opportunities. Meanwhile, 35.2% accessed

cooperative or bank loans, and only 5.6% benefited from government support. This underscores the necessity of enhancing financial literacy, expanding access to formal financing, and leveraging government-backed funding programs through digital and inclusive financial mechanisms (Mardhiyaturrositaningsih and Hakim, 2023; Syahnur et al., 2024).

Finally, the majority of businesses (52.4%) employed 1–4 workers, while 32.0% operated without employees, indicating that 84.4% remained at the micro or individual level. This limited capacity highlights their heavy reliance on owners and family labor, reinforcing the urgency of capacity-building, digitalization, and financing access to support transitions toward small- and medium-scale enterprises.

In summary, women-led MSMEs in this study were generally micro-scale, predominantly financed by personal savings, and strongly motivated by household needs. However, their relatively high educational attainment, growing legal compliance, and sectoral diversification indicate strong potential for growth if supported by targeted empowerment strategies in digitalization and financial inclusion.

4.2 Descriptive analysis

A questionnaire was distributed to woman's MSMEs regarding their opinions on data access and literacy, financial knowledge, financial behavior, financial attitudes, financial support, motivation, competence, and self-development.

Data access and literacy are crucial for woman's MSMEs in utilizing digital technology, encompassing device skills, understanding the benefits of e-commerce, and the use of mobile applications for business efficiency (Diskominfo, 2022; Saptantinah et al., 2025; Utomo and Setiyono, 2024). Financial knowledge plays a role in accessing formal services, managing capital, understanding loan interest rates, and the impact of inflation. Financial behavior relates to cash flow management, record-keeping, and financing decisions (Joshua and Nuryasman, 2021; Meida and Kartini, 2023). Financial attitudes reflect an entrepreneurial mindset, including confidence in the business's future, planning, and risk-taking (Joshua and Nuryasman, 2021). Financial support, whether from formal institutions, family, community, or government, is a key external factor for the growth of women-owned MSMEs. Furthermore, motivation, competence, and self-development, particularly mastery of technology and market opportunities, foster sustainable competitiveness. Digital marketing strategies through social media and e-commerce provide more equal competitive opportunities with cost-effectiveness, while financial performance serves as the primary measure of business success, as evidenced by increased sales, profits, and capital reserves.

A summary of the distribution of respondents' responses to these eight variables is presented in Table 2.

Overall, the woman's MSME owners in this study demonstrated high motivation, positive attitudes, and strong social support. Their digital and financial literacy levels are quite good, but three main challenges remain:

1. Suboptimal utilization of technology.
2. Inconsistent financial recording and management.
3. Limited access to formal capital.

TABLE 2 A summary of the distribution of respondents' responses.

No	Variable	Findings
1	Data Access and Literacy	Respondents understand the benefits of technology, but its use in daily operations is not yet optimal
2	Financial Knowledge	Respondents have a good understanding of digital financial transactions and macroeconomic issues affecting businesses, but access to formal financial products remains limited.
3	Financial behavior	Respondents are open to professional input, but financial record-keeping is not yet consistent
4	Financial attitude	Respondents have a clear vision and future orientation, but they are cautious about risks.
5	Financial support	The social environment plays a significant role in supporting businesses, but access to formal capital remains a major obstacle
6	Motivation, competence, and self-development	High motivation but difficulty expanding market reach.
7	Digital marketing	They believe e-commerce platforms can increase sales, but implementation of platform use is still lacking
8	Financial performance	Increased market reach but not an increase in the number of employees.

The potential for development is enormous if the empowerment model implemented integrates digitalization, financial inclusion, and managerial capacity building. With this approach, woman's MSME owners can not only increase their turnover but also expand their market share, manage their finances professionally, and create new jobs.

4.3 Analysis of interview and FGD results

In Indonesia, MSMEs play a strategic role in the economy, contributing more than 60% of GDP and absorbing 97% of the workforce. However, the level of digitalization among MSMEs remains low, particularly among women. There are 65 million MSMEs, but only around 26.5% have adopted digitalization. The majority lack basic computer, internet, or online marketing skills. Low digital literacy is a major obstacle limiting the competitiveness of women-owned MSMEs in the digital era (Kumar et al., 2024; Murwenie et al., 2025).

The Indonesian government has launched various programs to encourage MSME empowerment, such as the People's Business Credit, the National Strategy for Women's Inclusive Finance, and financial and digital literacy training in collaboration with the Ministry of State-Owned Enterprises and the private sector (BRI, 2024; Limanseto, 2021; Purwowidhu, 2022). The Mekaar BRI and Jakpreneur programs in Jakarta serve as examples of collaboration between financial institutions

and local governments in providing coaching, capital, and access to digital marketing (Kearney, 2025; Syukur, 2025). However, the program's effectiveness remains limited because it has not reached all MSMEs, particularly those in remote areas and micro-enterprises.

Interviews indicate that most women are unable to access formal financing to increase their business capital. The main reasons are limited business legality, low financial literacy, and the fact that assets are generally held in the man's name, thus lacking collateral. As explained by several respondents:

> "I can't borrow from a bank; I have to have a house certificate or vehicle registration as collateral; everything is in my husband's name" (interview with female MSME, clothing sector, business 9-years).

Furthermore, persistent negative perceptions of bank loans and the complexity of administrative procedures lead most female MSMEs to prefer personal capital or family loans. Several respondents explained:

> "I don't dare borrow from the bank, I'm afraid of making a mistake, because the requirements are too complicated. I'd rather borrow from family" (interview with female MSME, food sector, business 5-years).

Furthermore, several respondents stated:

> "There's interest on borrowing from the bank, and I don't want to because it violates religious rules" (interview with female MSME, food sector, business10-years).

The majority of female MSMEs operate on the micro and ultra-micro scale, with small capital needs, so they haven't prioritized access to formal financing. This situation suggests that empowerment policies need to be tailored to the characteristics of this group. In addition to structural barriers, time factors and women's dual roles as housewives also influence their involvement in training or mentoring programs.

Gaps in information and access to empowerment programs were also identified. Female MSMEs who are members of communities or associations have easier access to information and mentoring, while those who are not members tend to be left behind. The lack of outreach that reaches all MSMEs and limited digital access means that most women's MSMEs are unaware of programs like Jakpreneur or the training they offer.

Therefore, to improve the effectiveness of empowerment programs, a more inclusive and community-based strategy is needed. Local governments need to strengthen the role of sub-districts and districts as spearheads of MSME outreach and development, by involving Family Welfare Movement (PKK) cadres, MSME activists, and local communities. Furthermore, training activities should be more flexible, with schedules that accommodate the time of women entrepreneurs and utilize easily accessible digital channels. Cross-sector collaboration between the government, banking, the private sector, universities, and communities is key to creating a sustainable, inclusive, and adaptable MSME empowerment ecosystem for women.

4.4 Findings and discussion

The integration of quantitative and qualitative results demonstrates consistency between descriptive findings and respondents' empirical experiences. Quantitative data demonstrates a relatively good level of literacy, while qualitative data highlights the existence of structural and social barriers that hinder implementation. This underscores the importance of a mixed methods approach in providing a more comprehensive understanding. From the analysis of quantitative and qualitative data, this study found:

1. Barriers to financial literacy, time, and low digitalization practices.

The questionnaire findings indicate that female MSMEs in Indonesia have high entrepreneurial motivation, a relatively good level of education, and awareness of the benefits of digitalization and formal financial services. However, this awareness has not yet been put into practice in operating their businesses. This demonstrates a gap between knowledge and actual implementation.

In terms of financial inclusion, the questionnaire results showed that female MSMEs are aware of formal financing, but interviews revealed that this understanding is not matched by the practical skills and courage to access formal financing and manage business bookkeeping. One respondent stated:

> "I know about bank financing, but I'm afraid of making a mistake, afraid of making a loss. I'd rather borrow from family." (Interview with female MSME, food sector, business 5-years).

Another respondent revealed structural barriers:

> "Bank financing requires collateral such as a vehicle title or registration, which I don't have because the title or registration is in my husband's name." (Interview with female MSMEs, food sector, business 3-year).

This finding indicates limited access to formal financing for female MSMEs. This reinforces the concept of gender-based financial exclusion, where women's limited access to formal financing is caused not only by low financial literacy, but also by asset ownership structures and institutional practices (Demirgüç-Kunt et al., 2025; Gupta, 2025). This reinforces the importance of improving financial literacy along with reforms to women-friendly access and financing schemes.

In terms of time constraints, the majority of women are housewives who must balance their time between managing their businesses and families. This is a major barrier to participating in training. This is as stated by one respondent:

> "If there was training, I would actually like to participate, but it often clashes with child and household responsibilities" (interview with female MSMEs, service sector, business 7-years).

This situation explains the low level of digitalization adoption despite a high level of understanding of the benefits of technology. The low level of actual digitalization practices may also be due to busy schedules. As one respondent expressed:

> "I have to be clever about managing my time between business and taking care of my children. I often have to share my phone with my children's school activities because I only have one. So I don't try to practice digitalization in running my business" (interview with female MSME, food sector, business 6-years).

> This aligns with the findings of Olsson and Bernhard (2021) who stated that the use of social media increases market exposure, but digital capacity remains a constraint. Digitalization has not yet become a common operational practice, but is still viewed as an additional activity.

2. Gap between digital awareness and actual implementation.

Questionnaire and interview results indicate a gap between digital awareness and digitalization practices. The majority stated that they are aware that social media and e-commerce can increase market reach, but their use is still limited to passive promotion. This finding was expressed by a respondent:

> "I already have a marketplace account, but I rarely update it. I usually just use WhatsApp because it's easier" (interview: Female MSME, fashion sector, 4 years old).

This finding aligns with research by Olsson and Bernhard (2021) which states that the use of social media can expand market reach, but limited digital capacity hinders its utilization. Digitalization among women's MSMEs is still at the awareness stage, not yet at the stage of utilization in their businesses.

3. Barriers to accessing formal financing and perceptions of financial institutions.

Interview results indicate persistent barriers to accessing formal financing, particularly in terms of limited legality, collateral, and negative perceptions of financial institutions. As one respondent put it:

> "Banks have many requirements, while the assets are in my husband's name. In the end, I just use my own capital, although this limits business development" (interview with female MSME, culinary sector, 6 years old).

This finding supports research by Destiari (2024) which states that digitalization and financial inclusion significantly influence business sustainability. This study further states that gender-based barriers limit the effectiveness of financial inclusion policies for micro- and ultra-micro-scale women's MSMEs.

4. The importance of equitable information distribution and strengthening community networks.

Findings from FGDs and interviews indicate that access to information about empowerment programs is largely determined by membership in a community or association. Women MSMEs who are members of a community or association have easier access to training and mentoring, while those who are not members tend to be left behind. As one respondent explained:

> "I only found out about the mentoring program after being invited by a community friend. I had never received any information before" (interview: Female MSME, crafts sector, business 2-years).

This indicates that the success of empowerment programs is determined not only by program implementation but also by the effectiveness of local communication and social networks, as stated by (Awaludin and Yusrizal, 2025). Therefore, communities at the village and sub-district levels play a key role in equitable access and participation for women MSMEs. From a social capital perspective, these findings indicate that community networks function as informal institutional bridges that reduce information and access gaps.

5. Design of a Women's MSME Empowerment Model Based on Digitalization and Financial Inclusion

Based on the research findings, a model for empowering women's MSMEs can be design The model consists of four layers, detailed as follows:

1. Foundation layer, focusing on digital and financial literacy, legality, and motivation, with the aim of increasing awareness and readiness.
2. Strengthening layer, focusing on practical training and mentoring, with the aim of implementing real-world training and mentoring.
3. Acceleration layer, focusing on collaboration, partnerships, and market expansion, with the aim of business growth.
4. Social Impact layer, focusing on increased income and job opportunities, with the aim of sustainable empowerment.

The four main layers of empowerment are depicted in the form of pillars:

1. Strengthening Digital Literacy & Practice, aiming to increase digitalization from "knowing the benefits" to "actively using e-commerce".
2. Financial Access & Literacy, aiming to increase bank partnerships, business proposal training, and financial product education.
3. Financial Management & Attitude, with the aim of increasing the use of simple bookkeeping applications, routine consultations, and risk management.

TABLE 3 Key findings, constraints, and model interventions.

Key findings	Barriers facing	Model interventions
High awareness of the benefits of e-commerce but low actual usage	Gap between digital knowledge and practice	Sales simulation-based training, direct mentoring, and monitoring of e-commerce usage
Low access to formal savings and loan products	Limited financial literacy and minimal outreach	Capital access clinics, credit application training, and partnerships with banks, rural banks, cooperatives, and fintech
Financial record-keeping is inconsistent	Business management is unstructured and mixed with personal finances	Use of simple bookkeeping applications, cash flow management training, and financial mentoring
Overcautious attitude towards risk	Lack of innovation, business expansion, and product diversification	Risk management education, expansion planning simulations, and examples of successful practices
Low ease of obtaining capital loans	Limited connections to financial institutions	Women-friendly microcredit schemes, facilitating partnerships with financial institutions, and community collaboration
Remains a local market	Limited sales reach and low competitiveness	Cross-regional digital marketing strategies, supply chain collaboration, and global marketplace-based promotions

4. Strengthening Production & Market Capacity, with the aim of increasing collaboration between MSMEs, cross-regional digital promotion, and product innovation.

The empowerment model for women's MSMEs can be described as follows:

This research identified a gap between women's MSMEs' awareness, practices, and access to digital technology and formal financial services. Therefore, an empowerment model was designed to provide appropriate interventions based on the key findings.

Table 3 shows that female MSMEs have a relatively high level of awareness of the benefits of e-commerce, but their practical implementation remains relatively low. This situation indicates a gap between their digital knowledge and their ability or readiness to apply it in business activities. Furthermore, limited access to formal financial services remains a major obstacle, influenced by low financial literacy and limited reach of financial institutions.

This finding aligns with reports from the OECD (2023) and World Bank (2022) which show that high literacy or awareness does not always translate into optimal utilization of digital and financial services. This is further supported by the technology adoption model proposed by Venkatesh et al. (2012), which states that technology use is determined not only by knowledge but also by other factors such as system support, ease of use, and the social environment.

However, the results of this study do not fully align with those of Davis (1989) and Lusardi and Mitchell (2014), which suggest that increased knowledge or literacy directly drives technology use and financial behavior. In the context of this research, the gap occurs at the implementation stage, not at the level of understanding, indicating other barriers such as a lack of mentoring, limited hands-on practice, and psychological factors such as a cautious attitude towards risk.

Furthermore, inconsistencies in financial record-keeping indicate that business management is still not carried out professionally, particularly regarding the separation of personal and business finances. This reinforces the findings of previous research that emphasized the importance of financial literacy in improving the quality of business management. Furthermore, limited access to financing and the limited reach of the local market indicate the low competitiveness of women-owned MSMEs in facing broader competition.

Therefore, interventions designed within the empowerment model focus on practical and applicable approaches, such as simulation-based training, direct mentoring, strengthening financial literacy, and facilitating access to formal financial institutions. Furthermore, market development strategies through cross-regional digital marketing and supply chain collaboration are also important steps to increase business competitiveness and sustainability. Overall, Table 3 not only illustrates the empirical conditions faced by women's MSMEs, but also makes an important contribution by highlighting the gap between knowledge and practice, as well as the need for a more contextual and sustainable intervention approach in supporting digitalization-based empowerment and financial inclusion.

5 Conclusion

Research findings indicate that efforts to increase digital and financial inclusion among women-owned MSMEs in Indonesia remain challenging. Although the majority of women-owned MSMEs recognize the importance of digital technology and financial management, this understanding has not been fully implemented in business practices. Obstacles include time constraints, the burden of domestic roles as housewives, limited access to formal financing, and asset ownership and legality.

Digital and financial literacy have not yet driven changes in business behavior among women-owned MSMEs. Women still face structural and social barriers. This research deepens our understanding that digital and financial inclusion are gradual processes and are heavily influenced by the social context, not solely by individual capabilities.

Women-owned MSME empowerment programs need to be designed with an approach more tailored to the real-world conditions of business actors. Digital and financial training

should be accompanied by ongoing mentoring, more flexible implementation times, and simplified requirements for accessing financing. Furthermore, the role of local communities and networks has proven crucial in disseminating information and encouraging the participation of women-owned MSMEs in various empowerment programs.

This study still has limitations, particularly in terms of coverage and number of respondents. Therefore, future research is recommended to involve a wider region and use a long-term approach to more deeply examine changes in the behavior of women's MSMEs. Further research could also explore the role of policies, financial institutions, and financial technology in strengthening women's financial inclusion.

Overall, this research is expected to provide a more realistic picture of the challenges and needs of women's MSMEs and serve as a reference for policymakers and relevant parties in formulating more inclusive and sustainable empowerment strategies. Practically, the results of this study can serve as a basis for the government, financial institutions, and supporting organizations to design empowerment programs based on the real needs of women's MSMEs, such as practice-based training, women-friendly financing schemes, and strengthening an inclusive digital ecosystem.

Future research is recommended to use a longitudinal approach to continuously observe changes in the behavior of women's MSMEs. Furthermore, research can also test the effectiveness of the proposed empowerment model through an experimental or quasi-experimental approach.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The requirement of ethical approval was waived by Deputy Chair IV for Research and Publication Sekolah Tinggi Ilmu Ekonomi Indonesia Jakarta, Indonesia for the studies involving humans. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

DP: Data curation, Visualization, Investigation, Validation, Methodology, Project administration, Conceptualization, Supervision, Funding acquisition, Software, Resources, Writing – review & editing, Writing – original draft, Formal analysis. IS: Data curation, Conceptualization, Investigation, Formal analysis, Writing – review & editing, Methodology, Supervision. WW: Writing – review & editing, Investigation, Resources.

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