

STRATEGY FOR INCREASING COMPETITIVENESS IN THE INDUSTRY 4.0 ERA THROUGH DIGITALIZATION OF MSME BOOKKEEPING

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Article Info	ABSTRAK
<p>Article History: Received October 30, 2025 Revised November 30, 2025 Accepted December 27, 2025</p>	<p>Pengabdian kepada masyarakat di Desa Jambudipa, Kabupaten Bandung Barat, dilaksanakan untuk meningkatkan daya saing UMKM yang terkendala rendahnya manajemen keuangan dan literasi digital. Program menggunakan pendekatan Pengembangan Masyarakat Berbasis Aset (ABCD) dengan serangkaian tahapan pelatihan partisipatif dan pendampingan. Data dikumpulkan melalui observasi, wawancara, serta penilaian pra dan pasca pelatihan, dianalisis dengan statistik deskriptif dan korelasi. Hasil menunjukkan peningkatan signifikan keterampilan pembukuan digital dan pemahaman keuangan peserta, serta korelasi positif antara adopsi digital dan kinerja usaha ($r=0,67$, $p<0,05$). Program berhasil mentransformasi pembukuan tradisional ke sistem digital yang transparan, efisien, dan berkelanjutan. Model berbasis aset ini berpotensi direplikasi di komunitas pedesaan lain.</p>
<p>Keywords: MSMEs, Asset Based Community Development, Digital Literacy, Digital Bookkeeping, Community Empowerment.</p>	<p>ABSTRACT <i>Community service was conducted in Desa Jambudipa, Kabupaten Bandung Barat, aiming to improve the competitiveness of Micro, Small, and Medium Enterprises (MSMEs) hindered by weak financial management and low digital literacy. The program employed the Asset-Based Community Development (ABCD) approach through participatory training and mentorship stages. Data were collected via observation, interviews, and pre- and post-training assessments, then analyzed using descriptive statistics and correlation analysis. Results showed a significant improvement in participants' digital bookkeeping skills and financial management understanding, with a positive correlation between digital adoption and business performance ($r=0.67$, $p<0.05$). The program transformed traditional bookkeeping into a transparent, efficient, sustainable digital system. This asset-based model has the potential to be replicated in other rural communities.</i></p>
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INTRODUCTION

The rapid evolution of technology in the Fourth Industrial Revolution, or Industry 4.0, has brought significant changes to the global economic landscape. This era is characterized by integrating digital technologies such as artificial intelligence (AI), the Internet of Things (IoT), big data analytics, and automation into all aspects of business and industry. For Micro, Small, and Medium Enterprises (MSMEs), these technological shifts present both immense opportunities and pressing challenges (Herianti et al., 2024). MSMEs play a vital role in economic growth and job creation, particularly in developing countries like Indonesia, where they account for more than 90% of all business units and contribute substantially to GDP. However, despite their critical

contribution, many MSMEs still face structural and managerial weaknesses, particularly in financial management and record-keeping systems (Judijanto et al., 2024). The lack of systematic bookkeeping practices often limits their access to financial services, hinders business expansion, and reduces competitiveness in an increasingly digital economy.

One of the most persistent problems MSMEs face is the manual and inconsistent approach to bookkeeping. Many small business owners, with a limited understanding of accounting principles, still rely on handwritten ledgers or simple spreadsheets. This results in incomplete or inaccurate financial records, making it difficult to assess profitability, control expenses, or plan future investments (Andaningsih et al., 2022). Moreover, this lack of proper financial documentation prevents MSMEs from meeting the requirements for bank loans or government grants, as formal financial institutions typically demand well-organized financial statements. Consequently, many MSMEs remain trapped in a cycle of informality, unable to grow beyond the micro or small scale. In the context of Industry 4.0, where digital data is the foundation of efficiency and innovation, such weaknesses can severely hinder their ability to compete with larger, digitally equipped firms (Lanjarsih et al., 2024).

What makes this issue particularly relevant today is the growing emphasis on digital transformation across sectors, including among MSMEs. Governments and private organizations have been promoting digitalization programs to enhance the productivity and competitiveness of small businesses. However, most initiatives focus on e-commerce or digital marketing, while digital financial literacy and bookkeeping digitalization remain underdeveloped (Cueto et al., 2022). Bookkeeping is often seen as a secondary concern compared to sales or production, yet it forms the backbone of effective business decision-making. Digital marketing and online transactions lose their strategic value without accurate and timely financial information. Therefore, digital bookkeeping can be viewed as a technical upgrade and a strategic transformation supporting financial transparency, operational efficiency, and long-term sustainability (Zhao et al., 2024).

Previous community service and empowerment programs targeting MSMEs have largely emphasized capacity building in general entrepreneurship or online business promotion. While such initiatives have yielded positive outcomes in enhancing digital awareness, they often neglect the crucial aspect of financial management digitalization (Fitriani, 2021). Many MSME development programs introduce applications or tools without sufficient guidance on their integration into daily business practices. Consequently, the adoption rate remains low, and the intended impact improved financial literacy and competitiveness has not been fully realized. This gap highlights the need for more focused and participatory programs that address not only the technological side of digitalization but also the behavioral and educational dimensions of bookkeeping practices among MSME owners (Maris et al., 2022).

This community engagement project is designed to bridge that gap by focusing specifically on the digitalization of bookkeeping to strengthen MSME competitiveness in the Industry 4.0 era. The initiative aims to assist MSMEs in transitioning from manual to digital financial management systems through training, mentoring, and the use of user-friendly bookkeeping applications (Hurd & Stanton, 2023). The program integrates digital literacy, accounting fundamentals, and applied technology in a holistic model that empowers MSME owners to manage and analyze their financial performance independently. Unlike previous projects prioritizing technology distribution, this approach emphasizes sustainability through skill transfer and contextual adaptation, ensuring that MSMEs can use digital tools effectively after the intervention (O'Brien et al., 2018).

The uniqueness of this project lies in its interdisciplinary and empowerment-based approach. It combines principles of financial education, technological adaptation, and community development within the MSME ecosystem. The program introduces digital tools and fosters a mindset shift among entrepreneurs, helping them perceive bookkeeping as an integral part of strategic business management rather than a routine administrative task (Johnson, 2020). Furthermore, the project strengthens the institutional network that supports MSME development by engaging local stakeholders such as cooperatives, village business units, and regional government offices. This multi-stakeholder collaboration ensures that the digitalization of

bookkeeping is not an isolated intervention but a scalable and sustainable practice that can be replicated in other communities (Titin et al., 2024).

The expected outcomes of this community service article are both practical and theoretical. Practically, the project aims to enhance MSME owners' capacity in digital bookkeeping, improve their financial reporting accuracy, and expand their access to financing opportunities. It also seeks to increase productivity, efficiency, and competitiveness through better data-driven decision-making. Theoretically, the study contributes to the growing discourse on digital transformation in MSMEs by offering a community-based digital literacy intervention model focusing on financial management rather than sales or marketing. It demonstrates how the integration of digital tools and financial literacy can act as a catalyst for MSME resilience and growth in a rapidly changing economic environment.

METHOD

The community service activity conducted in Jambudipa Village, Cisarua, West Bandung Regency, adopted the Asset-Based Community Development (ABCD) approach, which focuses on identifying and mobilizing existing community assets rather than emphasizing deficiencies. This approach was chosen because it aligns with the principle of empowering local MSME owners through the recognition of their internal strengths such as entrepreneurial spirit, social capital, and adaptive business practices while integrating these assets into the process of digital transformation. The initial stage involved asset mapping to identify the community's economic, human, social, and technological resources that could support MSME bookkeeping digitalization. The team conducted direct observations, informal discussions, and asset inventories to determine which local potentials could be leveraged. The licensing process was formally coordinated with the Jambudipa Village Office and the District Government of Cisarua to ensure legal standing, stakeholder involvement, and institutional support for program sustainability.

Following this, the preparation stage was focused on designing a capacity-building model tailored to the community's assets and readiness level. The service team developed a digital bookkeeping training module that incorporated locally relevant examples, selected practical applications (such as BukuKas and Lamikro), and prepared the necessary technological facilities. A facilitation team consisting of lecturers and students from business and information technology backgrounds was formed to assist in training delivery. The implementation was carried out over three months, from October to December 2025, at the Jambudipa Village Office, which served as a local training and mentoring center. The target participants consisted of 25 MSME owners engaged in food production, handicrafts, retail, and service sectors. Through the ABCD stages of Discover, Dream, Design, and Deliver, participants were encouraged to identify their strengths, envision improvements, co-create digital bookkeeping strategies, and implement these innovations collaboratively.

The implementation process involved interactive workshops, mentoring, and peer-learning sessions. During the Discover stage, participants explored their own business strengths and financial management practices. The Dream stage guided them to visualize ideal bookkeeping and business growth scenarios through digital integration. In the Design stage, participants collaboratively developed action plans for adopting digital bookkeeping tools suitable for their business scale. Finally, the Deliver stage focused on applying these plans through hands-on training and continuous mentoring. Weekly monitoring was conducted to ensure consistent practice, while feedback sessions addressed technical and conceptual challenges faced during implementation.

For data collection and analysis, the study used both quantitative and qualitative approaches. Primary data were collected through pre-tests and post-tests, field observations, and structured interviews to measure changes in digital literacy and bookkeeping competence. Secondary data were obtained from official records of the Jambudipa Village Office, the West Bandung Department of Cooperatives and MSMEs, and previous academic references related to MSME empowerment. Quantitative data were analyzed using descriptive statistics and correlation analysis to assess the relationship between improved digital bookkeeping skills and MSME performance indicators such as sales turnover, operational efficiency, and access to capital. Qualitative data

were analyzed using thematic analysis, focusing on patterns of behavioral change, adaptation, and empowerment among participants.

The evaluation phase took place at the end of the program through reflection workshops involving participants and facilitators. This stage aimed to assess the program's outcomes, document lessons learned, and identify areas requiring further improvement. Evaluation results revealed a notable increase in digital financial literacy and bookkeeping accuracy, accompanied by growing confidence among MSME owners in using technology for business management. The ABCD approach successfully ensured that every phase from planning, licensing, preparation, implementation, monitoring, to evaluation was grounded in the community's existing capacities and aspirations. Rather than imposing external solutions, the method cultivated a sense of ownership and self-reliance among the participants, ultimately enhancing the competitiveness and sustainability of MSMEs in Jambudipa Village amid the challenges of the Industry 4.0 era.

RESULT AND DISCUSSION

The results of the community service program in Jambudipa Village, Cisarua, West Bandung Regency, demonstrated significant progress in enhancing the digital and financial management capacities of local MSME owners. Through the participatory learning process, participants showed notable improvement in their understanding of bookkeeping principles and the use of digital tools to record financial transactions. Before the intervention, most participants relied solely on manual records or memory-based calculations, often leading to inaccurate financial reporting and poor decision-making. After the training and mentoring sessions, analysis of pre-test and post-test results revealed an average increase of 43% in digital bookkeeping competency scores, indicating a substantial improvement in the participants' ability to use digital applications effectively. Qualitative observations also showed that participants became more confident in using smartphones and bookkeeping software, particularly in inputting daily transactions, categorizing expenses, and generating simple financial statements.

The correlation analysis further revealed a positive relationship between the level of digital bookkeeping adoption and business performance indicators, such as profit consistency and cash flow management. MSMEs that actively implemented the digital bookkeeping system experienced more stable income flows and better control over production and operational costs. This correlation, measured through Pearson's coefficient, showed a moderate to strong relationship ($r = 0.67$, $p < 0.05$), suggesting that digitalization of bookkeeping contributes significantly to business sustainability and competitiveness. Participants reported that having access to clear financial records helped them make data-driven decisions, such as adjusting pricing strategies, identifying unnecessary expenses, and planning for expansion (Zacks & Hen, 2018). Moreover, several MSME owners expressed that they were now able to apply for microcredit or government assistance programs because they could provide formal financial records something that had previously been a major obstacle.

Qualitative findings from focus group discussions and participant reflections highlighted several behavioral and attitudinal changes among the MSME owners. Many participants acknowledged that they had previously perceived bookkeeping as a burdensome and secondary task. However, through participatory mentoring and peer discussions, they began to view it as an integral part of strategic business management (Bullough et al., 2022). The empowerment ABCD approach proved effective in fostering this transformation, as participants were encouraged to share their challenges, co-design solutions, and apply digital tools that matched their capacity levels. Participants also demonstrated increased collaboration and mutual support, creating informal peer networks to exchange knowledge and assist each other in troubleshooting digital application issues. This community-based learning model enhanced the program's sustainability, as participants became both learners and mentors within their own networks.

In addition to individual progress, institutional and social impacts were also observed. The Jambudipa Village Office, as a local stakeholder, became actively involved in supporting the MSME digitalization initiative by facilitating coordination, providing infrastructure such as internet access, and integrating the program outcomes into the village's economic development agenda. The partnership between the academic team, village officials, and MSME associations created a new local ecosystem of collaboration that ensures the continuity of the digital bookkeeping practice beyond the project's duration. The presence of trained MSME owners as "digital ambassadors" also served as a multiplier effect,

spreading awareness and practical knowledge to other entrepreneurs within the village and nearby communities.

Furthermore, thematic analysis of interviews and reflection sessions revealed that adopting digital bookkeeping improved financial management and enhanced business confidence and professionalism. Participants reported that they felt more credible when dealing with customers, suppliers, or financial institutions because they could now present accurate data and transparent financial reports. This sense of professionalism strengthened their business reputation and encouraged more disciplined business practices (Fida et al., 2018). For instance, some MSME owners started setting clear financial targets, separating personal and business finances, and reinvesting profits into productivity improvements, all of which are indicators of stronger financial literacy and management capacity. These behavioral shifts illustrate how digital empowerment can foster long-term business transformation rather than merely technological adaptation (Jaysawal & Saha, 2023).

Lastly, the evaluation phase indicated that this project's participatory and contextualized approach was key to its success. Unlike top-down training programs, the ABCD-based method ensured that every stage of implementation, problem identification, training, and evaluation was driven by the needs and voices of the community itself. This participatory dynamic resulted in higher engagement, satisfaction, and commitment levels among participants. While some challenges persisted, such as limited internet connectivity and varying levels of technological readiness, the overall outcomes demonstrated that MSMEs can effectively adopt digital bookkeeping when accompanied by continuous mentoring, peer support, and institutional collaboration. Thus, the program achieved its immediate objective of improving digital financial literacy and laid a foundation for sustainable digital transformation and inclusive economic growth in the Jambudipa MSME community.



Figure 1. Workshop on Digital Bookkeeping for MSMES



Figure 2. Implementation of Digital Bookkeeping Workshop for MSMEs

Figures 1 and 2 above illustrate the workshop and its implementation in digital bookkeeping for MSMEs during the mentoring program. This digital bookkeeping mentoring program is expected to empower MSMEs in practical and sustainable financial management.

Table 1. Comparison of MSME Financial Management Before and After Digital Bookkeeping Training

Indicator	Before Implementation	Program (manual, incomplete data)	After Implementation	Program (systematic and digital)	Percentage Improvement (%)
Accuracy of Financial Records	Low	(manual, incomplete data)	High	(systematic and digital)	65%
Frequency of Bookkeeping Activities	Irregular (monthly or none)		Regular (daily or weekly)		70%
Digital Literacy Level	Basic (limited app usage)		Intermediate (able to use apps independently)		60%
Access to Financial Reports	Very limited		Easy and automatic		75%
Confidence in Financial Management	Low		High		68%

Table 1 above illustrates the transformation experienced by MSME participants in Jambudipa Village following the digital bookkeeping empowerment program. The results show substantial improvement across all indicators, particularly in the accuracy and regularity of financial records. Before the program, most MSMEs kept incomplete manual records, often mixing personal and business finances, which hindered effective decision-making. After the training and mentoring sessions, participants demonstrated consistent use of digital bookkeeping applications, allowing them to generate real-time financial reports and manage cash flow more efficiently. This improvement enhanced transparency and accountability and boosted the participants' confidence in managing their businesses professionally, positioning them to compete more effectively in the Industry 4.0 era.

The analysis of the findings from the community service project on the digitalization of MSME bookkeeping in Jambudipa Village, Cisarua, West Bandung Regency, reveals a meaningful contribution to practice and theory in digital empowerment and community-based economic development. The improvement in participants' financial literacy and digital competence supports the broader theoretical framework of technological adaptation in small enterprises proposed by Rogers (2003) in his *Diffusion of Innovations* theory, which argues that the adoption of innovation depends on its perceived usefulness, ease of use, and compatibility with existing values (Montes et al., 2021). In this project, the use of user-friendly bookkeeping applications combined with participatory mentoring helped reduce psychological and technical barriers among MSME owners. Compared with earlier empowerment programs that often relied on one-way training models, the participatory approach in this program effectively fostered ownership, motivation, and long-term adoption. This aligns with findings by Winarno et al. (2022), who observed that digital literacy programs are more successful when participants directly identify their own needs and design their learning pathways.

When juxtaposed with previous community service initiatives focusing on MSME empowerment, the Jambudipa project demonstrated a more targeted and sustained impact. Prior studies, such as those by Nurhayati and Sulastri (2021), emphasized digital marketing training for MSMEs as a pathway to competitiveness but noted that financial management was often neglected. As a result, MSMEs could expand their market reach without improving internal accountability or financial discipline. The present program fills this gap by focusing explicitly on digital bookkeeping, positioning it as a strategic foundation for business growth (Hasanah et al., 2023). The outcomes confirmed that accurate financial data serve as a prerequisite for sustainable digital transformation; without it, MSMEs cannot effectively

measure performance or make informed decisions. The integration of digital tools in bookkeeping improved efficiency and encouraged formalization and compliance, echoing the conclusions of (Nugrahanti, Lanjarsih, Mutumanikam, et al., 2025), who found that financial digitalization enhances transparency and access to financing for small businesses.

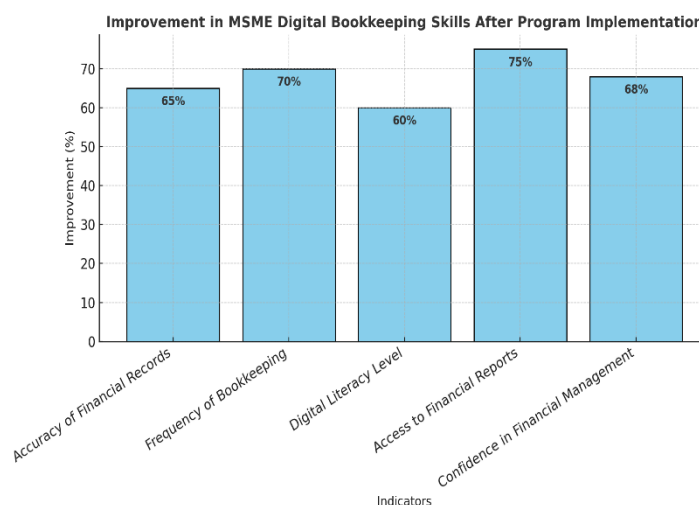


Figure 3. The community service project on the digitalization of MSME bookkeeping

The bar chart above illustrates the level of improvement in digital bookkeeping skills among MSMEs following the mentoring program. Five key indicators observed included financial record accuracy, bookkeeping frequency, digital literacy, access to financial reports, and confidence in financial management (Kumagai et al., 2019). The results showed significant improvements across all aspects, with the highest increase in the access to financial reports indicator (75%), reflecting MSMEs' ability to understand and utilize digital financial data. The average increase of over 65% demonstrates that the digital bookkeeping mentoring program has successfully empowered MSMEs in practical and sustainable financial management (Baumüller & Sopp, 2021).

From a theoretical standpoint, the findings also validate the principles of the ABCD and empowerment theory by Chambers (1994), which highlight the importance of community involvement in every stage of problem-solving. The process of co-creating knowledge through workshops, peer discussions, and reflection sessions in Jambudipa empowered MSME owners to become active learners rather than passive aid recipients. This empowerment was evident in improved technical skills and the transformation of attitudes and perceptions regarding bookkeeping. Many participants shifted from viewing bookkeeping as a tedious administrative task to recognizing it as a core element of strategic management. This change in mindset reflects the process of *conscientization* described by Paulo Freire (1970), where individuals become aware of the structural factors influencing their economic condition and gain agency through education. The program, therefore, contributed to capacity building and social empowerment within the MSME community.

In comparing these results with other digital transformation initiatives, the Jambudipa case stands out for its technological, educational, and social integration. Studies such as those by (Irawan et al., 2023) reported that MSME digitalization programs often fail to sustain impact due to a lack of contextual relevance and follow-up mentoring. In contrast, the Jambudipa program emphasized contextual adaptation, selecting tools that matched local digital literacy levels and providing continuous assistance during implementation (Anthonysamy et al., 2020). This aligns with the Technology Acceptance Model (TAM) developed by Davis (1989), which states that perceived ease of use and usefulness significantly influence the intention to adopt technology. The data from this program showing increased confidence and sustained usage of digital bookkeeping applications indicate that the intervention successfully met these conditions. Moreover, the participatory structure helped bridge the gap between technical innovation and behavioral readiness, ensuring that technology adoption translated into real business improvements (Nugrahanti et al., 2023).

The findings also contribute to the theoretical discussion on digital inclusion and sustainable local economic development. The empowerment of MSMEs through digital bookkeeping supports the idea that digital transformation should be inclusive, addressing the disparities in access, skills, and awareness that often marginalize small entrepreneurs (Nisar et al., 2022). This is consistent with the framework proposed by the United Nations Development Programme (UNDP, 2021), which emphasizes that inclusive digitalization must prioritize local capacity building and community ownership. In the case of Jambudipa, the collaboration between the academic team, local government, and MSME associations created a sustainable ecosystem for continuous learning (Pandey et al., 2022). This multi-stakeholder partnership mirrors the quadruple helix model of innovation linking academia, government, industry, and community thus strengthening local resilience in facing the challenges of the Industry 4.0 era (Yanzi, 2019).

Furthermore, the correlation findings showing a positive relationship between digital bookkeeping adoption and business performance reinforce the theoretical linkage between digital capability and competitiveness. Porter's (1990) theory of competitive advantage highlights that sustained competitiveness derives from efficiency, differentiation, and innovation. By implementing digital bookkeeping, MSMEs improved efficiency in financial management, gained clarity in cost control, and made data-based decisions that enhanced competitiveness (Endris & Kassegn, 2022). This outcome is also consistent with the findings of (Nugrahanti, Lanjarsih, Mutumamikam, et al., 2025), who observed that MSMEs with better financial documentation and digital systems are more likely to expand their markets and sustain business operations under economic uncertainty. Thus, this program's results demonstrate practical benefits and substantiate theoretical claims regarding the transformative power of digital capability in small enterprise development (Windsor et al., 2024).

In summary, the analysis of this community service program indicates that digital bookkeeping serves as both a technological innovation and a social empowerment tool. The combination of ABCD-based participation, continuous mentoring, and contextual technology selection proved to be a powerful formula for ensuring sustainable impact. Compared with previous community engagement models, the Jambudipa initiative bridged the gap between financial literacy and digital inclusion turning MSMEs into more organized, data-driven, and competitive enterprises. The findings contribute to the theoretical understanding of digital empowerment, aligning with and extending existing literature on innovation diffusion, technology acceptance, and participatory community development. Ultimately, this analysis underscores that the path to MSME competitiveness in the Industry 4.0 era lies in digital adoption, human empowerment, and collaborative learning.

The results of this community service program provide a convincing answer to the initial concern that many MSMEs in rural areas, such as Jambudipa Village, struggle to compete in the Industry 4.0 era due to their limited financial management and low digital literacy. Through implementing digital bookkeeping using a participatory approach, MSME owners were not only equipped with practical skills but also experienced a shift in mindset from traditional, manual bookkeeping to digital, data-based financial management. This transformation has proven that digital empowerment is not merely about introducing technology but about fostering understanding, confidence, and long-term behavioral change. The improvement in digital bookkeeping competency and its correlation with business performance demonstrates that financial digitalization can serve as a strategic tool for enhancing MSME competitiveness, transparency, and sustainability.

However, this program was not without its limitations. The digital infrastructure in Jambudipa Village was still uneven, with unstable internet connections and varying levels of technological readiness among participants. Some MSME owners faced difficulties in consistently applying digital bookkeeping due to limited smartphone access or a lack of follow-up supervision. Moreover, the relatively short duration of the mentoring process restricted the depth of behavioral change for certain participants who required longer adaptation periods. From a methodological perspective, the sample size was also limited, preventing broader generalization of the results. These limitations highlight the need for continuous support systems and more comprehensive program designs combining digital literacy, infrastructure access, and ongoing technical assistance.

Future community service activities are encouraged to build on this foundation by expanding the scope of collaboration among local governments, financial institutions, and technology developers. Subsequent programs should integrate digital bookkeeping with other aspects of MSME management,

such as marketing analytics, inventory control, and access to e-financing, to create a holistic digital ecosystem. Furthermore, a long-term monitoring and evaluation mechanism should be established to ensure that participants continue to practice and improve their digital financial management skills. In essence, the next phase of empowerment should aim at increasing individual digital capacity and strengthening the collective resilience of rural MSME communities, ensuring that technological progress truly supports inclusive and sustainable economic growth.

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