



Strengthening Production Capacity and Business Management through Co-Creation as a Foundation for Digital Transformation in Community-Based Producer Groups

Melissa Indah Fianty^{1*}, Sy. Yuliani²,
Wanda Gema Prasadio Akbar Hidayat³, Kannisa Adjani⁴

^{1, 2, 3} Universitas Multimedia Nusantara, Tangerang, Indonesia

⁴ Universitas Teknologi Bandung, Bandung, Indonesia

*Corresponding author: melissa.indah@umn.ac.id

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ABSTRAK

Keterbatasan kapasitas organisasi dan pengelolaan usaha yang masih dilakukan secara manual menjadi salah satu hambatan utama dalam mendukung transformasi digital pada kelompok usaha produktif di pedesaan. Program pengabdian ini bertujuan memperkuat kapasitas Kelompok Budidaya Perikanan Dewata Farm dan Kelompok Pengolahan Pangan Mekar Lestari melalui pendekatan knowledge transfer dan co-creation sebagai fondasi transformasi digital. Program dilaksanakan secara partisipatif melalui identifikasi kebutuhan, workshop, pendampingan, perancangan prototype, dan evaluasi menggunakan kuesioner skala Likert lima poin yang dianalisis secara deskriptif. Hasil kegiatan menunjukkan bahwa mitra memiliki tingkat penerimaan dan kesiapan yang sangat tinggi terhadap implementasi solusi digital, ditunjukkan oleh nilai Readiness for Prototype Implementation sebesar 4,92 dan Knowledge Transfer Effectiveness sebesar 4,91. Selain meningkatkan kapasitas mitra, program ini menghasilkan kebutuhan fungsional dan rancangan prototype yang disusun berdasarkan karakteristik operasional kedua kelompok usaha. Temuan ini menunjukkan bahwa penguatan kapasitas melalui pendekatan partisipatif mampu membangun kesiapan organisasi sebagai fondasi implementasi transformasi digital yang lebih berkelanjutan.

Kata kunci: Penguatan Kapasitas; Ko-kreasi; Transfer Pengetahuan; Transformasi Digital; Pemberdayaan Masyarakat.

ABSTRACT

Limited organizational capacity and manual business management remain significant barriers to digital transformation in productive community enterprises. This community empowerment program aimed to strengthen the capacity of the Dewata Farm aquaculture group and the Mekar Lestari food processing group through knowledge transfer and co-creation as the foundation for digital transformation. The program employed a participatory approach consisting of needs assessment, workshops, mentoring, prototype design, and evaluation using a five-point Likert-scale questionnaire analyzed descriptively. The results indicated a very high level of partner acceptance and readiness for digital solution implementation, reflected by a Readiness for Prototype Implementation score of 4.92 and a Knowledge Transfer Effectiveness score of 4.91. In addition, the program produced functional system requirements and a prototype tailored to the operational characteristics of both partner groups. These findings demonstrate that participatory capacity building can enhance organizational readiness and establish a strong foundation for sustainable digital transformation in rural productive enterprises.

Keywords: Capacity Building; Co-Creation; Community Empowerment; Digital Transformation; Knowledge Transfer.



INTRODUCTION

Community-based economic strengthening continues to be one of the main strategies in rural development because it is able to encourage the utilization of local resources, create added value for products, and expand employment opportunities for the community (Ji et al., 2026). The success of this strategy is determined not only by resource potential and market access, but also by the ability of business groups to manage production activities, organize resources, and build decision-making mechanisms that are adaptive to changes in the business environment (Zhang, 2026). In this context, organizational capacity is regarded as the foundation that determines a group's ability to sustain business continuity while enhancing its competitiveness amid the growing demands of efficiency and digitalization (Cheng et al., 2026).

Organizational capacity develops through a process that involves strengthening knowledge, skills, leadership, work systems, collaborative networks, and collective problem-solving abilities (Amoozad Mahdiraji et al., 2021; Magnanini et al., 2022). Therefore, capacity development is no longer understood merely as a training activity oriented toward improving individual competencies, but rather as an organizational learning process that enables new knowledge to be translated into changes in working methods, governance, and decision-making mechanisms (Kang et al., 2021; van Assche et al., 2021). This approach produces more sustainable change because organizations not only gain new knowledge but also build the ability to manage change independently (De Toni & Pessot, 2021; Vedel & Kokshagina, 2021).

This paradigm shift has driven the development of a more participatory empowerment approach (Gerlak et al., 2023). Workshops are no longer positioned merely as a medium for delivering material, but as a space for dialogue to identify problems, build shared understanding, and formulate alternative solutions based on the community's real experience (Bourne et al., 2023). Through this process, academic knowledge and practical knowledge complement each other so that the resulting solutions are more contextual, easier to implement, and have a greater chance of being sustained after the empowerment program has been completed (Jacobi et al., 2022). The co-creation approach then developed as a mechanism that bridges this process by involving all stakeholders in formulating needs, validating solutions, and developing innovations collaboratively (van Maurik Matuk et al., 2023).

Although various empowerment programs have been widely implemented, their implementation is still often oriented toward the delivery of material, provision of facilities, or the introduction of technology without being preceded by adequate strengthening of organizational capacity (Machado et al., 2021). This condition causes the various innovations introduced to not yet be fully integrated into the group's operational processes because work mechanisms, documentation of business activities, and decision-making systems are still carried out conventionally (Silva et al., 2025). As a result, technology more often functions as a supplementary tool rather than as part of the business process that supports increased productivity and business

sustainability (Su et al., 2023). This situation shows that digital transformation cannot be separated from organizational readiness in managing knowledge, information, and work processes that form the operational basis of business groups (Yang et al., 2024).

These characteristics were also found in the Dewata Farm Aquaculture Group and the Mekar Lestari Food Processing Group in Serdang Wetan Village, Tangerang Regency. As shown in Figure 1, both groups have been running their business activities sustainably, but most operational processes still rely on members' experience and manual record-keeping. In the aquaculture group, feed usage, seed stocking schedules, fish growth, and harvest cycles have not been systematically documented. This condition makes it difficult to evaluate productivity between cycles because adequate historical information is not available as a basis for analysis. As a result, feed efficiency, production cost estimates, and identification of the causes of differences in harvest yields cannot be objectively evaluated, so cultivation decisions are more often based on experience rather than documented data.



Figure 1. Existing conditions of production activities and business management in the partner groups

A similar problem occurs in the food processing group. Order management, recording of production costs, production scheduling, and documentation of operational activities are still carried out through manual recording, so business information is scattered across various media and difficult to trace consistently. This condition increases the potential for inconsistencies in information between orders, production processes, and the use of raw materials, while also making it difficult for the group to evaluate costs, calculate profits, and prepare production plans based on its capacity. The accumulation of these various conditions causes the decision-making process to not yet be supported by structured information, so that opportunities for improving efficiency and business development cannot be optimally utilized. In addition, the initial assessment indicated limitations in production management and systematic operational documentation, reinforcing the need for organizational capacity strengthening before introducing digital innovation.

Based on the characteristics of these problems, capacity strengthening was positioned as the initial stage in building digital transformation readiness for productive business groups. Workshops were used to strengthen knowledge transfer and build a shared understanding of production practices and business management,

while the mentoring process facilitated the application of this knowledge into the group's operational activities . Subsequently, the co-creation approach was used to translate the operational needs that had been identified into business process improvements, strengthening of business governance, and the preparation of a system prototype that represents the partners' real needs. Thus, the prototype was not positioned as the main goal of the activity, but as an output of the organizational learning process that is expected to strengthen the group's readiness to sustainably adopt digital transformation.

IMPLEMENTATION METHOD

The implementation method of this community service activity was developed using a systematic and participatory community empowerment approach, placing the partners as the main subjects in every stage of the activity (Ajith et al., 2022). The program was conducted in Serdang Wetan Village, Tangerang Regency, from April to August 2026, involving a total of 40 participants from the Dewata Farm aquaculture group and the Mekar Lestari food processing group, all of whom participated in the workshop evaluation. The implementation framework along with the main activities at each stage is presented in Figure 2.

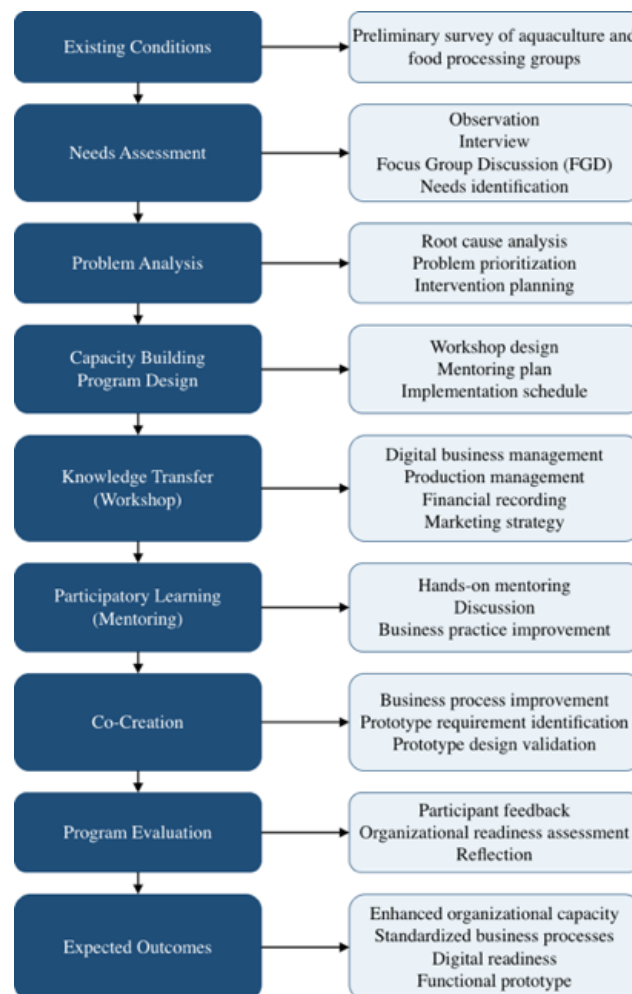


Figure 2. Framework of Community Empowerment Program Implementation and Key Activities

This approach was designed to ensure that all interventions provided are in accordance with the needs, problems, and operational characteristics of both the aquaculture group and the food processing group (Yudarwati & Gregory, 2022). The program was implemented in stages, starting with the identification of existing conditions and needs analysis, followed by the design of a capacity building program, the implementation of knowledge transfer through workshops, participatory mentoring, co-creation in business process improvement and prototype needs identification, up to the program evaluation stage (Clarkson et al., 2022; Lang et al., 2024).

Identification of Existing Conditions and Partner Needs Analysis

The initial stage of program implementation began with the identification of existing conditions and an analysis of partner needs to obtain a comprehensive understanding of the business characteristics, operational problems, and development needs of the Dewata Farm aquaculture group and the Mekar Lestari food processing group. This activity aims to ensure that the entire empowerment program is developed based on the real conditions faced by the partners, so that the interventions provided are better targeted and aligned with the priority needs (Fianty et al., 2025).

As shown in Figure 3, the identification process was carried out through field observation, semi-structured interviews with the group's management and members, and Focus Group Discussions (FGD) involving the implementation team and the partners. Observation was used to identify the operational processes currently underway, including production activities, business management, record-keeping, and marketing mechanisms. Interviews were conducted to gather information on the constraints faced, experiences in running the business, and expectations for the empowerment program (Saputri et al., 2024). Meanwhile, the FGD was used as a participatory discussion forum to validate the results of the observations and interviews, agree on priority problems, and formulate development needs that would form the basis for designing the capacity building program.



Figure 3. Identification of existing conditions and partner needs analysis

The identification results show that both partner groups already have business activities that run sustainably, but most of the management processes are still carried

out manually, so operational information has not been systematically documented. This condition affects the partners' limited ability to conduct business evaluations, make data-based decisions, and plan sustainable business development. These findings form the basis for designing the workshop materials, mentoring activities, and the co-creation process to support the strengthening of organizational capacity and digital transformation readiness.

Capacity Strengthening through Knowledge Transfer

The knowledge transfer stage was implemented to enhance the partners' capacity in both managerial and technical aspects as a foundation for more structured business development oriented toward the utilization of digital technology. Based on the results of the needs identification, the training materials were developed according to the characteristics of each partner group so that they could address the operational problems faced. The implementation process is shown in Figure 4. The first workshop focused on strengthening business management capacity for both partner groups through material on business management functions, production and inventory recording, production cost calculation, selling price determination, the use of data for decision-making, business performance indicators, and the digitalization of record-keeping as a basis for more systematic business management. This material became the foundation for formulating the functional requirements of the prototype being developed, so that the designed features align with the business processes and business management needs of the partners.



Figure 4. Implementation of knowledge transfer activities through workshops.

The second workshop was aimed at the aquaculture group, providing technical capacity strengthening on the application of the biofloc system, pond preparation, water quality management, seed stocking, feeding, the use of probiotics, and the management of the cultivation cycle through to harvest. This material became the basis for identifying operational information needs, which were subsequently accommodated in the design of the Pond Assistant prototype to support more systematic record-keeping and management of cultivation activities. In addition to the delivery of material, each workshop was conducted interactively through discussions, question-and-answer sessions, and case studies that allowed participants to relate the material to the real conditions they face in running their businesses. This

approach produced a shared understanding of business development needs and served as important input for the mentoring, co-creation, and prototype design stages.

Participatory Mentoring and Co-Creation

The mentoring and co-creation stage was carried out after the knowledge transfer activities to help the partners implement the material they had acquired into their daily business management practices. Mentoring was carried out participatively through field visits, group discussions, and direct consultations with the partners in order to identify implementation constraints, evaluate business processes, and formulate more specific development needs.

As shown in Figure 5, the mentoring and co-creation activities involved direct interaction between the implementation team and the partners in evaluating workflows, record-keeping mechanisms, and decision-making processes in aquaculture and food processing activities. The results of these discussions were used to refine the functional requirements to be accommodated in the prototype. The co-creation approach enabled the partners to actively express their needs, provide input on the proposed solution, and validate the suitability of the features with their operational activities.



Figure 5. Mentoring and co-creation activities with the partners.

Through this participatory approach, the prototype developed not only represents the solution designed by the implementation team, but also reflects the partners' real needs and operational experience. Thus, the co-creation process becomes an important stage to ensure that the system design has a high level of suitability to field conditions and supports implementation in the next stage.

Prototype Development and Validation

Following the knowledge transfer workshops, a series of discussion and mentoring sessions was conducted with both partner groups to communicate the development progress of the prototype. During these sessions, the implementation team presented the prototype design, demonstrated the developed features, and discussed the suitability of the proposed system with the partners' operational activities. Partners were encouraged to provide feedback regarding business processes, functional requirements, user interface, and information needs to support further prototype refinement before implementation.

Workshop Evaluation and Partner Readiness

Evaluation was carried out after all the workshop sessions were completed to assess the effectiveness of the activity's implementation and to identify the partners' readiness to proceed to the next stage of the program. The evaluation involved all participants from the Dewata Farm aquaculture group and the Mekar Lestari food processing group using a questionnaire with a five-point Likert scale (1 = strongly disagree to 5 = strongly agree).

The evaluation instrument covered five main constructs, namely workshop relevance, knowledge transfer effectiveness, participant satisfaction, perceived program benefits, and readiness for prototype implementation. In addition to closed-ended questions, the questionnaire also included open-ended questions to gather input on system development needs, constraints faced during business management, and suggestions for the implementation of future programs.

The data obtained were analyzed descriptively using the mean value and standard deviation (SD). The mean value was used to describe the level of participants' assessment for each construct, while the SD indicates the level of variation or consistency of responses among respondents.

RESULTS AND DISCUSSION

The implementation of the empowerment program for the Dewata Farm aquaculture group and the Mekar Lestari food processing group produced various achievements that support the strengthening of organizational capacity and digital transformation readiness. These achievements were obtained through a series of activities that included needs identification, knowledge transfer, participatory mentoring, co-creation, and program evaluation. The results of the activities not only show an increase in the partners' understanding and readiness to manage their business more systematically, but also produced functional requirements as a basis for developing digital solutions suited to the operational characteristics of each partner group.

Prototype Development Results

The prototype development stage was carried out as a continuation of the knowledge transfer, mentoring, and co-creation activities to ensure that the proposed system reflected the operational needs of both partner groups. After the initial prototype had been developed, a series of discussion and validation sessions was conducted with the partners. During these activities, the implementation team presented the development progress, demonstrated the prototype functions, and collected feedback from the partners regarding the suitability of the business processes, functional features, user interface, and information required to support their daily operational activities.

As shown in Figure 6, the discussion and validation sessions provided valuable input for refining the prototype. For the Dewata Farm aquaculture group, participants

emphasized the importance of features supporting pond registration, stocking schedules, feed management, water quality monitoring, probiotic application, operational cost recording, and harvest documentation. The partners also recommended simplifying the data entry process to facilitate routine production recording. These suggestions were incorporated into the prototype to improve usability and ensure that the application aligned with the operational workflow of community-based aquaculture management.

For the Mekar Lestari food processing group, the discussion focused on business management activities, including customer order management, raw material recording, production scheduling, product catalog management, sales recording, production cost calculation, and business reporting. The partners also provided suggestions regarding menu organization, navigation flow, and information presentation to improve ease of use for users with different levels of digital literacy. These recommendations contributed to refining the prototype so that it better supported the group's operational and administrative activities.



Figure 6. Prototype validation through discussion with partner groups

Beyond validating the functional requirements, the discussion sessions enabled both partner groups to evaluate the suitability of the proposed digital workflow with their existing business practices. The active involvement of the partners facilitated the identification of additional system requirements and ensured that the prototype reflected actual operational conditions rather than conceptual assumptions. This participatory process also strengthened the partners' understanding of how digital technology could support production management, business administration, and decision-making.

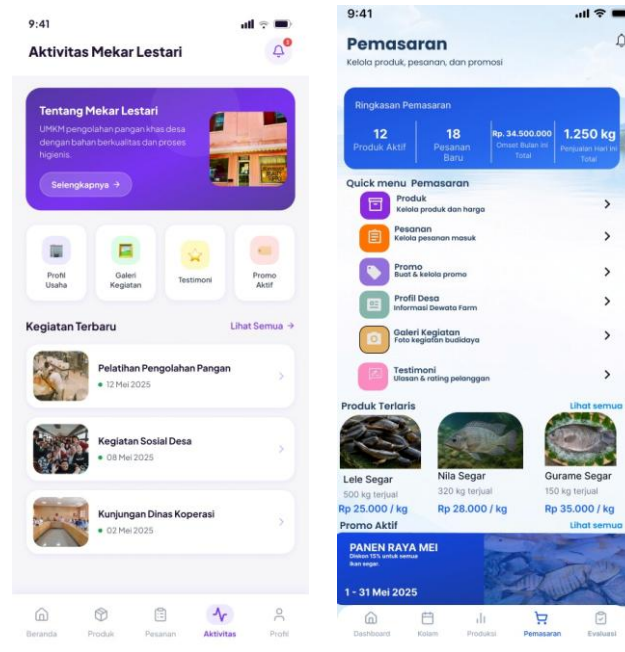


Figure 7. Final mobile application prototypes developed through the co-creation process: (a) Mekar Lestari application and (b) Dewata Farm aquaculture application

Following the third discussion and validation session, the prototype was further refined based on feedback from both partner groups and domain experts. The prototype was reviewed by experts in aquaculture and business management to ensure that the proposed business processes, functional modules, and information flow were consistent with operational practices commonly implemented by community-based aquaculture and food processing enterprises. Consequently, the final prototype represents a validated, user-centered digital solution that reflects the operational requirements of the partner groups while supporting production management and business administration. The final mobile application prototype is presented in Figure 7.

Results of Partner Capacity Strengthening

The evaluation results indicated positive participant perceptions of the capacity-strengthening activities conducted with the Dewata Farm aquaculture group and the Mekar Lestari food processing group. Based on the post-activity evaluation, participants reported positive perceptions regarding the relevance of the workshops, effectiveness of knowledge transfer, perceived program benefits, and readiness to adopt the proposed digital solutions. As the evaluation did not employ a pre-test–post-test design, these findings are interpreted as participants' perceived outcomes and readiness following the activities rather than as direct evidence of measurable changes in knowledge or skills.

The results of the workshop evaluation showed that participants reported highly positive perceptions of the program implementation. For interpretation, the mean scores were classified into five categories using equal intervals of the five-point Likert scale: 1.00–1.80 = Very Low, 1.81–2.60 = Low, 2.61–3.40 = Moderate, 3.41–4.20

= High, and 4.21–5.00 = Very High. As presented in Table 1, all evaluation constructs obtained mean scores ranging from 4.88 to 4.92 and were therefore categorized as Very High. The highest score was obtained for the Readiness for Prototype Implementation construct (Mean = 4.92; SD = 0.24), indicating a very high level of participant-reported readiness to utilize the prototype in supporting business management. The Knowledge Transfer Effectiveness construct also obtained a very high score (Mean = 4.91; SD = 0.26), indicating that participants perceived the knowledge transfer activities as effective and relevant to their business needs.

Table 1. Descriptive statistics of workshop evaluation and participant readiness (n = 40).

Construct	Items	Mean	SD	Interpretation
Workshop relevance	2	4.89	0.29	Very High
Knowledge transfer effectiveness	3	4.91	0.26	Very High
Participant satisfaction	1	4.88	0.31	Very High
Perceived program benefits	2	4.90	0.27	Very High
Readiness for prototype implementation	4	4.92	0.24	Very High
Overall	12	4.90	0.27	Very High

Note: Responses were measured using a five-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). Mean represents the average score of participants for each construct, while SD (Standard Deviation) indicates the variability of responses. Higher Mean values and lower SD values indicate more positive perceptions and greater consistency among participants.

Overall, the relatively low standard deviation values across all constructs indicate that participants' perceptions of the program's implementation tend to be consistent. These findings indicate that an empowerment approach combining knowledge transfer with participatory mentoring can be well received by both partner groups. The workshop activities not only served as a means of delivering material, but also became a learning medium that encouraged participants to understand the importance of business record-keeping, operational data management, and the use of digital technology to support decision-making.

In addition to increasing individual capacity, the empowerment process also strengthened the partners' engagement at every stage of the program. Discussions during the mentoring and co-creation process produced a shared understanding of the main problems faced and the priority needs for business development. This condition became important capital in supporting the implementation of digital solutions suited to the operational characteristics of each partner group, so that the digital transformation process was not only oriented toward the use of technology, but was also supported by increased organizational capacity and user readiness.

Empowerment Program Outcomes

The community empowerment program generated several key outputs that support organizational capacity strengthening and digital transformation readiness for both partner groups. Through a systematic process of needs identification, knowledge transfer, participatory mentoring, co-creation, and prototype validation, the partners enhanced their understanding of digital-based business management while actively contributing to the development of solutions that address their operational needs.

The collaborative activities also resulted in the formulation of functional requirements, improvements to business processes, and the development of mobile application prototypes tailored to the operational characteristics of the Dewata Farm aquaculture group and the Mekar Lestari food processing group. These outputs provide an initial foundation for the implementation of digital solutions that support production management, business administration, and data-driven decision-making. Figure 8 presents the implementation team, partner groups, and invited experts following the workshop activities. The workshop not only facilitated knowledge exchange and prototype validation but also strengthened collaboration among academics, experts, and community partners. This collaborative engagement played an important role in building shared commitment and readiness for the subsequent implementation of digital transformation initiatives.



Figure 8. Group photo of the implementation team, partner groups, and invited experts following the workshop activities.

Overall, the program successfully strengthened the organizational capacity of both partner groups while establishing a foundation for sustainable digital transformation. The integration of knowledge transfer, participatory mentoring, and co-creation encouraged active partner involvement throughout the program, resulting in validated digital solutions that reflect real operational needs and demonstrate the potential for long-term adoption within community-based producer groups.

CONCLUSION

This empowerment program was implemented in response to the problems faced by the Dewata Farm aquaculture group and the Mekar Lestari food processing group, particularly manual record-keeping, limited systematic documentation of operational data, and limited use of digital technology to support decision-making. Through knowledge transfer, participatory mentoring, and co-creation, the program received positive participant perceptions regarding the relevance and effectiveness of the activities and demonstrated a high level of readiness for digital solution implementation. The program also resulted in the identification of functional requirements tailored to the operational characteristics of each group and the development of a prototype based on the partners' actual needs. These findings indicate that a participatory approach can facilitate partner engagement and establish an initial foundation for digital transformation in community-based producer groups.

However, the evaluation was limited to a post-activity perception questionnaire without a pre-test, post-test design; therefore, the findings cannot be interpreted as direct evidence of measurable improvements in participants' knowledge, skills, or operational practices. In addition, the evaluation was limited to the two partner groups involved in the program, which restricts the generalizability of the findings. Future activities should therefore focus on implementing and testing the prototype, accompanied by pre-test, post-test measurements and systematic observation of operational practices, to evaluate changes in partner capacity and the impact of digital adoption on business management efficiency and program sustainability.

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