

Research Paper

Cooperative Facilitation and MSME Digital Outcomes: The Role of Co-Created Digital Dynamic Capabilities

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ARTICLE INFO	ABSTRACT
Keywords Cooperative Facilitation; Digital Dynamic Capabilities; MSME Digital Outcomes; MSME Performance	As MSMEs increasingly depend on digital technologies for competitiveness and resilience, an unresolved issue is how external facilitation translates digitalisation support into firm-level capabilities, digital maturity, and business performance. This study examines whether cooperative facilitation practices build co-created digital dynamic capabilities (CDDC) and how these capabilities relate to MSME digital maturity and performance. Survey data were obtained from 120 cooperative and MSME facilitators in Central Java, Indonesia. The unit of analysis was the facilitator, with respondents providing assessments based on the MSMEs they supported. Five reflective constructs were assessed through 41 indicators using a two-stage composite procedure. The measurement model was evaluated with SmartPLS, and the structural model was estimated from loading-weighted scores with 5,000 bootstrap resamples. Facilitation intensity and interactive methods strongly predicted CDDC ($\beta = 0.625$, $p < 0.001$), while relational embeddedness contributed positively ($\beta = 0.257$, $p = 0.002$). Both facilitation dimensions directly increased digital maturity, particularly relational embeddedness ($\beta = 0.571$, $p < 0.001$). CDDC improved MSME performance ($\beta = 0.261$, $p = 0.006$), and digital maturity was the strongest predictor ($\beta = 0.591$, $p < 0.001$). However, CDDC did not independently predict digital maturity. The findings support sustained, trust-based facilitation rather than episodic technology training.
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Introduction

Digital transformation is particularly challenging for micro, small, and medium enterprises (MSMEs) because the central problem is not simply whether firms adopt digital technologies, but whether they can develop the organisational capabilities required to use them strategically. Digital platforms, social media, electronic payments, cloud-based records, and data-supported customer management can widen market access and reduce transaction costs, yet their value depends on their integration into routines, decisions, and value propositions (Pandey, 2026). For resource-constrained MSMEs, this transition is difficult because they often have limited managerial slack, specialist labour, financial resources, and analytical infrastructure (Setiawan, et al., 2025). Consequently, firms may adopt individual digital applications without developing the capabilities needed to coordinate them into sustained organisational transformation (Eller et al., 2020; OECD, 2021; Verhoef et al., 2021; Vial, 2019). Recent research therefore increasingly treats digitalisation as an organisational capability problem rather than merely a technology acquisition problem (Canhoto et al., 2021; Kraus et al., 2022).

Digitalization challenges call for the external intervention that is especially important for MSMEs active in developing countries due to the uneven access to knowledge, financial resources, infrastructure, and specialized services. In Indonesia, cooperative and MSME facilitators are situated at the crossroads of state initiatives, financial organizations, technology companies, cooperatives, and entrepreneurs (Fatmah & Atnang, 2025). While their scope of work may go beyond formal training and may comprise digitalization tool introduction, problem diagnosis, application demonstration, entrepreneurs' market connection, and communication in the process of implementation, digitalization projects are typically assessed on the basis of input-related criteria such as participation numbers, training sessions held, modules provided, or platforms registered (Sari & Sarumpaet, 2025). These criteria indicate the scope of a project but say nothing about how the MSMEs are able to acquire the ability to interpret the digitalization opportunities, choose and try out relevant solutions, and change business practices accordingly. Thus, there is a need to analyze facilitation activities not as a service delivery process but as a means for MSMEs' digital capability development.

In particular, the dynamic capabilities theory provides a useful theoretical basis for studying this phenomenon, since this theory pays attention to the ways organizations are aware of opportunities and threats, capture opportunities via resources mobilization, and change their resources as conditions change (Fransisca & Vani, 2025; Teece, 2007). It is more applicable to the current research in contrast to technology adoption theories, which mostly focus on explaining technology acceptance or use, since it is the process of digital tool embedding in the organization that matters in this case. It also provides a wider explanation in comparison with absorptive capacity, which mostly addresses acquisition, assimilation, transformation, and exploitation of external knowledge, and organizational learning, which is about knowledge creation and modification processes (Rumere & Suruan, 2026). Even though all these theories shed light on some essential aspects of digital transformation, none of them provides an explanation of how adaptive capabilities emerge as a result of continuous interaction between an MSME and its external partner. Research on digital transformation reveals that technology creates opportunities, while capabilities determine the way these opportunities are interpreted and transformed (Warner & Wäger, 2019).

The differentiation is crucial since existing research on dynamic capabilities tends to be firm-centered, positioning sensing, seizing, and transforming inside organisational borders. Such a differentiation might not be exhaustive for resource-limited MSMEs which rely heavily on the involvement of external entities in knowledge production, interpretation, experimentation, and implementation (Kidprasert & Phuthong, 2026). The intermediaries can act as knowledge brokers, translators, network conveners, and partners of implementation, linking firms to knowledge and ecosystems resources (Crupi et al., 2020; Hafeez et al., 2025; Marinelli et al., 2024). But describing the role of intermediaries does not answer the question of how repeated interactions between the facilitators and entrepreneurs result in developing an adaptive capability through firm's decisions and routines. The concept of co-creation will help solve this challenge but must not be used as another name for collaboration or value creation. Capability co-creation takes place in our study when the intermediaries and the MSMEs jointly diagnose the challenges, experiment with digital solutions, interpret the results, and adjust routines according to specific circumstances of a business.

Based on the above differentiation, CDDC is defined as a firm-level capability to sense digital opportunities and threats, seize appropriate opportunities, and transform business processes through a collaborative learning process by employing an external facilitator (Handayani et al., 2025). CDDC is different from the traditional dynamic capabilities mainly by the way it develops. While the term 'dynamic capabilities' defines the adaptive capacity of the organization, the CDDC construct helps to understand how the adaptive capacity of an organization can be created through continuous interaction which surpasses the organizational boundary (Chaudhary et al., 2025). In addition, CDDC is also different from digital capabilities since the focus of CDDC is on the adaptive processes of sensing, seizing and transforming rather than on the capacity to use digital technologies. Organizational learning and absorptive capacity are also different from the CDDC concept since CDDC refers to the joint creation of these adaptive processes through the facilitator-MSME interaction. The difference between co-creation and CDDC is that the former is the relational process through which CDDC is created, while the latter is the resulting firm-level adaptive capacity.

Two dimensions of facilitation are therefore examined as potential conditions for CDDC and MSME digital outcomes. The first, facilitation intensity and interactive methods, captures repeated contact, field visits, demonstrations, hands-on practice, follow-up, digital communication, and group discussion. The second, relational embeddedness, captures trust, openness, contextual understanding, mutual respect, and continuity. These dimensions distinguish the practical intensity of support from the relational conditions that make support context-sensitive and sustainable. The study examines digital maturity as the extent to which digital tools become integrated into marketing, transactions, records, inventory, customer feedback, and online presence, while performance captures perceived improvements in sales, market reach, operational efficiency, resilience, and profitability. Prior research generally identifies positive relationships among digital capability, transformation, innovation, and performance (Karadağ et al., 2026; Pfister & Lehmann, 2023; Prakasa & Jumani, 2024; Valdez-Juárez et al., 2024), while recent previous studies have also highlighted digital transformation and FinTech-related mechanisms for MSME performance (Putri et al., 2026; Rohaeni et al., 2026).

Despite these insights, an important theoretical gap remains in explaining dynamic capability formation beyond organisational boundaries through sustained facilitator–MSME interaction. Existing research has established the importance of internal digital capabilities and has increasingly recognised external intermediaries, but less is known about how continuing facilitation becomes a firm-level adaptive capacity and how relationally embedded support contributes to digital maturity and performance. This study addresses this gap by positioning CDDC as the central theoretical contribution and examining how facilitation intensity, interactive methods, and relational embeddedness are associated with capability formation and MSME digital outcomes. The study therefore extends the dynamic capabilities view by explaining the relational conditions under which adaptive digital capabilities can be co-created with an external facilitator. It further distinguishes CDDC from digital maturity and performance to examine whether capability formation and routinised digital practice operate through the same or different pathways. The study uses survey data from 120 cooperative and MSME facilitators in Central Java and a theory-consistent, loading-weighted composite model with bootstrap inference.

Theoretical Foundation and Hypotheses Development

Dynamic Capabilities and Externally Supported Co-Creation

Dynamic capabilities refer to higher-order organisational capacities that enable firms to adapt, renew, and reconfigure their resource base in response to changing environments. Teece (2007) conceptualises these capacities through three interconnected processes: sensing, which involves identifying and interpreting opportunities and threats; seizing, which concerns selecting, committing to, and mobilising resources around identified opportunities; and transforming, which involves reconfiguring routines, assets, and organisational structures. Digital transformation intensifies the importance of these capabilities because digital technologies are modular, rapidly evolving, and closely intertwined with strategy, people, processes, and business models (Vial, 2019; Warner & Wäger, 2019). For MSMEs, however, the development of such capabilities is unlikely to depend entirely on internal resources. Limited specialist knowledge, managerial time, and experimentation capacity make external interaction particularly important. Intermediaries can reduce search costs, translate technical knowledge into actionable guidance, connect firms with technology providers, and facilitate learning across organisational boundaries (Crupi et al., 2020; Marinelli et al., 2024). In this study, therefore, co-created digital dynamic capabilities (CDDC) are understood as firm-level capacities that emerge through the joint enactment of sensing, seizing, and transforming with external facilitators. External actors do not substitute for the firm's own capability; rather, they contribute knowledge, interpretation, experimentation, and feedback through which the capability can be developed and exercised.

Facilitation Intensity and Interactive Methods

The development of dynamic capabilities requires opportunities to repeatedly interpret information, experiment with alternatives, and adjust practices rather than simply receive technological information. Facilitation intensity and interaction enable the creation of such conditions through an increase in the number of interactions between the facilitator

and the MSME in terms of frequency and depth (Canhoto et al., 2021). Such interactions give the facilitator a chance to find out implementation challenges, see how the entrepreneur uses the digital technology, create examples based on the specific context of the business, and provide feedback when the first efforts fail to achieve the desired outcomes. Demonstration, practice, peer discussions, and fieldwork also turn the abstract technological knowledge into actual experimentation (Hafeez et al., 2025). Through these interactions, the external facilitators can aid the building of dynamic capability in all three areas; sensing changes in the customers, markets, and technology, seizing opportunities through assessment of the digital technology solutions and allocation of available resources, and transformation of routines. Importantly, facilitation intensity does not mean that the capability is transferred in a mechanical way to the MSME.

H1: Facilitation intensity and interactive methods positively influence co-created digital dynamic capabilities (CDDC).

Similarly, the same facilitation process may directly lead to the digital maturity of the MSMEs. By digital maturity, it does not mean whether the firm accesses digital technology or tests digital technologies (Leso et al., 2024). The question of digital maturity revolves around the extent to which the digital practices become consistent, integrated, and embedded into the business processes (Kidprasert & Phuthong, 2026). This can be done through intensive facilitation that will be able to troubleshoot and offer support after the adoption of technology. This will help the firm to go beyond just accessing digital technologies to implementing them regularly in business practices such as transactions, communication, recording, marketing, and coordination. The direct effect of facilitation on digital maturity is different from that of the capability effect. In other words, facilitation may enhance digital maturity despite the lack of institutionalized dynamic capabilities.

H2: Facilitation intensity and interactive methods positively influence MSME digital maturity.

Relational Embeddedness

Relational embeddedness describes the extent to which economic interaction is situated within continuing relationships characterised by trust, openness, and social connection (Granovetter, 1985). In the context of digital facilitation, relational embeddedness provides a complementary mechanism to facilitation intensity and interactive methods. While intensive facilitation concerns the frequency and manner of interaction, relational embeddedness concerns the quality and social context within which that interaction occurs (Li & Wang, 2026). A trusted relationship can reduce the social distance between facilitator and entrepreneur and create a safer environment for discussing operational weaknesses, failed experiments, financial constraints, and uncertainty surrounding technology adoption. Such information is particularly valuable for dynamic capability development because effective sensing depends on access to relevant contextual knowledge, while seizing and transforming require recommendations and interventions that are appropriate to the firm's actual conditions.

External facilitators can therefore become participants in the sensing–seizing–transforming process without becoming owners of the capability themselves. Through sustained relationships, they can help entrepreneurs interpret ambiguous market or technological signals, assess alternative courses of action, and adjust implementation when

initial solutions fail (Marinelli et al., 2024). Relational embeddedness also facilitates the exchange of tacit knowledge that may not be communicated through formal training. Consequently, trust and continuity should increase the likelihood that facilitator knowledge is incorporated into entrepreneurial decision-making and translated into CDDC.

H3: Relational embeddedness positively influences co-created digital dynamic capabilities (CDDC).

Relational embeddedness can also directly affect the digital maturity of MSMEs. Trust can make entrepreneurs more likely to accept suggestions made, report problems related to the implementation of digital practices, and seek help whenever digital practices face challenges (Pandey, 2026). Meanwhile, continuity makes it possible for facilitators to modify their help as the needs of the organization and its technological environment change. Through these mechanisms, it would become possible to sustain digital practices after their experimental implementation and integrate them into everyday business processes (Putri et al., 2026). Thus, the direct effect becomes theoretically plausible regardless of the absence of the CDDC because a trusted facilitator can assist the MSME in sustaining and improving digital practices by giving advice and solving emerging problems without such practices having to become a dynamic capability.

H4: Relational embeddedness positively influences MSME digital maturity.

CDDC, Digital Maturity, and Performance

While CDDC allows MSMEs to be able to act in response to digital opportunities and threats, the ownership of such capabilities does not automatically translate into digital maturity. The sensing capability allows firms to detect changes in their customers, competitors, platforms, and digital threats; the seizing capability allows firms to assess options and commit their limited resources; while the transforming capability allows firms to adapt their routines, processes, channels, and responsibilities (Prakasa & Jumani, 2024; Rohaeni et al., 2026). Yet, the application of these capabilities does not guarantee any quick change in the level of digital maturity. While capability is an ability to act, digital maturity is the degree to which digital processes have been made consistent, coherent, and integrated within organizational activities.

This is especially crucial for MSMEs that receive external facilitation. External facilitation can induce sensing, facilitate evaluation in the context of seizing, and even help transform the practice, but external facilitation cannot control everything needed internally in order to institutionalize the new practices (Setiawan et al., 2025). It could be possible for an MSME to have or to demonstrate higher levels of CDDC without showing uniform maturity due to the lack of the translation of experiment into routine. External facilitation would help in closing this gap through feedback and implementation assistance, but still the institutionalization of new digital practices would partially depend on the internal capability of the firm.

H5: Co-created digital dynamic capabilities (CDDC) positively influence MSME digital maturity.

However, CDDC must still affect the performance of the MSMEs directly through the dynamics of capability because the dynamic capabilities allow organizations to spot the opportunities, adapt to environmental changes, and make better use of their resources

(Kallmuenzer et al., 2025; Karadağ, et al., 2026). Thus, sensing helps to recognize the existence of new customers, new market opportunities, or new threats connected with the use of digital technologies; seizing is concerned with making decisions on what technologies and opportunities to invest the limited resources in; and transforming allows for improving the organizational arrangement and being more responsive to environmental changes. This can be achieved even if the digital maturity of the organization is inconsistent because the capability allows making decisions at the strategic and operational levels prior to the full institutionalization of digital activities (Valdez- Juárez et al., 2024). The performance effect thus is a theoretically different pathway from the maturity pathway because an organization can benefit from its capability without achieving the mature state of digital integration.

H6: Co-created digital dynamic capabilities (CDDC) positively influence MSME performance.

Digital maturity represents a more established manifestation of digitalisation in which technologies and practices become integrated into routine organisational activities. As digital practices become more consistent and interconnected, MSMEs can potentially broaden market access, accelerate transactions, improve information quality, strengthen customer management, and enhance inventory and operational coordination (Ates & Acur, 2022; Verhoef et al., 2021). These benefits provide a direct basis for improved business performance. Digital maturity can also help firms capture the benefits of earlier experimentation by converting isolated digital initiatives into repeatable and integrated practices. Consequently, although capability formation and maturity development should be conceptually distinguished, higher digital maturity is expected to be associated with stronger performance outcomes.

H7: MSME digital maturity positively influences MSME performance.

Indirect Relationship and The Role of Capability Translation

The effects of external facilitation may extend beyond the direct relationships proposed in the model. Facilitation intensity and interactive methods, as well as relational embeddedness, may strengthen CDDC by enabling MSMEs to jointly interpret opportunities, evaluate technological alternatives, and adapt business practices, thereby potentially improving performance through enhanced capability formation. Both facilitation dimensions may also contribute to performance through digital maturity, as practical guidance, troubleshooting, trust, and continuity can help translate digital initiatives into more consistent and integrated organisational practices. Importantly, these indirect pathways do not imply a predetermined sequential process in which facilitation must always generate CDDC, CDDC must produce maturity, and maturity must subsequently generate performance. CDDC and digital maturity represent conceptually distinct mechanisms: CDDC reflects the capacity to sense, seize, and transform, whereas digital maturity reflects the extent to which digital practices have become established and integrated. Accordingly, capability formation may generate performance benefits without immediately producing mature digitalisation, while direct facilitation may advance digital maturity through practical and relational support even when capability development remains incomplete. Therefore, the study examines the indirect effects of both facilitation dimensions on MSME performance through CDDC, through digital maturity, and the

indirect effect of CDDC on performance through digital maturity. These relationships allow the study to assess whether capability formation and digital practice institutionalisation operate as complementary or partially independent pathways linking facilitation to MSME outcomes.

H1–H7 establish the proposed theoretical relationships linking external facilitation to MSME digital outcomes. H1 and H2 position facilitation intensity and interactive methods and relational embeddedness as two complementary antecedents of CDDC, while H3 and H4 recognise their potential direct contributions to MSME digital maturity. H5 addresses the theoretically important relationship between CDDC and digital maturity, while H6 and H7 extend the model to MSME performance by considering both capability-based and maturity-based pathways. The proposed indirect relationships further examine whether facilitation contributes to performance through CDDC and digital maturity and whether CDDC contributes to performance through digital maturity. Thus, the model distinguishes capability formation from the institutionalisation of digital practices while allowing these mechanisms to operate through interconnected pathways. Figure 1 presents the resulting research model, visually summarising the hypothesised relationships and the corresponding H1–H7 paths among facilitation practices, relational embeddedness, co-created digital dynamic capabilities, MSME digital maturity, and MSME performance.

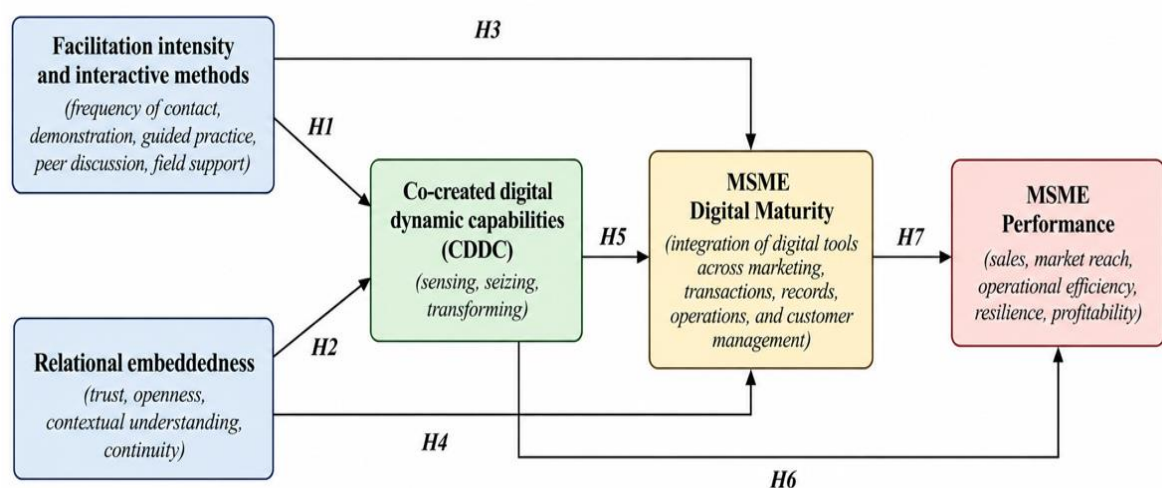


Figure 1. Research Model and Hypotheses

Method

Research Design and Respondents

The study employed a quantitative, explanatory, cross-sectional survey design to examine the relationships among cooperative facilitation practices, co-created digital dynamic capabilities (CDDC), MSME digital maturity, and MSME performance. The target population comprised facilitators involved in cooperative and MSME digitalisation programmes in Central Java, Indonesia. Respondents were eligible when they had practical experience assisting MSMEs with at least one digital business activity, including marketplace use, social media marketing, digital payment, point-of-sale applications, digital bookkeeping, inventory records, or online communication. A total of 120 usable questionnaires were obtained and included in the analysis.

The unit of analysis was the facilitator/respondent. Each questionnaire constituted one facilitator-level observation, with respondents providing assessments based on their experience supporting the MSMEs under their facilitation. Thus, MSMEs were not treated as separate observations, and the study does not constitute a nested MSME-within-facilitator dataset. The constructs of MSME digital maturity and MSME performance therefore represent facilitator-reported assessments of the MSMEs they supported, rather than independently collected responses from MSME owners or managers. Facilitators were selected because their practical involvement enabled them to observe the continuity, methods, and relational character of support as well as the digital practices and perceived outcomes of the MSMEs they assisted. This specification also means that the findings should be interpreted as facilitator-reported associations concerning supported MSMEs rather than independently verified MSME-level causal effects.

Instruments and Data Collection

Data were collected using a structured questionnaire comprising five reflective constructs with 41 indicators. All items were measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Facilitation intensity and interactive methods were measured with eight items covering routine contact, session duration, digital communication, learning modules, field visits, hands-on practice, follow-up, and group discussion. Relational embeddedness was measured with six items addressing trust, personal closeness, informal communication, openness, mutual respect, contextual understanding, and relationship continuity. These two constructs capture the procedural and relational dimensions of facilitator support.

Table 1. Construct Operationalization

Construct	Items	Operational domain
Facilitation intensity and interactive methods	8	Frequency, duration, digital communication, modules, field visits, hands-on practice, follow-up, group discussion
Relational embeddedness	6	Trust, personal closeness, informal communication, openness, mutual respect, contextual understanding, continuity
Co-created digital dynamic capabilities	15	Digital sensing, seizing, and transforming developed through facilitator–MSME interaction
MSME digital maturity	7	Marketplace, digital point of sale, social media, payments, inventory/records, online feedback, website or online store
MSME performance	5	Sales, market reach, operational efficiency, resilience, profitability

CDDC was measured using 15 items covering digital sensing, seizing, and transforming developed through facilitator–MSME interaction. MSME digital maturity was measured using seven items addressing marketplace presence, digital point-of-sale use,

social media promotion, digital payments, digital inventory or spreadsheet use, online customer feedback, and website or online-store presence. MSME performance was measured using five items covering sales, market reach, operational efficiency, resilience, and profitability. The wording of all measures was adapted to the context of cooperative facilitation and MSME digitalisation. The constructs were specified reflectively, treating their indicators as manifestations of the underlying dimensions. The complete operationalisation of the constructs is presented in [Table 1](#).

Data Analysis

Data analysis was conducted in two stages. First, the reflective measurement model was assessed using the SmartPLS 4 output generated from the indicator data. Indicator loadings, Cronbach's alpha, rho_A, composite reliability (CR), and average variance extracted (AVE) were examined to assess indicator reliability, internal consistency, and convergent validity. Discriminant validity was evaluated using the heterotrait–monotrait ratio (HTMT), following established guidance for variance-based structural equation modelling ([Hair et al., 2019, 2022](#); [Henseler et al., 2015](#)). These procedures established the empirical quality of the measurement model before structural relationships were estimated.

Second, a theory-consistent structural model was estimated using loading-weighted construct scores. Each indicator was standardised and multiplied by its corresponding measurement-model loading; the weighted indicators were then aggregated within their respective constructs, and the resulting construct scores were standardised before structural estimation. Ordinary least squares (OLS) was subsequently used to estimate the three endogenous equations specified by the theoretical model: CDDC was predicted by facilitation intensity and interactive methods and relational embeddedness; digital maturity was predicted by the two facilitation dimensions and CDDC; and MSME performance was predicted by CDDC and digital maturity. This two-stage procedure was adopted to retain information from the empirically estimated measurement model while allowing the structural specification to correspond directly to the hypothesised relationships. A sensitivity check comparing loading-weighted and unit-weighted composite scores showed stable signs and substantive conclusions, although the magnitude and precision of the CDDC-to-maturity relationship varied slightly.

Inference, Predictive Assessment, and Sample Adequacy

Statistical inference was obtained from 5,000 case-resampling bootstrap draws using a fixed random seed, with 95% percentile confidence intervals used to evaluate direct and indirect effects. Statistical significance was determined from the bootstrap estimates and confidence intervals. Collinearity was assessed using variance inflation factors (VIFs), and effect sizes were calculated using $f^2 = (R^2_{\text{included}} - R^2_{\text{excluded}}) / (1 - R^2_{\text{included}})$. Explanatory performance was assessed using R^2 and adjusted R^2 , while out-of-sample predictive relevance was examined through repeated ten-fold cross-validation by comparing model prediction errors with a training-mean benchmark, following [Shmueli et al. \(2019\)](#). An a priori multiple-regression power calculation indicated that 77 observations were required for three predictors, $\alpha = .05$, power = .80, and a medium effect size of $f^2 = .15$. The sample of 120 therefore exceeded the minimum requirement and provided estimated power above .95 for the most complex equation.

Research Integrity

Because the study used a cross-sectional design, the observed relationships are interpreted as explanatory associations rather than causal effects. Particular caution is warranted because predictors and outcomes were obtained from the same facilitator informant group, which may introduce common-source variance. The analysis therefore did not treat high internal consistency as sufficient evidence of construct quality and additionally assessed discriminant validity and structural collinearity. The unusually high internal consistency of the CDDC construct and the borderline HTMT value between relational embeddedness and digital maturity were explicitly considered in interpreting the findings. The study also acknowledges that facilitator-reported MSME performance cannot substitute for independently verified sales, transaction, productivity, or profitability data. Future research should employ matched facilitator–MSME dyads, longitudinal observations, objective digital-use measures, and verified financial or operational indicators to distinguish facilitator perceptions from MSME-level outcomes and to enable appropriate modelling of nested observations where multiple MSMEs are assessed by the same facilitator.

Results**Descriptive Statistics**

The descriptive statistics indicate generally high levels across all five constructs, as presented in Table 2. Facilitation intensity and interactive methods recorded the highest mean score ($M = 4.152$, $SD = 0.708$), followed by co-created digital dynamic capabilities (CDDC) ($M = 4.099$, $SD = 0.880$) and MSME performance ($M = 3.937$, $SD = 0.791$). Relational embeddedness had a comparatively lower mean ($M = 3.753$, $SD = 0.911$), while MSME digital maturity recorded the lowest mean ($M = 3.718$, $SD = 0.824$). The minimum scores ranged from 1.500 for relational embeddedness to 2.375 for facilitation methods, whereas the maximum scores ranged from 4.875 to 5.000. The standard deviations, ranging from 0.708 to 0.911, indicate moderate variation in respondents' assessments. Overall, the descriptive results suggest that the sampled facilitation settings were characterised by relatively strong facilitation practices and CDDC, while digital maturity and relational embeddedness showed comparatively greater room for variation.

Table 2. Descriptive Statistics

Construct	Mean	SD	Minimum	Maximum
Facilitation methods	4.152	0.708	2.375	4.875
Relational embeddedness	3.753	0.911	1.500	5.000
CDDC	4.099	0.880	1.933	5.000
Digital maturity	3.718	0.824	2.000	5.000
MSME performance	3.937	0.791	2.000	5.000

Measurement Model Assessment

The measurement model results presented in Table 3 indicate satisfactory indicator reliability, internal consistency, and convergent validity across all five constructs. All indicator loadings ranged from .798 to .984, exceeding the commonly accepted threshold of .70. Cronbach's alpha values ranged from .920 to .993, while rho_A ranged from .924 to .993 and composite reliability (CR) ranged from .938 to .993, indicating strong internal consistency. The average variance extracted (AVE) values ranged from .696 to .910, exceeding the recommended minimum of .50 and supporting convergent validity. However, the CDDC construct recorded an exceptionally high Cronbach's alpha of .993 and CR of .993. Although these values indicate very high reliability, they may also suggest semantic overlap or redundancy among some of its 15 indicators. Thus, the measurement results provide strong evidence of reliability and convergent validity, while the unusually high CDDC consistency warrants caution in interpreting the construct.

Table 3. Measurement Model Analysis

Construct	Loading Range	α	rho_A	CR	AVE
Facilitation methods	.879–.963	.975	.977	.979	.854
Relational embeddedness	.825–.859	.920	.924	.938	.714
CDDC	.844–.984	.993	.993	.993	.910
Digital maturity	.798–.867	.928	.934	.941	.696
MSME performance	.851–.962	.951	.953	.963	.838

Discriminant validity was assessed using the heterotrait–monotrait ratio (HTMT), with the results reported in Table 4. Most HTMT values were below the conventional .90 threshold, indicating adequate empirical distinction among the constructs. However, the ratio between relational embeddedness and MSME digital maturity was .904, marginally exceeding the conventional criterion.

Table 4. Heterotrait-monotrait Ratio (HTMT)

Construct	Facilitation	Embeddedness	CDDC	Digital maturity	MSME Performance
Relational embeddedness	.762				
CDDC	.824	.743			
Digital maturity	.786	.904	.768		
MSME performance	.887	.790	.720	.835	

This result suggests that the two constructs are empirically close, although their conceptual meanings remain distinct: relational embeddedness captures the quality and continuity of

facilitator–MSME relationships, whereas digital maturity reflects the extent to which digital technologies are integrated into business activities. The bootstrapped confidence interval for this HTMT value remained below 1.00, providing additional support for retaining the distinction between the constructs. Nevertheless, the borderline HTMT result should be considered when interpreting the relatively large relationship between relational embeddedness and digital maturity in the structural model.

Structural Path and Hypotheses Testing

The structural path estimates reported in Table 5 show that six of the seven hypothesised direct relationships were statistically supported. Facilitation intensity and interactive methods had the strongest association with CDDC ($\beta = .625$, $SE = .079$, $p < .001$, 95% CI [.451, .760]), supporting H1, while relational embeddedness also positively predicted CDDC ($\beta = .257$, $SE = .088$, $p = .002$, 95% CI [.098, .438]), supporting H2. For digital maturity, facilitation intensity and interactive methods showed a positive but comparatively modest relationship ($\beta = .198$, $SE = .091$, $p = .025$, 95% CI [.033, .385]), supporting H3. Relational embeddedness demonstrated a substantially larger association with digital maturity ($\beta = .571$, $SE = .093$, $p < .001$, 95% CI [.373, .726]), supporting H4. In contrast, H5 was not supported: CDDC had a positive but statistically non-significant relationship with digital maturity ($\beta = .171$, $SE = .110$, $p = .127$, 95% CI [−.042, .385]).

Table 5. Structural Path and Hypotheses Testing

H	Path	β	Boot SE	t	p	95% CI	Decision
H1	Facilitation methods → CDDC	0.625	0.079	7.87	< .001	[0.451, 0.760]	Supported
H2	Relational embeddedness → CDDC	0.257	0.088	2.91	0.002	[0.098, 0.438]	Supported
H3	Facilitation methods → Digital maturity	0.198	0.091	2.18	0.025	[0.033, 0.385]	Supported
H4	Relational embeddedness → Digital maturity	0.571	0.093	6.16	< .001	[0.373, 0.726]	Supported
H5	CDDC → Digital maturity	0.171	0.110	1.56	0.127	[−0.042, 0.385]	Not supported
H6	CDDC → MSME performance	0.261	0.099	2.62	0.006	[0.078, 0.468]	Supported
H7	Digital maturity → MSME performance	0.591	0.093	6.33	< .001	[0.395, 0.758]	Supported

The remaining results in Table 5 indicate that CDDC positively predicted MSME performance ($\beta = .261$, $SE = .099$, $p = .006$, 95% CI [.078, .468]), supporting H6, while digital maturity showed the strongest direct association with performance ($\beta = .591$, $SE = .093$, $p < .001$, 95% CI [.395, .758]), supporting H7. The corresponding effect sizes further indicate that facilitation methods made a large contribution to CDDC ($f^2 = .598$), relational embeddedness

made a small-to-medium contribution ($f^2 = .101$), and relational embeddedness had a large contribution to digital maturity ($f^2 = .573$). As reported in Table 6, the structural model explained 68.8% of the variance in CDDC, 75.2% in digital maturity, and 64.5% in MSME performance. The Q^2_{predict} values were .672, .736, and .624, respectively, while model RMSE values were lower than the corresponding benchmark RMSE values. These results indicate substantial explanatory and predictive performance, although the relatively large coefficients should be interpreted cautiously given the borderline discriminant validity and common-source measurement.

Table 6. Explanatory and Predictive Quality

Endogenous Construct	R^2	Adjusted R^2	Q^2_{predict}	Model RMSE	Benchmark RMSE
CDDC	0.688	0.682	0.672	0.575	1.005
Digital maturity	0.752	0.745	0.736	0.517	1.006
MSME performance	0.645	0.639	0.624	0.615	1.004

Indirect Effect Analysis

Table 7 reports the indirect effects. Facilitation methods significantly influenced performance through CDDC ($\beta = .163$, $p = .006$, 95% CI [.047, .291]), while relational embeddedness showed a smaller but significant indirect effect through CDDC ($\beta = .067$, $p = .008$, 95% CI [.011, .164]). Facilitation methods also had a significant indirect effect on performance through digital maturity ($\beta = .117$, $p = .025$, 95% CI [.018, .239]), whereas the corresponding indirect effect of relational embeddedness was substantially stronger ($\beta = .338$, $p < .001$, 95% CI [.173, .516]). In contrast, the indirect effect of CDDC on performance through digital maturity was not significant ($\beta = .101$, $p = .127$, 95% CI [-.027, .213]). Neither of the serial pathways in which a facilitation dimension operated through CDDC and subsequently through digital maturity reached statistical significance. Overall, these findings provide greater support for a parallel-pathway interpretation than for a fully serial mediation process.

A sensitivity analysis compared unit-weighted and loading-weighted composite scores to assess the robustness of the structural estimates. The direction and substantive interpretation of the relationships remained stable across the two scoring approaches, although the magnitude and precision of the CDDC-to-digital-maturity relationship varied slightly. Such variation is plausible given the relatively high correlations among the constructs and the large number of strongly loading indicators comprising CDDC. The loading-weighted estimates were therefore retained as the primary results because they incorporate information from the measurement model when constructing the composite scores. Nevertheless, the structural findings should be interpreted as theory-consistent associations rather than definitive causal effects, particularly given the common-source design, borderline discriminant validity between some constructs, and relatively modest

sample size. Replication using independent informants and longitudinal data would provide stronger evidence for the stability and temporal ordering of these relationships

Table 7. Bootstrapped Analysis of Indirect Effects

Indirect pathway	β	Boot SE	p	95% CI	Conclusion
Facilitation methods → CDDC → Performance	0.163	0.062	0.006	[0.047, 0.291]	Significant
Relational embeddedness → CDDC → Performance	0.067	0.041	0.008	[0.011, 0.164]	Significant
Facilitation methods → Digital maturity → Performance	0.117	0.057	0.025	[0.018, 0.239]	Significant
Relational embeddedness → Digital maturity → Performance	0.338	0.091	< .001	[0.173, 0.516]	Significant
CDDC → Digital maturity → Performance	0.101	0.061	0.127	[-0.027, 0.213]	Not significant
Facilitation methods → CDDC → Digital maturity → Performance	0.063	0.038	0.127	[-0.017, 0.133]	Not significant
Relational embeddedness → CDDC → Digital maturity → Performance	0.026	0.019	0.129	[-0.006, 0.067]	Not significant

Discussion

The findings offer a more refined understanding of the role of external facilitation in achieving MSMEs' digitalisation-related outcomes. In general, facilitation appears to work through two different paths: it aids the development of adaptive digital capabilities and supports the establishment of more stable digital practices. This distinction matters because the results do not support a simple sequence in which facilitation first creates digital capabilities and those capabilities automatically produce digital maturity. Rather, the depth and quality of interaction appear important for capability creation, while the relational context is especially important for embedding digital practices. Such a perspective extends the traditional understanding of digitalisation as a primarily internal organisational process. Similar to SME digitalisation research that highlights internal strategies and skills (Eller et al., 2020; Matarazzo et al., 2021), the findings suggest that internal capability remains crucial, but its development can be substantially enabled through interaction with external actors. This interpretation is consistent with process-based studies showing that SME digital transformation involves capability building, managerial renewal, external support, and ecosystem-level adaptation rather than technology acquisition alone (Li et al., 2018; Soluk & Kammerlander, 2021; Khurana et al., 2022).

The strong association between facilitation intensity and interactive methods and CDDC indicates that adaptive capability is more likely to emerge when external support involves repeated and practical engagement. The implication is not simply that more facilitation is better, but that the form of interaction matters because demonstration, guided

practice, feedback, follow-up, and field-based problem solving provide opportunities to translate abstract digital knowledge into situated decisions. Through such interactions, facilitators can help MSMEs recognise relevant technological or market changes, evaluate feasible responses, and adjust routines based on implementation experience. This interpretation is consistent with the broader intermediary literature, which positions external actors as knowledge brokers and connectors rather than merely information providers (Crupi et al., 2020; Hafeez et al., 2025; Marinelli et al., 2024). Network-based evidence likewise shows that resource-constrained SMEs can draw on external business networks to build dynamic capabilities that facilitate digital technology adoption (Soluk et al., 2023), while execution-oriented research indicates that transformation outcomes depend on capabilities that convert digital initiatives into organisational change (Ates & Acur, 2022). The finding also resonates with evidence that research and technology organisations are expanding from technology-development roles toward broader coordination, workforce, and capability-building functions in digital transformation (Anzolin & O'Sullivan, 2025).

Relational embeddedness as an explanation for digital maturity offers a different perspective. While interactive facilitation seems especially valuable for fostering the capacity for adaptation, the continued use of digital practices appears to depend more strongly on the relational context of implementation. Digital maturity requires sustained use of digital technology, documentation, transaction processing, communication with clients, and the incorporation of digital information into decision making after initial facilitation. These activities involve risk-taking, adjustment, and occasional failure, making relational embeddedness important for continued experimentation. A facilitator who is more deeply embedded in the relationship may have better opportunities to identify hidden constraints, understand why a specific technology does not work for an entrepreneur, and tailor recommendations to the entrepreneur's circumstances. This interpretation is consistent with Granovetter's (1985) view of economic action as embedded in social relations. Recent evidence similarly shows that relational embeddedness in digital technology networks can strengthen digital dynamic capabilities, although excessive embeddedness may generate diminishing returns (Li & Wang, 2026). Related SME research also demonstrates that network capability can translate digital platform capability into better performance (Cenamor et al., 2019), while research on innovation intermediaries shows that their digital resources and capabilities shape the digital services they are able to provide to client firms (Sala-Vilar et al., 2024).

The most theoretically consequential finding concerns the absence of a statistically significant independent relationship between CDDC and digital maturity. The result challenges a simple assumption that higher levels of dynamic capability necessarily produce higher digital maturity. One explanation is that sensing, seizing, and transforming represent an adaptive capacity that does not automatically lead to the routinisation of technology use. MSMEs may be able to identify digital opportunities, evaluate possible solutions, and modify business operations without yet reaching a stage in which marketing, transactions, records, inventory management, and decision-making are consistently integrated into digital routines. This distinction is compatible with research that combines dynamic-capability and digital-maturity perspectives but treats maturity as the outcome of broader bundles of organisational actions, structures, and enablers rather than as a direct synonym for dynamic capability (Leso et al., 2024). It also aligns with evidence that dynamic capabilities contribute to managing digital transformation through multiple organisational

mechanisms (Schneider et al., 2024). In the SME context, digitalisation outcomes additionally depend on complementary conditions such as appropriate technologies, digital skills, organisational culture, and the ability to overcome legacy-system constraints (Kallmuenzer et al., 2025).

The non-significant CDDC-to-maturity relationship may also indicate that externally supported capability formation and digital-practice institutionalisation are partly complementary rather than strictly sequential processes. The significant relationships between facilitation dimensions and maturity suggest that facilitators can contribute directly to implementation through troubleshooting, contextual adaptation, follow-up, and relational support, without capability formation necessarily serving as an intermediate stage. In this sense, capability and maturity may develop through overlapping processes but at different organisational speeds. An MSME can receive sufficient practical and relational assistance to establish a digital payment or record-keeping routine before it has developed a broader capacity to systematically sense and seize emerging digital opportunities. Conversely, an entrepreneur may possess substantial adaptive capability while remaining constrained by financial resources, limited infrastructure, or weak internal routines. This interpretation is also consistent with evidence that the performance consequences of SME digital orientation can be non-linear: initial digital investment and capability development may create short-term costs before performance benefits become visible at higher levels of digital orientation (Escoz Barragan & Becker, 2025). The finding therefore cautions against treating capability, adoption, transformation, maturity, and performance as interchangeable concepts or as inevitable stages of one linear process.

In addition, the performance results help distinguish these different processes. The findings indicate that adaptive capability and digital maturity can contribute to performance through different mechanisms rather than representing successive stages of a single process. CDDC may create value through opportunity recognition, experimentation, adaptation, and reconfiguration even before digital practices are fully integrated, whereas digital maturity reflects the extent to which digital routines are embedded sufficiently to generate more continuous performance gains. This interpretation is consistent with research showing that digital capabilities are important for converting the availability of digital technologies into business outcomes, including digital export activity (Elia et al., 2021). It also accords with evidence that digital platform capability can influence SME financial performance indirectly through network capability (Cenamor et al., 2019). The results therefore help explain why previous research has reported positive relationships among digital capability, transformation, innovation, and performance while still treating these constructs as related but distinct (Prakasa & Jumani, 2024; Valdez-Juárez et al., 2024). Recently published studies in Shirkah have likewise highlighted digital transformation and FinTech-related mechanisms in explaining MSME performance (Putri et al., 2026; Rohaeni et al., 2026). The present study extends this discussion by examining the facilitation and capability-development processes that precede those performance mechanisms.

The indirect effects strengthen the interpretation of facilitation as a performance driver operating through more than one pathway. The significant indirect effect through CDDC indicates that external assistance can create performance value by improving the MSME's adaptive capacity, while the significant pathways through digital maturity show that facilitation can also create value by helping entrepreneurs establish more consistent digital practices. The stronger maturity-based pathway from relational embeddedness suggests

that trust and continuity are especially important when the objective is not merely to begin using a digital technology but to sustain it and integrate it into everyday activities. This parallel-pathway pattern is compatible with studies showing that SME transformation can be advanced by external platform or network support while capability development and operational implementation evolve through partially distinct mechanisms (Li et al., 2018; Soluk et al., 2023). Conversely, the non-significant CDDC-to-maturity indirect pathway does not support a fully serial account in which facilitation creates CDDC, CDDC necessarily produces maturity, and maturity then produces performance. Co-creation should therefore be interpreted as a complex process in which capability development and implementation may reinforce one another without following a single predetermined sequence.

However, these interpretations should be considered in light of the methodological constraints of the study. The model's explanatory and predictive power supports the viability of the observed associations but does not establish causality. The cross-sectional design does not provide temporal precedence, while the use of facilitator-reported measures for both explanatory and dependent constructs creates the possibility of common-source variance. The unusually high internal consistency of the CDDC scale may indicate overlapping items, and the borderline HTMT value between relational embeddedness and digital maturity indicates empirical closeness between these constructs. These issues are especially relevant when interpreting the comparatively large structural coefficients. At the same time, the pattern does not uniformly suggest inflated relationships, because the theoretically expected CDDC-to-maturity path was non-significant and the structural paths differed substantially in magnitude and significance. Future research should therefore combine longitudinal designs, matched facilitator-MSME dyads, objective measures of digital use, and verified business-performance indicators to test the temporal ordering and robustness of the proposed pathways.

The findings have important theoretical and practical implications for research and policy on MSME digitalisation. Theoretically, the study extends the dynamic capabilities view by showing that firm-level adaptive capabilities can be developed through structured interaction beyond organisational boundaries, while relational embeddedness can function as a microfoundation through which external knowledge becomes actionable and sustained. More importantly, distinguishing CDDC from digital maturity clarifies that the capacity to adapt is not equivalent to the institutionalisation of digital practices. This extension is consistent with contemporary work arguing that innovation intermediaries must themselves adapt their roles, resources, and service models as digital technologies reshape intermediation (Howells, 2024; Sala-Vilar et al., 2024) and that coordination among intermediaries becomes increasingly important in supporting firms' digital transformation (Anzolin & O'Sullivan, 2025). Practically, cooperative and MSME programmes should therefore evaluate facilitation not only by training frequency or technology adoption, but by the quality of joint diagnosis, experimentation, follow-up, and routine integration. Facilitators need both technical and relational competencies, while programme designs should allow enough continuity for trust and contextual understanding to develop. A tiered approach combining foundational training, field-based coaching, peer learning, and ecosystem brokerage may be more appropriate than uniform instruction, with evaluation focusing on sustained digital routines and business outcomes rather than platform registration alone.

Conclusion

This study shows that cooperative facilitation is most valuable when it functions as capability-building and relational implementation support. Facilitation intensity and interactive methods, together with relational embeddedness, were associated with stronger co-created digital dynamic capabilities. Relational embeddedness was especially important for digital maturity, while CDDC and digital maturity independently contributed to MSME performance. The results refine a simple sequential account of digital transformation: capability formation did not automatically produce maturity after facilitation dimensions were controlled. Instead, facilitation, capability, and maturity operated through parallel and complementary pathways. The practical implication is direct: MSME digitalisation programmes should be designed as sustained, trust-based, hands-on problem-solving processes and evaluated through changes in routines and performance, not only training outputs or platform registrations.

The study is limited by its cross-sectional design, the use of a single facilitator informant group, a geographically bounded sample, and potential item redundancy in the CDDC measure. Perceived performance cannot substitute for verified sales, transaction, productivity, and profitability data. Future research should employ matched facilitator-owner dyads, longitudinal observations, objective platform and financial indicators, and multi-group comparisons across sectors and regions. The CDDC scale should be shortened and revalidated, and future models should test institutional and infrastructural conditions as boundary factors. These extensions would determine when external facilitation produces durable firm-level capabilities and when ecosystem constraints prevent those capabilities from becoming mature digital practice.

Authors' Declaration

The authors developed the research problem and study design. The authors analyzed the data, analyzed the findings, and critically analyzed the outcome of the study. The authors also reviewed the manuscript and approved the final version.

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