e-ISSN: 2686-1461
p-ISSN: 2686-1453
Volume 8 No. 2 October 2026

The Role of Triple Helix Collaboration in Creating Inclusive Digital Entrepreneurship

Tika Koeswandi, Dede Kurnia, Azizah Fauziyah, Ismail Yusuf, Nandang Nandang, Nizza Nadya Rachmani, Mira Nurfitriya
Entrepreneurship, Universitas Pendidikan Indonesia
Email: tikakoeswandi@upi.edu; dedekurnialagi@upi.edu; azizahfauziyah@upi.edu; ismail_yusuf@upi.edu; nandang@upi.edu; nadyarachmani@upi.edu; mira.nurfitriya@upi.edu.

Accepted:	Accepted After Revision:	Published:
3 August 2026	2 September 2026	30 October 2026

Abstract

Digital transformation has become a critical pathway for expanding economic participation, yet entrepreneurs with disabilities often remain excluded due to limited access, skills, and support systems. Triple helix collaboration, typically involving association, academia, and business, has been proposed as a model to bridge this gap, but its specific role in fostering inclusive digital entrepreneurship among disability entrepreneurs communities remains underexplored. This study aims to examine the role of triple helix collaboration, with disability associations replacing the government pillar, in creating inclusive digital entrepreneurship among members of a community. A qualitative descriptive approach was employed, using in-depth, semi-structured interviews as the primary data collection technique. Informants consisted of eight participants representing three stakeholder groups: entrepreneurs with disabilities affiliated with community, representatives of the disability association coordinating the community, and academic or business actors involved in digital empowerment programs. Data were analyzed using thematic analysis, involving reduction, categorization, and interpretation to identify recurring patterns. The findings indicate that collaboration among the three actors has facilitated access to digital payment systems and basic digital literacy training for disability entrepreneurs. However, gaps remain in the accessibility design of digital platforms and the continuity of mentoring programs, with each actor's contribution unevenly distributed, the association providing advocacy and member coordination, academia offering training, and business contributing limited technological access. These findings suggest that this adapted triple helix model can meaningfully support inclusive digital entrepreneurship, but its effectiveness depends on stronger coordination, accessibility-oriented technology design, and sustained, needs-tailored mentoring. This study contributes to the literature on inclusive innovation ecosystems.

Keywords: Triple Helix, Collaboration, Entrepreneurship, Digital Inclusive.

1 INTRODUCTION

Digital transformation has fundamentally reshaped how entrepreneurs access markets, manage transactions, and build sustainable livelihoods. Digital payment systems, e-commerce platforms, and online marketing tools have lowered barriers to entry for small-scale entrepreneurs, enabling participation beyond the limits of physical location and capital [1]. Systematic reviews of MSME digitalization confirm that such technology adoption significantly enhances operational efficiency, market access, and long-term social, economic, and environmental sustainability [2]. However, this transformation has not been equally distributed. In the Indonesian context, digital MSME growth carries a persistent risk of reproducing inequality of access and reinforcing platform market dominance if inclusivity is not deliberately built into digitalization strategies [3].

Entrepreneurs with disabilities in particular continue to face compounded barriers to digital participation. Systematic evidence shows that these barriers are multidimensional, spanning technological (limited access to assistive tools and digital infrastructure), psychological (low digital self-efficacy), institutional (weak policy implementation), and social (stigma and exclusion from networks) domains, which collectively restrict their ability to establish and sustain digital enterprises [4], [5]. In the Indonesian context specifically, digital entrepreneurship among persons with disabilities remains constrained by digital illiteracy, heavy reliance on volunteer support, and inadequate infrastructure, despite the presence of community-based initiatives that attempt to bridge this gap [5].

Publishing services by BPPM UNIBI
This is an open access article under the CC-BY-SA license (https://creativecommons.org/licenses/by-sa/4.0/)

Addressing this gap requires more than individual effort; it demands collaborative ecosystems capable of mobilizing resources, expertise, and advocacy across multiple actors. The triple helix model, originally conceptualized around the collaboration of government, academia, and business in driving innovation, has been widely applied to explain how coordinated multi-actor collaboration accelerates technology adoption and entrepreneurial development, with empirical evidence showing that inefficient coordination among these three helices constrains a country's innovation output [6]. At the operational level, effective university, industry, government collaboration has been shown to depend heavily on structured enablers such as trust-building, shared facilities, and joint innovation activities [7], and systematic literature reviews further confirm that such cooperation offers significant, underutilized potential for strengthening MSME competitiveness [8]. Building on this foundation, subsequent scholarship has extended the model beyond its original three actors, for instance, incorporating civil society and community organizations as a fourth "N-Helix" agent to respond more directly to the needs of underserved stakeholders during crises such as the COVID-19 pandemic [1], and arguing that the standard triple helix configuration is often insufficient on its own, calling for the inclusion of additional players and alternative cooperation models to sustain genuinely inclusive innovation [9].

In the context of disability entrepreneurship, government involvement is not always the most immediate or accessible source of support. Disability associations often function as the primary institutional actor engaging directly with entrepreneurs with disabilities, coordinating access to resources, training, and advocacy more directly than formal government bodies. This dynamic is illustrated by community-based pentahelix collaboration involving academics, businesses, community groups, government, and media to support visually impaired micro-entrepreneurs in Denpasar, Bali, where the community and business actors, rather than government alone, played the most direct role in building financial literacy, digital record-keeping, and market access [10]. This suggests the relevance of an adapted triple helix model, in which a disability association assumes the coordinating role traditionally held by government, working alongside academia and business to support inclusive digital entrepreneurship.

Despite growing scholarly interest in digital inclusion and triple helix collaboration separately, limited research has examined how these two areas intersect specifically within disability entrepreneurship communities, particularly through an adapted collaborative model involving associations rather than government. This study therefore aims to examine the role of triple helix collaboration, with a disability association replacing the government pillar, in creating inclusive digital entrepreneurship among members of the entrepreneurs disability community. The findings are expected to contribute both theoretically, by extending the triple helix framework to disability-inclusive contexts, and practically, by informing associations, academic institutions, and businesses on how to design more effective, accessible support systems for entrepreneurs with disabilities.

2 LITERATURE REVIEW

2.1 Triple Helix Collaboration Framework

The triple helix model refers to coordinated interaction among three institutional actors, conventionally government, academia, and business, that jointly mobilize resources, knowledge, and networks to accelerate innovation and entrepreneurial development [6]. Effective collaboration under this model depends on structured enablers such as trust-building between individual actors, shared facilities, and joint innovation activities [7]. In this study, the model is adapted such that a disability association assumes the coordinating function conventionally held by government, given that associations often engage more directly with entrepreneurs with disabilities than formal government bodies do [10]. This adapted framework is referred to here as an association-led triple helix collaboration. Drawing on the reviewed literature, triple helix collaboration in this study is assessed through the following indicators:

Table 1. Indicator of Triple Helix Collaboration

Dimension	Indicator	Source
Trust-building	Consistency and clarity of role commitment among actors	[7]
Resource-sharing	Access to shared facilities, technology, or platforms	[7]
Joint activity	Frequency and depth of joint training, mentoring, or research programs	[7], [8]
Coordinating function	Extent to which the association performs advocacy, legalization, and mediation roles typically held by government	[10]
Multi-actor extension	Involvement of additional stakeholders (e.g., community organizations) beyond the classical three actors	[1], [9]

Cross-country empirical evidence demonstrates that inefficient coordination among the three helices measurably constrains a nation's innovation output, underscoring that the quality, not merely the presence, of collaboration determines outcomes [6]. At the operational level, studies of university, industry partnerships confirm that collaboration built on trust and shared resources yields greater innovation and digital transformation outcomes [7], and literature reviews spanning more than two decades of university, industry

cooperation further show that such partnerships hold significant, often underutilized, potential for strengthening MSME competitiveness specifically [8]. More recent scholarship extends the classical model, incorporating community organizations as a fourth "N-Helix" agent to more directly respond to underserved stakeholders during crises such as the COVID-19 pandemic [1], and argues that the standard three-actor configuration is frequently insufficient on its own, calling for alternative cooperation models to sustain genuinely inclusive innovation [9]. Empirically, a pentahelix collaboration in Denpasar, Bali illustrates this extension in practice: community and business actors, rather than government, played the most direct role in building financial literacy, digital record-keeping, and market access for visually impaired micro-entrepreneurs [10] providing direct precedent for the association-led model adopted in this study.

2.2 Digital Entrepreneurship for Inclusive Community

Digital entrepreneurship refers to entrepreneurial activity that leverages digital technology, such as digital payment systems, e-commerce platforms, and online marketing tools, to overcome traditional constraints of location and capital [1]. This activity is understood as emerging specifically at the intersection of digital technology and entrepreneurial processes, fundamentally reshaping how ventures are created, financed, and scaled [11]. When extended to inclusive digital entrepreneurship, this activity is further defined as one that remains equally accessible to vulnerable groups, including persons with disabilities, rather than benefiting only those already digitally capable [1], [3]. This distinction is important because digitalization does not distribute benefits evenly by default; without deliberate inclusive design, it risks reinforcing existing inequality of access and platform dominance [3].

Based on the systematic barriers identified in the literature, this study assesses inclusive digital entrepreneurship for the disability community through four indicator dimensions:

Table 2. Indicator of Digital Entrepreneurship for Inclusive Community

Dimension	Indicator	Source
Technological	Access to assistive tools and adequate digital infrastructure	[4]
Psychological	Level of digital self-efficacy and confidence in using technology	[4]
Institutional	Availability and implementation of supportive, accessibility-oriented policy	[4], [5]
Social	Degree of stigma faced and level of inclusion in professional/business networks	[4]

A systematic review synthesizing recent evidence identifies these four barrier dimensions, technological, psychological, institutional, and social, as interrelated and mutually reinforcing obstacles that collectively restrict the ability of persons with disabilities to establish and sustain digital enterprises [4]. This is consistent with findings that digital self-efficacy and attitude toward digital devices are significant psychological determinants of digital literacy among persons with disabilities [15], and with evidence that structural stigma continues to shape how persons with disabilities are perceived and included, or excluded, within business and customer-facing environments [17]. On the institutional side, entrepreneurship training programs for persons with disabilities remain largely inaccessible, limiting the extent to which policy and training infrastructure can translate into real entrepreneurial capacity [16]. Financial access presents an additional compounding barrier: evidence shows that fintech adoption alone does not guarantee improved financial well-being for persons with disabilities unless accompanied by genuine financial access, knowledge, and supportive behavior [19], a pattern echoed in scoping reviews showing that financial exclusion remains a persistent human rights and health equity issue for persons with disabilities globally [20].

Complementary evidence from Southeast Asia further shows that even where community-based initiatives exist to support disability entrepreneurship, digital illiteracy, heavy reliance on volunteer support, and inadequate infrastructure continue to constrain scalability [5]. This aligns with broader findings from community-based inclusive development programs for persons with disabilities, which show that successful implementation depends heavily on the level of community participation and locally driven, rather than externally imposed, support structures [18]. At the macro level, systematic reviews of MSME digitalization more broadly confirm that technology adoption enhances operational efficiency and market access [2], yet in the Indonesian context this growth simultaneously risks widening inequality of access if inclusivity is not deliberately embedded into digital strategies [3]. Together, these studies indicate that inclusive digital entrepreneurship requires not only individual capacity-building but structured, collaborative support, directly motivating the integration of the triple helix framework (Section 2.1) with digital entrepreneurship outcomes examined in this study.

3 RESEARCH METHODS

3.1 Research Design

This study employed a qualitative approach with a descriptive case study design. This design was selected because the research aims to explore in depth how an

adapted triple helix collaboration, involving a disability association, academia, and business, operates in practice to support inclusive digital entrepreneurship, rather than to measure or statistically generalize outcomes. A case study approach allows the researcher to examine the collaboration process, actor roles, and barrier-reduction mechanisms within a specific, bounded community context.

3.2 Research Setting and Subject

This research was conducted within disability entrepreneur community and entrepreneurship study program association, located in Denpasar, Bali. This setting was selected purposively because it represents an organized community in which entrepreneurs with disabilities are coordinated by an association rather than a government agency, making it directly relevant to the association-led triple helix model examined in this study.

3.3 Informants and Sampling Technique

Informants were selected using a purposive sampling technique. Purposive sampling is widely used in qualitative research to identify and select information-rich cases relevant to the phenomenon under study; combining criterion-based sampling strategies is considered more appropriate than relying on a single strategy when a study aims to capture perspectives from multiple, distinct stakeholder groups [21]. Informants were grouped into four categories representing the actors relevant to the adapted triple helix model:

1. Entrepreneurs with disabilities: members of the community actively engaged in digital business activities (e.g., online selling, digital payment adoption, social media marketing).
2. Association representatives/coordinators: individuals responsible for member coordination, advocacy, and liaising with external stakeholders.
3. Academic actors: lecturers, researchers, or university-affiliated parties involved in training, mentoring, or research collaboration with the community.

The total number of informants were 8 determined based on data saturation, where data collection is considered sufficient once no new themes emerge from additional interviews.

3.4 Data Collection Technique

Data were collected through three complementary techniques to enable triangulation:

1. In-depth, semi-structured interviews: the primary data collection method, guided by an interview protocol developed around the research objectives while allowing flexibility to explore emerging themes.
2. Participatory observation: conducted to observe firsthand how digital tools are used by entrepreneurs with disabilities and how collaborative activities (training, mentoring, platform use) take place in practice.
3. Documentation study: reviewing supporting documents such as association reports, training materials, program records, or partnership agreements relevant to the collaboration.

Triangulation across these three data sources strengthens the validity of the findings by enabling convergence of information from different sources rather than relying on a single method or informant group [22].

3.5 Research Instrument

The main instrument in this study was the researcher, supported by an interview guide, a voice recorder, and field notes. The interview guide was structured around four thematic areas: (1) informants' experience with digital transformation, (2) the role and contribution of each triple helix actor, (3) barriers encountered in achieving inclusive digital entrepreneurship, and (4) suggestions for strengthening collaboration.

3.6 Data Analysis Technique

Data were analyzed using thematic analysis, an accessible and theoretically flexible method for identifying, analyzing, and reporting patterns within qualitative data [23]. The analysis followed three interrelated stages: (1) data reduction, in which raw interview transcripts and field notes were condensed and organized into relevant categories; (2) data display, in which reduced data were organized into thematic matrices to identify patterns across informant groups; and (3) conclusion drawing and verification, in which themes were interpreted in relation to the research objectives and cross-checked against triangulated data sources. Particular attention was given to ensuring that emerging themes genuinely reflect the meaning of the data set rather than the researcher's preconceptions [24].

Table 3. Semi-structured Thematic Analysis

	Theme	Sub-Theme	Question	Probing / Keywords
1	Digital Transformation	Technology Adoption	How have you experienced or supported the use of digital technology in the business?	digital payment, marketplace, social media
		Tool Accessibility	Are the technologies/platforms used sufficiently	assistive tools, universal

	Theme	Sub-Theme	Question	Probing / Keywords
			accessible for your needs?	design, technical barriers
		Digital Self-Confidence	How confident are you in using or teaching this digital technology?	self-efficacy, fear of mistakes, comfort level
2	Cross-Actor Collaboration	Roles & Coordination	What role does each actor (association, academia, business) play in supporting inclusive digital entrepreneurship?	facilitation, advocacy, liaison
		Trust-Building & Resource-Sharing	How is trust built, and how are facilities/funding/technology shared among actors?	trust-building, resource-sharing, commitment consistency
		Additional Actors	Are there other parties involved beyond the association–academia–business triad?	media, other communities, government
3	Social & Institutional Environment	Stigma & Social Acceptance	What has been your experience with social acceptance or stigma in running/supporting this business?	discrimination, prejudice, business networks
		Policy & Institutional Support	What barriers and needs exist regarding policy or affirmative programs supporting this business?	regulation, incentives, specialized training
4	Financial Access & Sustainability	Digital Financial Inclusion	What has been your access to and experience with digital financial services (QRIS, e-wallets)?	financial literacy, identity verification, transaction ease
		Future Needs & Program Sustainability	What support or continuity is still needed going forward?	further training, capital, program scalability

3.7 Data Validity

To ensure the credibility and trustworthiness of the findings, this study applied source triangulation (comparing information across the four informant categories) and technique triangulation (comparing interview data with observation and documentation results) [22]. Member checking was also conducted by sharing interpreted findings with key informants to confirm accuracy and address potential misinterpretation, consistent with recommended criteria for establishing rigor in thematic analysis [24].

4 RESULTS AND DISCUSSION

4.1 Results

4.1.1 Digital Transformation

4.1.1.1 Technology Adoption

Findings from the interviews indicate that digital tools were not merely present in an incidental or superficial way, but were actively and deliberately integrated into both the training process delivered by academic actors and the daily business practices of entrepreneurs with disabilities. From the academic perspective, digital adoption was framed as a multi-layered curriculum component rather than a single isolated tool. R1 described a training approach that combines several distinct technologies simultaneously, marketplaces, social media, artificial intelligence, and QRIS, suggesting that academic mentoring is designed to expose entrepreneurs to a broad digital ecosystem rather than teaching one platform in isolation.

R2: "*We mentor SMEs using Google Business Profile, Canva, and digital bookkeeping.*"

This is complemented by R2's account, which shifts the focus slightly from marketing-oriented tools toward operational and administrative digital literacy, specifically Google Business Profile, Canva, and digital bookkeeping. Taken together, these two academic accounts suggest that the training model being delivered spans both the front-end of digital entrepreneurship (customer-facing marketing and sales) and its back-end (business management and financial record-keeping), indicating a fairly comprehensive pedagogical approach rather than a narrow, one-dimensional digital skills program.

From the entrepreneur's side, R3's account provides direct evidence that this training content is not remaining abstract but is being translated into actual business practice.

R3: "*I market through Instagram, WhatsApp Business, and use QRIS.*"

The specific mention of Instagram, WhatsApp Business, and QRIS mirrors almost exactly the categories of tools introduced by the academic informants, which suggests a meaningful degree of alignment between what is being taught and what is being implemented on the ground. This alignment is an important signal for the broader triple helix framework of this study, as it indicates that the knowledge-transfer function of the academic actor is not merely occurring in a training room but is demonstrably reaching entrepreneurs with disabilities and translating into concrete marketing and financial transaction practices, rather than remaining confined to a training-room

exercise. R4 reinforced this pattern, noting that "marketplace and simple design apps help promote products," a response consistent with R3's and pointing to a shared reliance on promotion-oriented digital platforms among entrepreneurs.

The academician, association representatives and entrepreneurs with disabilities, appear to occupy a bridging role in this technology-adoption picture rather than a purely training- or advocacy-based one. R5 explained that "association representatives connects universities with SMEs for digital training," while R6 added, "We provide mentors and networks across campuses," positioning association representatives as an intermediary that channels academic digital knowledge toward disabled entrepreneurs across multiple locations rather than a single institution. entrepreneurs with disabilities's R7 similarly noted that the organisation "introduces accessible digital marketing," while R8 offered a more personal framing, observing that "digital technology expands opportunities despite mobility limitations." Read together, these accounts suggest that technology adoption in this ecosystem is actively mediated by academic trainers and community/association actors who tailor and channel digital knowledge to the specific circumstances of entrepreneurs with disabilities, rather than being left to entrepreneurs to acquire independently.

4.1.1.2 Tool Accessibility

While digital adoption is clearly underway, informants across all four actor groups converged on the observation that accessibility remains incomplete. From the academic side, R1 acknowledged that "not all platforms fully implement universal design," a concern echoed by R2, who noted that "commercial platforms still have accessibility gaps." These reflections from trainers are corroborated, and made concrete, by the entrepreneurs themselves: R3 reported that "some marketplace buttons are unreadable by screen readers," while R4 pointed out that "promotional videos often lack subtitles." The convergence between the academic actors' general observation and the entrepreneurs' specific, lived experience strengthens the credibility of this finding, the accessibility gaps identified in principle by trainers are the same gaps entrepreneurs encounter directly in practice.

The academician framed this less as a platform-design issue and more as a mentoring gap. R5 stated that "accessibility training is still needed," and R6 observed that "many platforms require direct mentoring," while entrepreneurs with disabilities's R7 and R8 added that "members need more accessibility features" and that "many users are unaware of built-in accessibility tools," respectively. Taken together, this sub-theme suggests that accessibility barriers operate on two levels simultaneously: structural limitations built into the platforms themselves, and a separate knowledge gap regarding the accessibility features that do already exist but remain underused.

4.1.1.3 Digital Self-Confidence

Despite these barriers, informants described a broadly positive trajectory in digital self-confidence, one explicitly linked to sustained mentoring rather than one-off training. R1 reported feeling "confident after regular AI training," and R2 similarly noted that "confidence grows through implementation," suggesting that from the trainers' vantage point, confidence is less a fixed trait than an outcome of repeated, hands-on practice. This is directly mirrored in the entrepreneurs' own accounts: R3, who described having been "initially afraid" of digital tools, reported being "now confident," while R4 attributed increased confidence to mentoring.

The academician framed this confidence-building process at a more collective level: R5 pointed to how "collaboration builds confidence," R6 to the benefit of "cross-campus learning," R7 to the continued importance of mentors, and R8 to the role of ongoing practice. Across all four actor groups, then, confidence emerges not as something entrepreneurs are simply expected to already have, but as a capacity actively built through repeated exposure, mentoring relationships, and cross-institutional collaboration.

4.1.2 Cross-Actor Collaboration

4.1.2.1 Roles & Coordination

Findings on role differentiation point toward a fairly clear, if informally defined, division of labour among the four actor groups in this triple-helix-plus-community model. Academic informants positioned themselves primarily as sources of knowledge and research: R1 stated simply that "academia provides knowledge," while R2 elaborated that "universities contribute research." Entrepreneurs, in turn, described themselves as the implementing and feedback-generating end of this relationship, R3 noted that "entrepreneurs implement ideas," and R4 added that "businesses provide feedback," indicating that the flow of knowledge is not depicted as strictly one-directional but as something that loops back from practice into training.

The academician occupy a coordinating and advocacy position that sits between these two poles. R5 described association representatives's role in terms that "association representatives coordinates collaboration," and R6 added that "association representatives shares best practices," while entrepreneurs with disabilities's R7 and R8 framed their organisation's role more around needs-identification and rights-based advocacy, stating

respectively that " identifies member needs" and "entrepreneurs with disabilities advocates equal opportunities." This distribution of roles, knowledge-provider, implementer, coordinator, and advocate, suggests a functioning, if informal, ecosystem in which no single actor is expected to carry out the full cycle of training, implementation, coordination, and advocacy alone.

4.1.2.2 Trust-Building & Resource-Sharing

Trust and resource-sharing were consistently linked, across informants, to the consistency and practical relevance of collaboration rather than to formal agreements or contracts. R1 attributed trust to "consistent mentoring," while R2 emphasised that "entrepreneurs are involved in planning," suggesting that from the academic side, trust is built through both reliability over time and participatory inclusion in decision-making. Entrepreneurs echoed this practical orientation: R3 stated that "practical support builds trust," and R4 that "relevant assistance increases commitment," reinforcing the idea that trust is earned through tangible, applicable help rather than symbolic gestures.

The academician framed resource-sharing in more structural terms: R5 pointed to "shared commitment" as what "enables resources," R6 highlighted "clear task division," R7 emphasised "common goals," and R8 stressed that "long-term collaboration matters." Together, these accounts suggest that trust and resource-sharing in this ecosystem function less as a formal governance mechanism and more as an accumulated, relationship-based outcome of consistent, practically-oriented, and long-term engagement among all four actor groups.

4.1.2.3 Additional Actors

When asked whether actors beyond the association–academia–business triad were involved, informants named a notably wide and non-overlapping range of additional parties, which itself suggests that the real-world ecosystem extends well beyond the triple-helix framework as narrowly defined. R1 pointed to "local government," R2 to "media," R3 to "banks," and R4 to "local communities," indicating that entrepreneurs and academic informants each recognise a different additional layer of support, from formal regulatory bodies to informal social networks.

Among the associative informants, R5 identified "technology companies," R6 named "business incubators," R7 pointed to "NGOs," and R8 mentioned the "private sector." The sheer diversity of these responses, spanning government, media, finance, community, technology, incubation, civil society, and the private sector, suggests that inclusive digital entrepreneurship in this context is sustained by a considerably broader and more distributed network of stakeholders than the core triad alone, even if that triad remains the primary structural relationship examined in this study.

4.1.3 Social & Institutional Environment

4.1.3.1 Stigma & Social Acceptance

Informants generally described stigma as a diminishing, though not yet eliminated, feature of the social environment surrounding disability entrepreneurship. R1 observed that "stigma is decreasing," while R2 argued more normatively that "competence should be prioritised" over disability status, together suggesting both an empirical trend and a prescriptive stance among the academic informants. Entrepreneurs' own accounts partially support this trajectory while also signalling that it remains incomplete: R3 reported that "customers value product quality," implying that market-based acceptance is, in practice, already occurring, whereas R4 cautioned that "some prejudice remains," a reminder that improvement has not been uniform across contexts.

The associative informants linked this shift explicitly to institutional and collaborative efforts: R5 credited universities with promoting inclusion, R6 stated that "collaboration reduces stigma," R7 pointed to community support as a confidence-building mechanism, and R8 observed that "success stories inspire others." Read as a whole, this sub-theme suggests that stigma reduction is being driven less by passive social change and more by active, visible demonstrations of competence and success, reinforced by institutional and community backing.

4.1.3.2 Policy & Institutional Support

On policy and institutional needs, informants across all actor groups identified gaps, but each pointed to a distinct dimension of what is missing, suggesting that policy support is currently uneven rather than absent altogether. R1 called for "sustainable affirmative programmes," implying that existing initiatives may be seen as short-term or project-based rather than embedded, while R2 emphasised the specific need for "post-training mentoring," a concern that echoes the confidence and technology-adoption findings above, where sustained support was repeatedly valued over one-off training. Entrepreneurs framed their needs in more immediately practical terms: R3 called for "simpler business assistance," and R4 for "wider access to finance."

The associative informants, meanwhile, articulated needs at a more systemic, regulatory level: R5

called for "inclusive regulations," R6 for "stronger inter-ministerial coordination," R7 for "disability-specific programmes," and R8 for "inclusive incentives." Taken together, these responses trace a policy gap that spans from the macro level (regulation and inter-ministerial coordination) down to the micro level (simplified assistance and continued mentoring), indicating that institutional support is needed at multiple levels of the system simultaneously rather than at any single point.

4.1.4 Social & Institutional Environment

4.1.4.1 Digital Financial Inclusion

Digital financial tools, and QRIS in particular, emerged as an area of relatively advanced adoption compared with some of the other digital tools discussed above, though informants still flagged specific gaps. R1 credited QRIS with improving "transparency," while R2 cautioned that "financial literacy remains important," suggesting that from the academic perspective, the technology itself is less of a bottleneck than entrepreneurs' underlying financial understanding. This is borne out directly by the entrepreneurs' own reports of use: R3 confirmed "regular QRIS use," and R4 noted that "e-wallets ease payments," indicating that digital payment tools have moved from pilot adoption into routine business practice for at least some entrepreneurs.

The associative informants framed their role as encouraging and supporting this adoption: R5 stated a wish to "encourage digital payments," R6 pointed to the value of "digital finance training," while R7 raised a more specific structural barrier, "identity verification challenges," that may particularly affect entrepreneurs with disabilities depending on the documentation required, and R8 simply noted the "growing adoption" observed overall. This sub-theme suggests that while digital financial inclusion is progressing well at the level of basic tool use, literacy and identity-verification barriers remain the more pressing unresolved issues.

4.1.4.2 Future Needs & Program Sustainability

When asked about what continued support was still needed going forward, informants' responses converged on a shared theme of continuity and scale rather than the introduction of entirely new interventions. R1 called for "long-term mentoring," and R2 for an expanded "research collaboration," both again reinforcing the pattern, seen elsewhere in these findings, that sustained rather than one-off engagement is what informants value most. Entrepreneurs' priorities pointed toward growth: R3 wanted "wider market access," and R4 sought "advanced AI training," suggesting that, having already adopted foundational digital and financial tools, entrepreneurs are now looking toward more advanced capabilities and expanded reach.

The associative informants articulated needs at a more institutional and systemic scale: R5 proposed a "national collaboration model," R6 emphasised the need for "monitoring and evaluation," R7 called for an "inclusive business support centre," and R8 stressed the importance of "multi-stakeholder commitment." Collectively, these responses suggest that the future sustainability of this ecosystem depends less on introducing new pilot programmes and more on formalising, scaling, and institutionally embedding the collaborative practices that informants describe as already underway.

4.2 Discussion

4.2.1 Role of Triple Helix Collaboration in Creating Inclusive Digital Entrepreneurship

The role-differentiation findings strongly support the core logic of the triple helix model [6], [9] and the university-industry collaboration literature [7], [8]: academic, entrepreneurial, and associative informants each describe complementary, non-overlapping functions, knowledge-provider, implementer, and coordinator/advocate respectively. This pattern closely parallels Dwijayanti et al.'s [10] pentahelix study of visually impaired MSMEs in Denpasar, which similarly found multiple synergising actors driving economic independence among disabled entrepreneurs, lending direct, context-specific support to the present findings. Trust and resource-sharing, in turn, are consistently described as accumulated through consistency and practical relevance rather than formal contracts, a pattern consistent with Xu et al.'s [13] emphasis on relational proximity as a driver of interorganizational coinnovation, and with Khiawnoi et al.'s [14] finding that long-term, relationship-based commitment underpins community enterprise sustainability.

Where the findings push beyond the classic triad is in the range of additional actors informants named unprompted: local government, media, banks, local communities, technology companies, business incubators, NGOs, and the private sector. Where [6] and [9] centre the model on academia, industry, and government alone, this breadth aligns far more closely with Carayannis and Campbell's [12] quadruple helix, which explicitly incorporates civil society and media, and with the pentahelix structure documented by Dwijayanti et al. [10] and the N-Helix stakeholder response described by Ibáñez et al. [1]. The collaboration described by informants, in other words, does not simply confirm the triple helix; it empirically motivates extending it, with associative organisations functioning not as one node among many equals, but as the specific bridge that converts generic academic and government resources into disability-accessible form.

Three points of synthesis emerge from reading these findings together against the literature. First, a mediated-adoption pattern recurs across both digital-technology and financial-inclusion findings: individual-level adoption theories such as [11], [15], [19], and [20] explain part of the picture, but the data show that associative and academic actors actively scaffold adoption for entrepreneurs with disabilities, a mediating layer that is under-specified in the individual-level literature.

Second, the collaboration findings suggest that the triple helix framework [6], [7], [8], [9], while a useful starting point, is empirically insufficient for this population; the data instead support a disability-specific N-Helix/pentahelix structure consistent with [1], [10], and [12], but with a distinctive feature not previously foregrounded: associative organisations function not merely as one node among many, but as a translating bridge that converts generic academic and government resources into disability-accessible form.

Third, the accessibility and policy findings together reveal a two-level and multi-level gap structure, respectively: accessibility barriers exist simultaneously at the platform-structural and user-awareness levels, while policy gaps exist simultaneously at the macro, meso, and micro levels. Neither of these stratified structures is made fully explicit in the individual studies reviewed [4], [15], [16], suggesting that the contribution of this study lies less in identifying entirely new barriers and more in showing how previously separately-reported barriers are layered and co-occurring, and how collaboration currently functions as the main mechanism holding that layered system together.

5 CONCLUSION

This study set out to examine how digital transformation, cross-actor collaboration, the social and institutional environment, and financial access and sustainability jointly shape inclusive digital entrepreneurship among persons with disabilities. Across eight informants spanning academia, entrepreneurs with disabilities, and two associative organisations, the findings show that these four dimensions are not independent but interlocking: technology and financial tools are adopted through mentoring rather than in isolation, confidence is built relationally rather than assumed as a fixed trait, stigma is actively reduced through visible competence and institutional backing rather than fading passively, and policy needs stack up from national regulation down to day-to-day business assistance.

Read against the existing literature, the findings largely confirm established theory, particularly the triple helix model [6], [7], [8], [9] and individual-level accounts of digital and financial adoption among persons with disabilities [11], [15], [19], [20], while also extending it in three specific ways. First, digital and financial technology adoption in this context is mediated: associative organisations translate generic academic and institutional knowledge into disability-accessible practice, rather than entrepreneurs adopting technology directly and independently. Second, the collaboration structure itself is broader than a classic triad; the range of additional actors named by informants supports a disability-specific N-Helix/pentahelix structure consistent with [1], [10], and [12]. Third, both the accessibility and policy barriers identified are layered rather than singular, operating simultaneously at the platform/awareness level and at the macro/meso/micro level respectively, a structure not made fully explicit in the individual studies reviewed [4], [16].

These findings are synthesised into the Bridged N-Helix Model of Inclusive Digital Entrepreneurship and five accompanying propositions (P1–P5), which together offer a testable account of how associative actors, digital confidence, accessibility, policy, and financial inclusion relate to one another. For practice, the findings suggest that programmes aiming to support disability-inclusive digital entrepreneurship should invest deliberately in the bridging role of associative organisations, address accessibility at both the platform and the awareness level, and coordinate policy support across governance levels rather than at a single level alone. For academic actors and universities, the findings suggest that training programmes are most effective when paired with sustained, relationship-based mentoring rather than one-off sessions.

This study is limited by its qualitative design and its reliance on eight informants drawn from a specific set of associative organisations, which constrains the generalisability of the findings beyond this context. The propositions advanced here are accordingly offered as a starting point for further inquiry rather than as generalised claims. Future research could test the Bridged N-Helix Model and its five propositions using larger and more geographically diverse samples, employ quantitative or mixed-methods designs to examine the relationships among the model's components, and examine whether the mediated-adoption pattern identified here extends to other underserved entrepreneurial populations beyond persons with disabilities.

REFERENCES

[1] M. J. Ibáñez, M. Guerrero, C. Yáñez-Valdés, and S. Barros-Celume, "Digital social entrepreneurship: The N-Helix response to stakeholders' COVID-19 needs," Journal of Technology Transfer, 2021, doi: 10.1007/s10961-021-09855-4.

[2] L. F. Panduwinata, W. T. Subroto, and N. C. Sakti, "Digitalization on micro, small, and medium enterprises (MSMEs): A systematic literature review," International Journal of Economics, Commerce, and Management, vol. 2, no. 1, pp. 397–409, 2025, doi: 10.62951/ijecm.v2i1.435.

[3] S. M. Pakaya, I. T. Kartika, M. A. Mursalim, and A. W. Thomas, "The role of digital MSMEs in achieving the SDGs: Inclusivity, inequality of access, and platform market dominance in Indonesia," SOSIOHUMANIORA: Jurnal Ilmiah Ilmu Sosial dan Humaniora, vol. 12, no. 1, pp. 101–116, 2026, doi: 10.30738/sosio.v12i1.20837.

[4] A. A. Abdul Rashid, I. A. Jumbri, and S. A. H. Al-Shami, "Barriers to digital entrepreneurship among persons with disabilities: A systematic review," International Journal of Research and Innovation in Social Science, vol. 9, no. 10, 2025, doi: 10.47772/IJRISS.2025.910000436.

[5] A. K. Widagdo, R. Rahmawati, R. A. Purnomo, N. I. Jaafar, and U. Markhumah, "Advancing disability inclusion through social and digital entrepreneurship in ASEAN," International Journal of Innovative Research and Scientific Studies, vol. 8, no. 3, pp. 1139–1152, 2025, doi: 10.53894/ijirss.v8i3.6764.

[6] F. Fidanoski, K. Simeonovski, T. Kaftandzieva, M. Ranga, L.-P. Dana, M. Davidovic, M. Ziolo, and B. S. Sergi, "The triple helix in developed countries: When knowledge meets innovation?," Heliyon, vol. 8, no. 8, e10168, 2022, doi: 10.1016/j.heliyon.2022.e10168.

[7] N. Evans, A. Miklosik, and J. T. Du, "University-industry collaboration as a driver of digital transformation: Types, benefits and enablers," Heliyon, vol. 9, no. 10, e21017, 2023, doi: 10.1016/j.heliyon.2023.e21017.

[8] E. Tereshchenko, E. Salmela, E. Melkko, S. K. Phang, and A. Happonen, "Emerging best strategies and capabilities for university–industry cooperation: Opportunities for MSMEs and universities to improve collaboration. A literature review 2000–2023," Journal of Innovation and Entrepreneurship, vol. 13, no. 1, p. 28, 2024, doi: 10.1186/s13731-024-00386-4.

[9] K. B. Schebesch, H. F. Șoim, and R. L. Blaga, "The triple-helix model as foundation of innovative entrepreneurial ecosystems," Journal of Ethics in Entrepreneurship and Technology, vol. 4, no. 2, pp. 104–129, 2024, doi: 10.1108/JEET-08-2024-0026.

[10] N. M. A. Dwijayanti, I. G. A. A. Pramitari, N. M. M. A. Utami, M. Yusuf, and I. W. Karmana, "Sinergi pentahelix dalam mendorong kemandirian ekonomi UMKM disabilitas tuna netra di Kota Denpasar," Panrita Abdi - Jurnal Pengabdian pada Masyarakat, vol. 10, no. 1, pp. 118–128, 2026, doi: 10.20956/pa.v10i1.44996.

[11] S. Nambisan, "Digital entrepreneurship: Toward a digital technology perspective of entrepreneurship," Entrepreneurship Theory and Practice, vol. 41, no. 6, pp. 1029–1055, 2017, doi: 10.1111/etap.12254.

[12] E. G. Carayannis and D. F. J. Campbell, "'Mode 3' and 'Quadruple Helix': Toward a 21st century fractal innovation ecosystem," International Journal of Technology Management, vol. 46, no. 3/4, pp. 201–234, 2009, doi: 10.1504/IJTM.2009.023374.

[13] J. Xu, C. Wang, and Y. Cui, "Multidimensional proximities and interorganizational coinnovation performance: The roles of intraorganizational collaboration network inefficiency," Frontiers in Psychology, vol. 14, 2023, doi: 10.3389/fpsyg.2023.1121908.

[14] P. Khiawnoi, S. S. Nakudom, P. Noobutr, and U. Kaewzang, "Empowering communities: The strategic role of community enterprise entrepreneurs in sustainable development," Sustainability, vol. 17, no. 12, p. 5483, 2025, doi: 10.3390/su17125483.

[15] E.-Y. Park, "Factors related to digital literacy in people with disabilities: Focus on self-efficacy and attitude toward digital devices and technology," International Review of Economics & Finance, vol. 104, 2025, doi: 10.1016/j.iref.2025.104671.

[16] S. Tiasakul, R. Abdulzaher, and C. Bazan, "Accessibility of entrepreneurship training programs for individuals with disabilities: A literature review," Administrative Sciences, vol. 14, no. 8, p. 187, 2024, doi: 10.3390/admsci14080187.

[17] L. M. McFarland and J. M. Tran, "Antecedents and consequences of the disability stigma for frontline employees: A qualitative study," Journal of Global Scholars of Marketing Science, vol. 34, no. 1, pp. 71–89, 2024, doi: 10.1080/21639159.2023.2243962.

[18] A. Bachfischer, M. C. Barbosa, A. A. Riveras Rojas, R. Bechler, E.-M. Schwienhorst-Stich, C.

Kasang, A. Simmenroth, and S. Parisi, "Implementing community based inclusive development for people with disability in Latin America: A mixed methods perspective on prioritized needs and lessons learned," International Journal for Equity in Health, vol. 22, 2023, doi: 10.1186/s12939-023-01966-8.

[19] A. Gafoor and S. Amilan, "Fintech adoption and financial well-being of persons with disabilities: The mediating role of financial access, financial knowledge and financial behaviour," International Journal of Social Economics, vol. 51, no. 11, pp. 1388–1401, 2024, doi: 10.1108/IJSE-08-2023-0596.

[20] L. Puli, N. Layton, D. Bell, and A. Z. Shahriar, "Financial inclusion for people with disability: A scoping review," Global Health Action, vol. 17, no. 1, 2024, doi: 10.1080/16549716.2024.2342634.

[21] L. A. Palinkas, S. M. Horwitz, C. A. Green, J. P. Wisdom, N. Duan, and K. Hoagwood, "Purposeful sampling for qualitative data collection and analysis in mixed method implementation research," Administration and Policy in Mental Health and Mental Health Services Research, vol. 42, no. 5, pp. 533–544, 2015, doi: 10.1007/s10488-013-0528-y.

[22] N. Carter, D. Bryant-Lukosius, A. DiCenso, J. Blythe, and A. J. Neville, "The use of triangulation in qualitative research," Oncology Nursing Forum, vol. 41, no. 5, pp. 545–547, 2014, doi: 10.1188/14.ONF.545-547.

[23] V. Braun and V. Clarke, "Using thematic analysis in psychology," Qualitative Research in Psychology, vol. 3, no. 2, pp. 77–101, 2006, doi: 10.1191/1478088706qp063oa.

[24] L. S. Nowell, J. M. Norris, D. E. White, and N. J. Moules, "Thematic analysis: Striving to meet the trustworthiness criteria," International Journal of Qualitative Methods, vol. 16, no. 1, 2017, doi: 10.1177/1609406917733847.