

Mapping the digital entrepreneurship initiative ecosystem: Structural challenges and inclusivity gaps in emerging economies

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Abstract

Digital entrepreneurship is increasingly prioritised by emerging economies as a driver of economic growth, resulting in a proliferation of initiatives to promote it by diverse stakeholders. Despite this, the structure, distribution and inclusivity of these initiatives remain underexplored. Drawing upon institutional theory and Isenberg's entrepreneurship ecosystem framework, this study develops and applies a systematic approach to mapping digital entrepreneurship initiatives (DEI) and applies it to Sarawak, Malaysia – a developing region undergoing strategic digital economic transformation. Using a two-phase method that combines desk study mapping analysis and structured interviews with initiative implementers and entrepreneurs, the study adapts Isenberg's entrepreneurship ecosystem framework for the mapping of digital entrepreneurship initiatives with an explicit target group dimension. The findings reveal fragmentation within the DEI ecosystem, particularly a concentration of financial support for technology-based ventures and limited provision for underserved entrepreneurs. Our study offers both empirical insights and a methodological contribution to ecosystem mapping in emerging economies, highlighting the need to address structural gaps and promote a more inclusive, ecosystem-oriented approach to digital entrepreneurship policy and implementation.

Keywords

digital entrepreneurship ecosystem, digital entrepreneurship initiatives, entrepreneurship ecosystem, digital economy, Sarawak

Introduction

In an increasingly digitalised economy, digital entrepreneurship is seen as a driver of economic development with the potential of creating opportunities for competitive advantage, improve market accessibility and promote innovation (Schwab, 2016; UNCTAD, 2019). The World Bank and the World Economic Forum have highlighted digital entrepreneurship as a pathway toward economic and social development (World Bank, 2020; WEF, 2021). Digital entrepreneurship is defined in this study as the creation of new businesses enabled by the utilisation of digital and internet technologies in their core business activities (Elia et al., 2020; Nambisan, 2017; Sussan and Acs, 2017). In response to the increasing significance of digital entrepreneurship as a means of employment creation and innovation, many developing countries have introduced various initiatives to enhance digital entrepreneurship skills, support digital entrepreneurial growth and strengthen economic resilience (Gumbo and Moos, 2024; Zahoro and

Banele, 2024; Zhou and Cen, 2024). Yet despite the growing number of digital entrepreneurship initiatives (DEIs), there remains limited understanding of how the structure, distribution and inclusivity of these initiatives can be mapped and understood in informing digital entrepreneurship policies, resource allocation and entrepreneurship development.

DEIs are programmes and interventions designed to nurture, support and promote digital entrepreneurship by fostering the adoption of digital technology, the digitalisation of businesses and the digital economy (Nedumaran et al.,

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2020). They support the digitalisation of some or all of what would be physical in the traditional settings, or the creation and transformation of business using novel digital technology (Davidson and Vaast, 2010; Zhao and Collier, 2016). The ability of researchers and practitioners to assess the DEI ecosystem, including its varied initiators, objectives, target audiences, and scope, is crucial for understanding the comprehensiveness of the DEI ecosystem and in identifying potential gaps within the ecosystem (Fuerlinger et al., 2015). While there have been studies focused on entrepreneurship ecosystem (EE) or entrepreneurship support organisation (ESO) mapping (Hruskova et al., 2022; Khan et al., 2013; Smith and Owalla, 2023), the focus on DEI mapping has been understudied, and fewer from developing regions.

In developing countries where digital economies are hailed as promising pathways to economic development, the state of Sarawak in Malaysia presents a notable case. Being Malaysia's largest state by land area, Sarawak is home to 2.82 million people. It remains one of the least densely populated regions in the country, with nearly 43% living in rural areas (Tey et al., 2019). Despite its RM140 billion Gross Domestic Product (GDP) in 2022, accounting for 9.5% of Malaysia's GDP predominantly through oil, gas and agriculture (Ashari and Farouk, 2023), Sarawak continues to face ongoing infrastructural and digital inequalities. Many rural and indigenous communities continue to experience limited connectivity, with cases of telecommunication towers built without active coverage remaining common (Yih and Zaman, 2024). While Malaysia's national Gini index has declined, and Sarawak has recently been classified as a high-income state, this classification masks a persistent income gap in Sarawak. Bumiputera¹ households in Sarawak alongside Sabah recorded the lowest mean income across all sub-groups (World Bank, 2024), compounded by entrenched rural–urban disparities in skills, access and entrepreneurial opportunities. Against this backdrop, Sarawak has introduced ambitious digital economy strategies aiming to position digital entrepreneurship as a core driver of growth. This combination of strong policy ambition and systemic structural inequality makes Sarawak a notable context to investigate the dynamics and inclusivity of the DEI ecosystem.

Comparable entrepreneurship digitalisation models have been studied in other developing countries such as South Africa (Gumbo and Moos, 2024), Tanzania (Zahoro and Banele, 2024), Indonesia (Savira et al., 2025) and China (Zhou and Cen, 2024). However, despite the proliferation of these initiatives, past research primarily focuses on firm-level or domain-specific analysis (Østergaard and Marinova, 2018), with limited studies focusing on the 'interdependencies between components of the ecosystem' (Elia et al., 2020, p. 2), and how support is distributed across diverse entrepreneurial groups. Consequently, there

remains insufficient empirical understanding of DEI ecosystem dynamics, coverage and effectiveness, particularly regarding their capacity to inclusively support diverse entrepreneurial groups from developing regions like Sarawak.

In addressing this, the study adopts an overarching aim to systematically map and evaluate the DEI ecosystem in Sarawak by adapting Isenberg's (2016) EE domains with a target-group dimension to the DEI context, allowing us to move beyond descriptive mapping of initiatives to interrogate institutional interdependencies and the inclusivity of Sarawak's DEI ecosystem. This aim is pursued through the three objectives below:

- To adapt Isenberg's EE framework for the systematic mapping of DEIs in Sarawak, incorporating a target group dimension to assess inclusivity of the ecosystem.
- To analyse the distribution and focus of DEIs across ecosystem domains and target groups, identifying structural gaps, overlaps and opportunities for ecosystem enhancement.
- To examine stakeholder and entrepreneur perspectives on the DEI ecosystem in Sarawak.

By extending Isenberg's EE framework to the digital context with a focus on both ecosystem domains and target groups, this study contributes to the work on EE mapping (Hruskova et al., 2022; Isenberg, 2010; Mujahid et al., 2019; Smith and Owalla, 2023), specifically within the digital EE literature (Bejjani et al., 2023; Sussan and Acs, 2017). The findings also contribute empirical insights into the dynamics of the DEI ecosystem in a developing region with a strategic digital transformation agenda, offering relevance for both local policy and comparable contexts in the Global South and beyond.

Literature review and theoretical background

Entrepreneurship ecosystem

The ecosystem perspective of entrepreneurship moves beyond individual entrepreneurs or isolated entrepreneurial activities to consider the broader community of actors and factors within a supportive or hindering external environment (Marinelli et al., 2023; Stam, 2015; Stam and Spigel, 2016). Stam (2015, p. 5) specifically describes EE as 'a set of interdependent actors and factors that are mutually reinforcing in such a way as to facilitate entrepreneurial activity'. Building on this conceptualisation, scholars have proposed numerous frameworks in conceptualising dimensions of EE (Isenberg, 2016; Mujahid et al., 2019; Stam, 2015). A seminal framework proposed by Daniel Isenberg (2016) defines EE as 'a set of elements such as finance,

culture, human capital, markets, policy and supports – that interact in ways that make entrepreneurship more likely, prevalent and self-sustaining’ (p. 567).

While these frameworks primarily outline what constitutes a thriving EE, studies also highlight how ineffective EE constrains entrepreneurship. For instance, the United Nations Economic Commission for Europe (UNECE, 2023) identifies several systemic challenges that limit the effectiveness of entrepreneurship support institutions in developing subregions. These include poor infrastructure development, limited private sector research and development, a lack of incentives to start a business, and persistent gaps in both human capital development and access to finance. Khan (2013) similarly argues that in developing economies, EE becomes effective when there is strategic integration across strategic (policy-level), institutional (supporting organisational-level) and enterprise (business-level) levels.

Digital Entrepreneurship Ecosystem

Although extensive research has explored EE, less attention has been given to the specific domain of digital EEs. Digital EE research primarily investigates how digital technologies impact the entrepreneurial environment and ecosystem characteristics. For instance, Sussan and Acs (2017) outline a digital EE framework emphasising multisided platforms comprising users, platforms and institutions, which Song (2019) subsequently refines into a four-quadrant model. Elia et al. (2020) focus on the conceptualisation of digital EE by distinguishing between digital outputs (products and services) and the digital environment enabling their creation. Additionally, Bejjani et al. (2023) propose a comprehensive framework through a systematic literature review that captures diverse digital ecosystem types based on the degree of collaboration or autonomy in ecosystem governance. The digital entrepreneurship literature highlights the need for understanding the characteristics within an ecosystem, including the roles of key actors (Elia et al., 2019; Nedumaran et al., 2020), the embeddedness between ecosystem members (Zhou and Cen, 2024) and its wider impact on its beneficiaries (Khan et al., 2013; Smith and Owalla, 2023).

Building on this growing body of literature, an important gap remains in understanding how DEIs operate as interdependent elements within a digital EE, particularly in developing economies. While prior research has examined the impact of business support services, most have focused on single target groups or specific initiatives (Du et al., 2018; Marinelli and Bartoloni, 2023; Smith and Owalla, 2023; Zahoro and Banele, 2024). There remains a research opportunity to map and analyse the broader DEI ecosystem, considering multiple stakeholders and the interplay between initiatives, especially in settings where DEIs are increasingly being introduced to support entrepreneurial growth.

Institutional view of Digital Entrepreneurship Initiatives

Scholars recognise the institutional-based view in the EE as the broader institutional environment, including regulatory systems, government agencies, public institutions and infrastructure provision that shapes entrepreneurship activities and outcomes (Isenberg, 2016; Marinelli et al., 2023; Stam, 2015). Institutional structures, which are the presence and quality of formal and informal institutions, can directly influence entrepreneurship by establishing rules, norms, and incentives that foster or constrain entrepreneurial innovation and growth (Nicotra et al., 2018; Roundy, 2017). Specifically, institutional capital includes structured support mechanisms such as incubators, accelerators, digital innovation hubs, co-working spaces and other ESOs, which provide critical resources, knowledge-sharing networks and legitimacy to new ventures (Goswami et al., 2018; Ratinho et al., 2020).

Institutional support through government policies and dedicated ESO has been critical in facilitating vibrant digital EEs, particularly in rural and developing regions where this support is necessary (Solarin, 2021). Involving policymakers and a network of local actors such as higher education institutions, business associations and local development associations, this institutional support collectively shapes the broader EE (Galvao et al., 2020). The institutional-based view further emphasises the importance of aligning formal institutions (e.g., regulatory systems and public policies) with informal institutions (e.g., cultural attitudes, trust, and networks) to ensure that entrepreneurial initiatives are effective (Roundy, 2017).

Where there is a growing emphasis on ‘digital’ in entrepreneurship initiatives (Sussan and Acs, 2017; Song, 2019), the institutional environment that constitutes the digital EE continues to shape the digital entrepreneurship opportunities in emerging economies. This is demonstrated through the growing studies on government-supported entrepreneurship initiatives in countries such as South Africa, Tanzania and Indonesia (Aloulou, 2021; Gumbo and Moos, 2024; Savira et al., 2025; Zahoro and Banele, 2024). Despite increased institutional interventions, empirical understanding of the collective impact and effectiveness of DEIs remains limited. Research within DEIs has predominantly focused on ecosystem characteristics or the general impacts of digital technologies (Bejjani et al., 2023; Elia et al., 2020; Sussan and Acs, 2017), leaving a gap in studies examining how institutional structures practically support digital entrepreneurship, particularly in understanding how diverse entrepreneurial groups are supported (Goswami et al., 2018; Memon, 2020).

Mapping of entrepreneurship initiatives

As DEIs are rolled out across various levels of ESOs, there is a growing need to ensure there is sufficient diversity and

distinction between these initiatives to avoid what Hruskova and colleagues (2022) called ‘cluttered landscapes’. When there are too many players and too little distinction between ESOs and the initiatives introduced, entrepreneurs find it difficult to differentiate between these sources of support. Entrepreneurs need varying supporting organisations according to their evolving needs and business stage (Spigel, 2016), and a clear comprehension of both distinct and available initiatives is necessary to better support the digital EE.

In his mapping of the EE in Saudi Arabia, Khan (2013) emphasises the importance of multi-level actors in the entrepreneurial development and growth ecosystem, highlighting the value of cooperative efforts across public sector organisations, non-profits and the private sector, in fostering digital entrepreneurship. The study demonstrates the need for an institutional understanding of key stakeholders and their interaction with enterprises in supporting the EE (Khan, 2013). On the other hand, Du et al. (2018), who study digital EE in China, demonstrate the need for mapping stakeholder roles and efforts through a qualitative case study, emphasising the need for community engagement in understanding digital EE. Similar mapping has been conducted in the UK using a geographical approach (Owalla et al., 2021). Studies of this nature conduct EE mapping with a focus on intersectionality, often highlighting underrepresented entrepreneurial groups such as ethnic minorities, women and geographically marginalised communities (Memon, 2020; Smith and Owalla, 2023). These studies emphasise the importance of addressing the broader socio-economic challenges faced by minority communities and ensuring that ecosystem initiatives are sensitive to these contextual factors.

The insights from the literature reviewed above collectively point to a set of institutional premises that inform this study. Prior studies have shown that effective EE depends on the coordinated provision across multiple domains, rather than the concentration of effort within isolated ecosystem areas, a concern that the digital EE literature extends to the dynamics of digital entrepreneurship. The institutional environment enabling this coordination is also shaped by both formal and informal institutions, where misalignment between them constrains entrepreneurial opportunity. In addition, recent scholarship on entrepreneurial initiative mapping increasingly highlights the uneven distribution of support across entrepreneurial groups, suggesting that inclusivity should be a deliberate design consideration rather than an incidental outcome. Viewed through this institutional lens, this study examines how DEIs in Sarawak, Malaysia are distributed across ecosystem domains and target groups, providing an evaluation of both the institutional coordination and the inclusivity of a digital EE in a developing region.

Methodology

Research design

This study employs a multi-phase research approach to explore its research objectives. Guided by Isenberg’s EE framework (Isenberg, 2016), Phase 1 comprised a desk-based study that maps DEIs in Sarawak, focusing on their distribution across ecosystem domains and target groups. Phase 2 consisted of a series of structured interviews with initiative implementers and beneficiary entrepreneurs to triangulate findings and provide contextual insights into the DEI ecosystem. As previously employed by other entrepreneurship studies (Chethan and Ramesh, 2020; Salas Gironés et al., 2020), this two-phase sequential approach combines both secondary and primary data, helping strengthen the validity of our findings while allowing better contextual comparison between policy intent and lived entrepreneurial experiences.

Case context: Sarawak’s digital entrepreneurship initiatives

Sarawak was selected as the focal case due to its distinctive combination of ambitious digitalisation policies and contextual challenges. Since the 1990s, Malaysia’s national development plans have progressively prioritised digital transformation, in pursuit of being a knowledge-based, high-income economy (Malaysia Digital Economy Blueprint, 2021). Sarawak has aligned with this national agenda through the Sarawak Digital Economy Strategy (2018–2022) and the Post-COVID-19 Development Strategy 2030 (2021), both of which position digital entrepreneurship as a central driver of economic growth. These strategies have been supported by multiple initiatives from federal, state, and private actors, aimed at catalysing the digital empowerment of local businesses through initiatives such as rural internet centres, digital innovation hubs and entrepreneurship training programmes (Abdul Ghaffar, 2022; SDEC, 2017; Tham, 2023).

Despite this strong policy emphasis (Ngah et al., 2022), inequalities in access to entrepreneurship support and digital resources remain pronounced. Rural entrepreneurs, particularly women and older populations, often face barriers associated with weak infrastructure, limited digital literacy, geographic isolation and rural–urban disparities (Hamid et al., 2021; Morni et al., 2020). These challenges exacerbate the digital divide and shape how entrepreneurs engage with the broader DEI ecosystem (Brooks et al., 2019; Brush et al., 2019; Bong et al., 2024). Sarawak, hence, offers a setting where strong institutional intent intersects with infrastructural and socio-economic constraints, presenting a critical case for evaluating the opportunities and limitations of DEIs. Studying Sarawak’s DEI ecosystem generates insights into the inclusivity and structure of

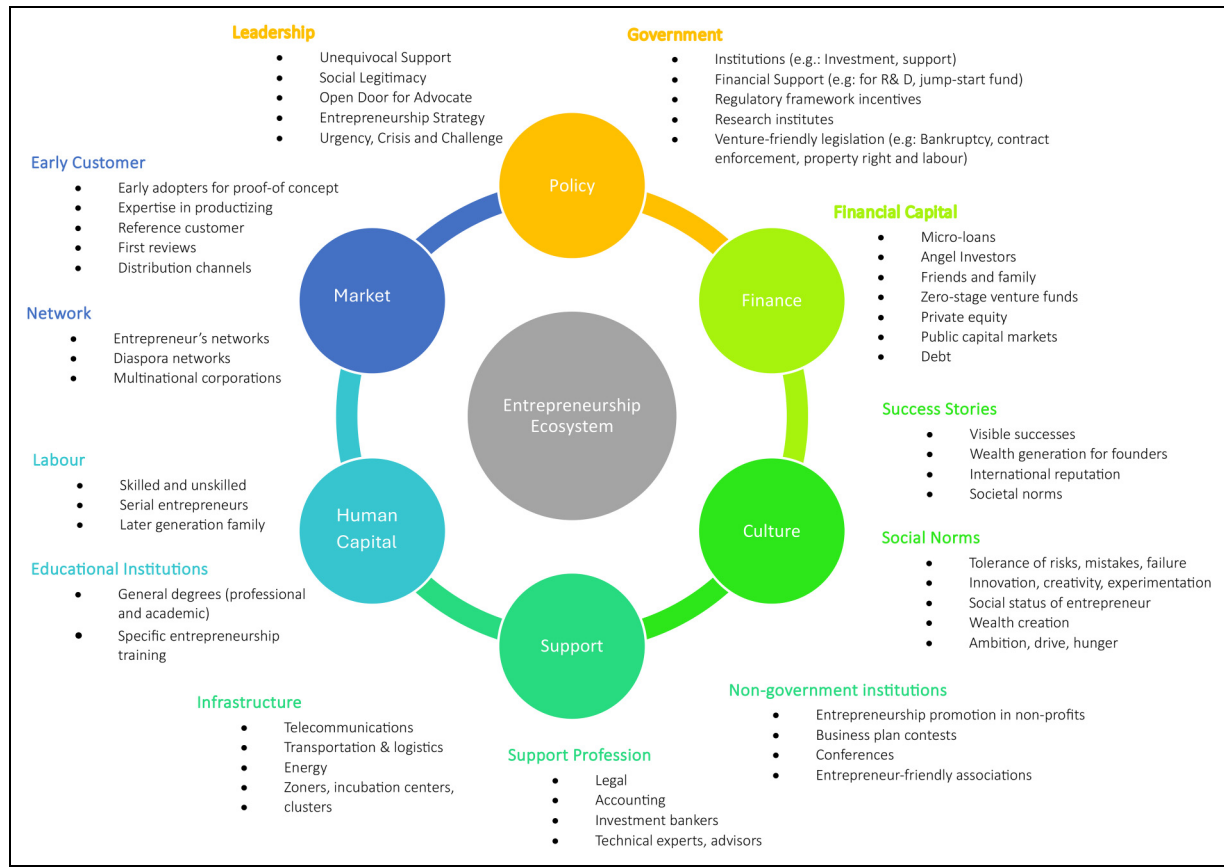


Figure 1. Isenberg's entrepreneurship ecosystem framework (2016).

digital entrepreneurship in a developing region, while offering lessons for other emerging economies in the wider Global South that face similar issues of digital inclusion and uneven development.

Theoretical framework: Institutional lens through Isenberg's EE

This study has adopted the institutional view as its theoretical lens, which highlights how formal and informal institutions shape EEs² (Isenberg, 2016; Roundy, 2017; Stam, 2015). This lens is especially pertinent in the context of Sarawak, where institutional entities such as government agencies, support organisations, and policy frameworks are instrumental in shaping the digital EE within this emerging region. Viewing the DEIs in Sarawak through an institutional lens allows us to analyse not only the structural distribution of DEIs across ecosystem domains but also how institutional arrangements enable or constrain opportunities for digital entrepreneurship.

In operationalising this lens, we adapted Isenberg's EE (Figure 1) as the primary model for mapping the DEI ecosystem in Sarawak. Isenberg's framework (2016) was

selected due to its suitability in conceptualising the institutional view of the DEI ecosystem through the consideration of the six key domains of policy, markets, finance, human capital, support and culture. Unlike other digital EE frameworks that primarily highlight components and processes (Elia et al., 2020; Sussan and Acs, 2017), Isenberg's model offers a more strategic, institutionally grounded perspective, as demonstrated in Khan's (2013) work. This broader coverage addresses the need to capture multi-level influences shaping Sarawak's DEI ecosystem.

However, Isenberg's EE framework is not without limitations. Like other EE mapping approaches, existing frameworks emphasise system-level constructs but do not sufficiently account for the inclusivity of diverse target groups. To address this, we extend Isenberg's six domains that support insights into the institutional environment (Brush et al., 2019; Hruskova et al., 2022; Isenberg, 2010; Stam, 2015) with the explicit mapping of target groups, as called for by previous EE literature (Memon, 2020; Smith and Owalla, 2023). This adaptation adds a critical inclusivity dimension to the ecosystem mapping, enabling a systematic and empirically driven investigation that considers both institutional structures and the differentiated experiences of entrepreneurial groups. To situate Isenberg's

Table 1. Typology of ecosystem domains of DEI adapted from Isenberg's entrepreneurship ecosystem framework (Isenberg, 2016).

Digital Market Access (DMA): • Digital markets and platforms • Access to markets beyond immediate locality • E-commerce platform infrastructure and adoption • Access to local and global digital markets	Digital Policy and Regulation (DPR): • Government policies supporting digital innovation • Data protection and privacy regulations • Intellectual property rights for digital products/services • Cybersecurity regulations
Digital Entrepreneurship Culture and Innovation (DCI): • Promoting a culture of innovation and risk-taking • Encouraging digital literacy and skills development • Fostering a supportive entrepreneurial mindset • Collaboration between digital entrepreneurs and traditional business	Digital Support and Infrastructure (DSI): • Availability of incubators and accelerators for digital start-ups • Access to mentorship and networking opportunities • Technical and business support services • Access to co-working spaces and digital hubs
Digital Finance and Investment (DFI): • Funding sources tailored to digital ventures • Availability of venture capital and angel investors • Crowdfunding platforms for digital start-ups • Government grants and incentives • Access to financial tools and resources	Digital Human Capital (DHC): • Education and training programs in digital technologies • Retention and attraction of digital talent • Collaboration between academia and industry • Continuous learning and digital upskilling opportunities • Access to a skilled digital workforce

Table 2. Categorisation of initiatives based on their respective definitions.

Categorisation of initiatives	Definition
Entrepreneurship Initiatives	Initiatives that advocate for entrepreneurship in general, identifying of an opportunity or the creation of new ones to develop and commercialize new products and services (Hitt, 2001), without a key focus or emphasis on digital technology or the digital economy.
Digital Initiatives	Initiatives that focus on digitalisation programmes: selforganising, scalable and sustainable systems composed of digital entities and their interrelations to increase system utility, cooperation and innovation (Li et al., 2017).
Digital Entrepreneurship Initiative	Initiatives that nurture, support and promote entrepreneurship with a key focus on digital technology, digitalisation of businesses and the digital economy (Nedumaran et al., 2020).

model within our specific context, we adapted each domain to reflect the components of Sarawak's DEI ecosystem (Table 1).

Desk study

Consistent with previous ecosystem mapping studies of EE (Hruskova et al., 2022; Spigel, 2016), this study first examined secondary data from publicly available documents and websites. This initial phase functioned as a desk study to map the breadth of DEIs in Sarawak. The period of desk search was conducted over three weeks (2–23 August 2023). We searched for relevant information using keywords of 'entrepreneurship', 'digital', 'e-commerce', 'digitalisation', 'digital entrepreneurship' and 'digital entrepreneurship initiatives'. Building on foundational studies of Sarawak's digital ecosystem (State Service Modernisation Unit, 2017), we searched through local government reports, institutional websites, mainstream and media publications, and research articles to identify initiatives aimed at digital entrepreneurship in Sarawak. Our scope of search was confined to the following six sources:

1. Federal Initiatives (government ministries and agencies)
2. State Initiatives (government ministries and agencies)
3. Private Initiatives (associations, social enterprises, non-governmental organisations)
4. Higher Education Institutions (universities in Sarawak)
5. Mainstream Media (news agencies, online news platforms)
6. Google Scholar (published research in Sarawak)

This search yielded an initial pool of 150 initiatives spanning federal and state-level efforts. Guided by our objective of investigating only DEIs, these initiatives were further analysed and filtered based on their main objectives to focus only on initiatives within the domains of 'digital entrepreneurship'. We then refined the list to 50 that met this study's definition of digital entrepreneurship (Table 2). Drawing on the approach illustrated by Malhotra (2021), which involved desk-based classification followed by deeper analysis, we next scrutinised each initiative's objectives and target audiences to categorise them according to the adapted six-DEI domain framework

Table 3. Digital entrepreneurship initiative interviews with key stakeholders.

Interviews of state- and federal-level stakeholders	Domains	Interviews conducted with the DEI key stakeholders	
		Implementers	Entrepreneurs
State	Digital Entrepreneurship Culture and Innovation (DCI)	1	1
Federal	Digital Entrepreneurship Culture and Innovation (DCI)		1
Federal	Digital Finance and Investment (DFI)	1	1
State	Digital Human Capital (DHC)	1	1
Federal	Digital Human Capital (DHC)	1	
State	Digital Market Access (DMA)	1	2
Federal	Digital Support and Infrastructure (DSI)	1	1
Federal	Digital Policy and Regulation (DPR)	1	
	Sub-total	7	7
	Total	14	

(Table 1). This initial mapping gave us a structured overview of Sarawak's DEI ecosystem and set the groundwork for our subsequent primary data collection.

Consistent with the interdependent nature of EEs (Stam, 2015), initiatives spanning multiple ecosystem domains were categorised across all relevant areas. This reflects the overlapping character of DEIs and is consistent with prior EE mapping approaches (Khan, 2013). Consequently, the total number of domain assignments exceeds the 50 DEIs identified, and frequency counts should be interpreted accordingly.

Structured interviews

Following the desk study, we conducted structured interviews to collect primary data on how the six DEI ecosystem domains operate in practice. This multi-stage design allows us to expand beyond previous EE mapping studies that solely focused on desk mapping (Hruskova et al., 2022; Khan, 2013; Spigel, 2016), thereby facilitating the collection of primary stakeholder perspectives (Chethan and Ramesh, 2020; Salas Gironés et al., 2020). Working in collaboration with the *Sarawak Development Institute* (a Sarawak-based research centre), we contacted representatives of all 50 DEIs identified in the desk study via email.

We employed purposeful sampling to ensure coverage of each of the six ecosystem domains across federal and state contexts. Seven DEI implementers, including chief executive officers, policymakers, heads of initiatives and programme managers, agreed to participate. From these initial contacts, we then used a snowball approach to recruit seven entrepreneurs (Table 3), identified as direct beneficiaries of these DEIs, mirroring best practices in ecosystem research where experts refer participating entrepreneurs for deeper insights (Malhotra, 2021). Implementers are defined as individuals in organisations responsible for executing DEIs, while entrepreneurs are defined here as individuals running a micro, small or medium business.

Interviews were conducted either in-person or via online conferencing, in either English or Malay. The list of interview questions was shared with participants prior to the interview, along with the project brief and consent form. Each interview lasted between 45 and 60 min, was recorded, transcribed using an intelligent verbatim approach, and translated to English when necessary. The interviews focused on participants' assessment of Sarawak's digital EE, the key performance indicators of each initiative, and their perception of the DEIs in aiding target groups.

Data analysis

We employed thematic analysis (Braun and Clarke, 2006) to analyse both secondary and primary data in this study. Guided by the EE framework, we analysed the objectives of the 50 DEIs thematically to categorise them into the six DEI domains proposed in this study. We then mapped the target audiences (e.g., tech entrepreneurs, rural entrepreneurs, etc.) to assess potential gaps in provision. This analytical approach mirrors previous EE research (Malhotra, 2021; Salas Gironés et al., 2020). Coding of the primary data collected through structured interviews generated 254 codes, which were refined to 30 sub-themes through consensus-based discussion between two researchers. As the interviews aimed to triangulate our desk findings, our coding was guided by the initial findings from the secondary data analysis while allowing for new sub-themes to develop (Braun and Clarke, 2006). The sub-themes were refined into four overarching themes, offering stakeholder perspectives on the ecosystem's coverage, effectiveness and gaps. This dual-phase approach builds on previous studies that combine desk-based analysis and qualitative interviews to gain a richer, more triangulated understanding (Pedersen et al., 2025; Valencia et al., 2024).

Federal Initiatives																		
Initiator	KKD		KUSKOP					MOSTI		MTEC		MOTAC	MITI		KKDW	MAFS	MEWC	
Implementer	MDEC	MCMC	BPES	INSKEN	MDEC	MDEC, CEDAR	SME Corp	CRADLE	MDC	MTEC	NTIS	Kraftagan Misa	MATRADE	MITF	KKDW	BPEK	MFDB	KKM & PMB
Initiatives	100 Go Digital (MDEC)	PEDI	Program Pemerkasaan Usahawan Wanita (PUAN)	Program Dropship dan Usahawan Wanita Ejen (DRA)	#MyDigital Matter	SME Digital Accelerator Program	Bumiputera Enterprise Enhancement Programme (BEEP)	MyStartup Accelerator Program	MDV Commercialisation Financing Programme	Technology Advisory Service	National Technology & Innovation Sandbox Fund	Craft On The Go	eTRADE Programme 2.0	Soft Financing for Digital and Technology (SFDT)	desamall	Smart Village Initiative	Incubator Virtualisation Model (IVM)	Pusat Internet Desa/Telecentre (PID)
eUsahawan Hub							Digital Financing Initiative (Microleap)	MyStartup Bootcamp	MDV Liquidity Financing for Tech Startups	Technopreneur Training Academy		E-Kraf Bazar						
eUsahawan Komuniti							Micro Connector Programme	MyStartup Dev	MDV Technology Acceleration & Commercialisation Scheme (MDV-TACT)			My Craft Shoppee						
eUsahawan Siswa								MyStartup Pre-Accelerator										
Program e-Dagang																		
Shop Malaysia Online																		

Figure 2. Federal-level initiators and implementers of digital entrepreneurship initiatives (DEIs) in Sarawak.

State Initiatives																	
Initiator	SDEC		SMA			MWCWBWFC & MDEC		MINTRED		MANRED	SECA & Swinb	TEGAS	SAINS	Timogah	UTS	WFDS	YPPB
Implementer	SDEC	SDEC, YPPB	SDEC	SMA	TEGAS	MWCWBWFC	NRDA TERAJU	SDEC	SAINS	Swinburne & SECA	Hills,WATS, RD	Spay, SAINS	Timogah	UTS &GDAIB	WFDS	TEGAS	
Initiatives	Digital Accelerator Village	SME Digitalise!	Digital Innovation Hub	Digital Immersion Adoption	TEGAS Innovation Hub/Village	Digital Kenyalang	Anjung Usahawan GoDigital	RIGHT	The Sarawak Digital Enabler Program	SAGO Incubator	dBazaar	Timogah Training	Chinese Cross Border E-Commerce Study Centre	eWanita	TEGAS Tech Immersion Prog		
	Kamek Digital																

Figure 3. State-level initiators and implementers of digital entrepreneurship initiatives (DEIs) in Sarawak.

Results

The results of the study are presented in three sections. First, the mapping of the DEIs in Sarawak is presented at both the state and federal levels, accompanied by the target audience mapping. This provides the descriptive basis for the ecosystem analysis that follows. Secondly, the DEI ecosystem mapping is presented using the adapted framework, addressing objective one. This is followed by the analysis of the DEI distribution across ecosystem domains and target groups, which addresses objective two. Thirdly, addressing objective three, four key themes that arose from the cross-tabulation of desk research and the thematic analysis are presented, triangulating the mapping findings with implementer and entrepreneur perspectives.

Mapping of digital entrepreneurship initiatives

At the federal level, government departments form the majority of the initiators (Figure 2), demonstrating the role of government as a key driver of DEIs. These include the Ministry of Science, Technology and Innovation (MOSTI), Ministry of Tourism, Arts and Culture (MOTAC) and Ministry of International Trade and Industry (MITI). Key implementers were predominantly government-linked agencies, some of which were

responsible for multiple initiatives, as seen through the Malaysia Digital Economy Corporation (MDEC), the Small and Medium Enterprise Corporation (SME Corp) and Cradle. At the state level (Figure 3), DEIs' initiators and implementers consist of a combination of governmental agencies, private companies and higher education institutions. The diversity in state DEIs compared to the federal could be attributable to Sarawak's strategic priority on digital transformation. A full list of DEIs is presented in Appendix 1, and the acronyms of initiators and implementers in Appendix 3. From the desk study, the target audiences for each initiative were mapped. An initial set of 24 groups was identified, aggregated into six final categories (Figure 4). The categories include Entrepreneurs and Start-ups, Micro, Small and Medium-sized Enterprises (MSMEs), Rural Entrepreneurs, Technology and Innovation, Educational and Public Institutions, and Special Groups. This finding demonstrates that the existing DEI ecosystem appears to span a diverse range of groups, though coverage is uneven as the later domain analysis shows.

Digital entrepreneurship initiative domains

The 50 DEIs were mapped and subsequently analysed, revealing the emphasis and gaps within the DEI landscape

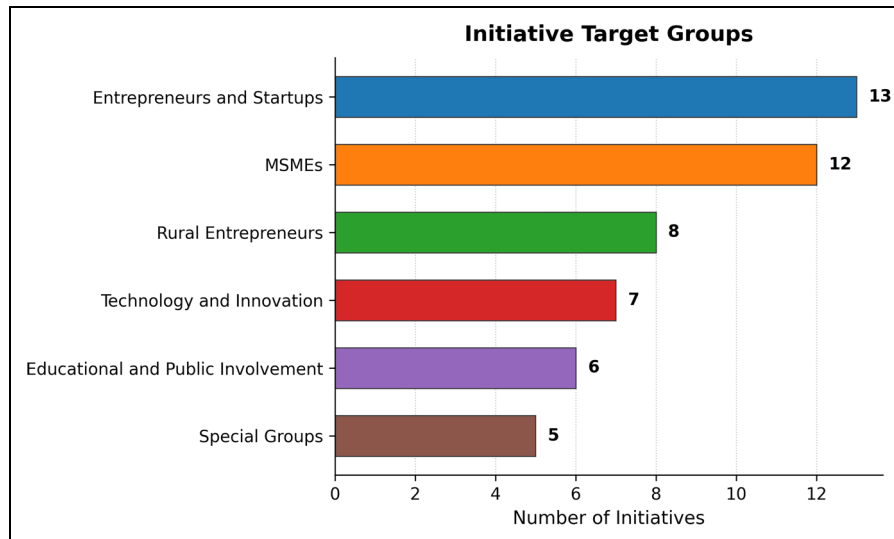


Figure 4. Categories of digital entrepreneurship initiative target groups in Sarawak.

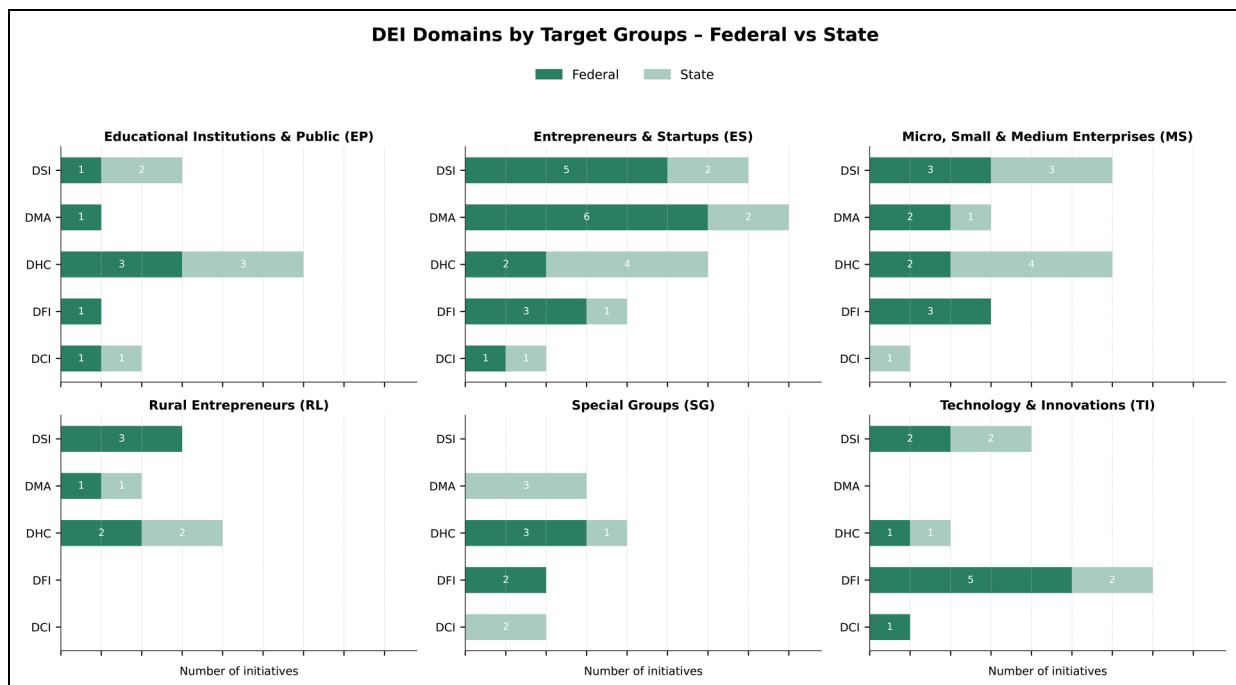


Figure 5. DEI ecosystem domains and target groups at the federal and state level present in Sarawak, 2023.³

(Figure 5). Digital Human Capital (DHC) is the most prominent domain (state: 10 initiatives; federal: 12 initiatives). This suggests a collective emphasis on digital competencies training among the various DEI initiators given the developing nature of the region's digital economy. This, however, also suggests an overemphasis on DHC at the expense of neglecting other crucial DEI domains (Appendix 2). The Digital Market Access (DMA) domain, while robustly represented (state: 7; federal: 9), reveals distinct targeting biases. Federal DMA initiatives focus primarily on

Educational and Public Institutions, sidelining Special Groups and Technology and Innovation entrepreneurs. This selective targeting suggests a potentially narrow DEI strategy that inhibits the inclusivity of the broader ecosystem.

Digital Entrepreneurship Culture and Innovation (DCI) receives limited attention (state: 5; federal: 5), primarily targeting Educational and Public Institutions and Entrepreneurs and Start-ups. The absence of DCI initiatives aimed at Rural Entrepreneurs indicates significant oversight

or a lack of inter-agency coordination. Given that nearly 43% of Sarawak's population is rural, the absence of DCI for rural entrepreneurs leaves significant group of entrepreneurs without digital entrepreneurial confidence and culture that this domain exists to cultivate. Digital Support and Infrastructure (DSI), which is considerably emphasised at the federal level (13 initiatives), demonstrates an inclusive strategic intent across all target groups. Contrastingly, the state-level approach (7 initiatives) excludes Rural Entrepreneurs and Special Groups, highlighting a critical disconnect between federal policy aspirations and local implementation capacities. As the excluded groups are precisely those furthest from urban infrastructure, the gap in federal and state implementation risk widening existing regional and social disparities that the group already experienced.

Financial support through Digital Finance and Investment (DFI) is substantially reliant on federal initiatives (13 initiatives) that widely cover most target groups, notably Technology and Innovation entrepreneurs. Yet state-level financial initiatives, with just two initiatives narrowly targeting Entrepreneurs and Start-ups and Technology and Innovation groups, exclude Rural Entrepreneurs entirely. With no financial instruments reaching rural entrepreneurs at both levels, the existing ecosystem leaves those least able to self-fund excluded from capital funding. Lastly, Digital Policy and Regulation (DPR), with nine initiatives mapped, clearly signals the strategic importance of digital entrepreneurship both at the national and state levels. The observed gaps between policy intentions and practical inclusivity across diverse entrepreneur groups point to a need for improved policy coordination and more comprehensive ecosystem management on the implementation level.

Perceptions of DEIs within Sarawak's digital ecosystem

Building on the desk study findings above, this section addresses the study's third objective by drawing on stakeholder and entrepreneur interviews to triangulate the ecosystem mapping and ground the distribution of DEIs across domains in how they are experienced in practice. Thematic analysis identified four key themes that illustrate the dynamics of Sarawak's DEIs: fragmentation of DHC programmes, a funding bias toward high-tech ventures, the exclusion of rural and marginalised entrepreneurs and challenges in DMA. The themes are interpreted through the DEI ecosystem framework, highlighting patterns in DEI distribution across domains and their impact on stakeholder inclusivity perceptions. Together, these insights provide a more comprehensive understanding of how initiatives are perceived and uncover where interventions are most needed.

Fragmentation of Digital Human Capital development. DHC initiatives dominate Sarawak's ecosystem, reflecting strong institutional emphasis on training and upskilling. This aligns with Isenberg's (2016) human capital domain and the broader consensus in EE literature that talent pipelines are central to entrepreneurial growth (Østergaard and Marinova, 2018; Stam, 2015). However, interviewees repeatedly described the programmes as fragmented and duplicative, often overlapping across ministries and agencies without clear coordination or targeting.

There will be overlap... (as) we now understand digitalisation as the way forward for everybody, every ministry, every agency is involved with society or entrepreneurs, they are going towards digitalisation. Yes, there is so much confusion... as everyone tries to have their own programme... The problem is that... there are many target groups hence many agencies. So I won't discount that there will be some who will be left out...

– Implementer, Digital Human Capital domain

Despite the numerous DHC initiatives in the state, accessibility and applicability of these programmes remain a challenge. Concerns were raised about third-party trainers benefiting more than entrepreneurs, and about programme content not being sufficiently tailored to meet local needs. Rural entrepreneurs, on the other hand, reported limited access to relevant training opportunities, despite their proliferation. Key policymakers recognise the scattered initiatives and call for more collaboration to promote DEI in Malaysia:

We need to consolidate this... You (an agency) focus on start-ups, you (another agency) look at the lifecycle, right from the early stage until... who's taking care of what, (that's) what's missing.

– Implementer, Digital Policy and Regulation domain

Aside from a lack of coordination among institutional stakeholders, this theme sheds light on how human capital development may be viewed by implementers as the primary means of developing a digital EE, while either lacking resources or support to promote the other DEI domains. Interpreted through the ecosystem framework, this fragmentation reveals coordination challenges within the DHC domain, providing insights into why the domain is overemphasised and how overlapping initiatives dilute the ecosystem's effectiveness and reach. This finding points towards the need for a broader conceptualisation of the DEI ecosystem beyond human capital development, and stronger integration between domain-specific initiatives and the entrepreneurial groups they intend to support.

A *funding bias toward ‘technopreneurs’*. Financial support through the DFI domain shows a pronounced bias toward high-tech and innovation-driven start-ups. While this matches Isenberg’s emphasis on finance (i.e. venture capital, angel funding and innovation-focused schemes), the narrow application sidelines micro-enterprises, rural SMEs and informal entrepreneurs who form a large share of Sarawak’s economy.

Capital is most important. Without modal (financial), we who are small entrepreneurs, our progress will be slow if we rely on our own capital...

– Entrepreneur, Digital Support and Infrastructure domain

I think yeah, if you have more flexibility where we can easily apply for loans, that can help us do more work... like getting more working capital.

– Entrepreneur, Digital Entrepreneurship Culture and Innovation domain

While some tech-based entrepreneurs expressed satisfaction with existing digital financial initiatives, others (vignettes above) stressed the difficulty of accessing affordable and flexible funding. This pattern echoes critiques that conventional funding models in developing regions prioritise return on investment (ROI) over inclusion (Block et al., 2018; Roundy, 2017). Our mapping also shows a divide between federal schemes (relatively diverse) and state-level schemes (narrowly targeted), with rural entrepreneurs excluded at both levels. This indicates a structural weakness that could further marginalise non-tech entrepreneurs.

Examining the distribution of DFI initiatives across target groups highlights the significant inequalities in the allocation of financial capital, which undermines the inclusivity and resilience of the ecosystem. From a DEI ecosystem perspective, this funding concentration reveals imbalances within the DFI domain, where financial support disproportionately favours technology-oriented ventures (Mason & Brown, 2014), narrowing access for other entrepreneurial groups. The findings suggest the importance of balancing ROI-focused financing with mission-driven financing to support a wider range of ecosystem participants.

The exclusion of rural and marginalised entrepreneurs. A critical finding of this study is the significant exclusion of rural and marginalised groups from multiple domains, including DSI, DFI and DCI. Both stakeholders and entrepreneur interviewees echoed the scarcity of DEI for rural communities. While numerous start-up and incubator programmes exist within the ecosystem, as demonstrated through the desk study, access is constrained by their concentration in

urban centres. Rural entrepreneurs themselves described feeling invisible to the ecosystem.

Yeah, I mean every year, the NGO and government (agencies) say there’s a lot of programmes (digital entrepreneurship). I actually laugh. If you say there’s a lot, where? Give it to me! Seriously, I feel left out you know.

– Rural Entrepreneur, Digital Support and Infrastructure domain

Initiative implementers working with remote communities also noted the lack of sustained engagement, and calls for a more strategically coordinated approach to training delivery that prioritises continuity within communities’ learning journeys, rather than the current sporadic roll-out of programmes.

Let’s say there’s a community in Bario (with products to sell digitally).

(It would be ideal if) There’s a programme throughout the year (providing) different stakeholders (with) different topics, different modules, so that the community can be more diversified in terms of skills...

– Implementer, Digital Market Access domain

This exclusion reflects what Korsgaard et al. (2015) describe as a disconnection between place and space in rural entrepreneurship, where ecosystem components exist but are not locally accessible. It also supports Bowen and Morris’s (2019) argument that digital ecosystems risk reproducing structural inequalities unless local realities are actively addressed. This spatial concentration of initiatives reflects gaps across several domains in the DEI ecosystem, particularly DSI, DFI and DCI, highlighting persistent inclusivity challenges for rural entrepreneurs. Our findings thus reveal the need for locally embedded models, such as rural-based incubators or mobile training units, which would facilitate a more locally responsive approach to ecosystem building. The current centralised, urban-based provision of DEIs also demonstrates a lack of inclusivity considerations in ecosystem frameworks, particularly in contexts where there are substantial minority or marginalised entrepreneurial communities.

Challenges of Digital Market Access. The final theme focuses on DMA initiatives, which enable entrepreneurs to access wider markets online, such as through digital platforms. While the study reveals successful examples of community-specific marketplaces being developed, the entrepreneurs and implementers stressed the broader challenge of accessibility and sustainability, which includes digital literacy

skills, ongoing logistical barriers and platform management capabilities.

I think Sarawak should have its own local platforms which are suitable for Sarawakians... Certain food or certain services (for example) are not the same... There is a need to make it (platforms) more local and reachable...

– Implementer, Digital Support and Infrastructure domain

These findings engage directly with Isenberg's Market and Support domains, which include early customers, distribution channels and support professionals. However, unlike traditional EE models, where market access assumes readiness, our study of Sarawak demonstrates that digital market availability alone is insufficient in strengthening the ecosystem without substantial support structures in response to local challenges (Bong et al., 2024). The analysis of our findings shows that where entrepreneurs received mentorship and relational support, outcomes of DMA were better. Where such support was absent, digital platforms alone were insufficient. Within the DEI ecosystem framework, these barriers point to structural weaknesses in the DMA domain, where limited market linkages and support mechanisms constrain entrepreneurs' ability to translate digital participation into commercial opportunities. The findings from this case therefore suggest that the success of market access initiatives depends on their integration into a broader support system that sustains participation.

Discussion

This study responds to the limited understanding of how DEIs function as an interconnected ecosystem in Sarawak. We now situate these findings within the broader EE literature and consider their theoretical and methodological implications.

Fragmented coordination between domains

Sarawak's strong focus on DHC reflects worldwide trends, as digital skills are widely seen as essential for the success of entrepreneurial ventures (World Economic Forum, 2020). Nonetheless, the proliferation of training initiatives has led to duplication, weak coordination and ineffective targeting due to overlapping agendas across ministries and agencies, and limited mechanisms for measurement and monitoring. This echoes broader critiques that institutional silos weaken EEs (Hruskova et al., 2022; Marinelli et al., 2023). The disconnect observed among implementers reflects the concerns raised by Stam (2015) about the risk of 'policy-heavy' ecosystems that lack cross-domain reinforcement, thereby impacting both the inclusivity and sustainability of these ecosystems.

Despite strategic national and state-level intent, stakeholders have identified a disconnect between policy priorities and institutional implementation. Agencies often design initiatives around their own mandates, resulting in significant duplication across DEI initiatives and ambiguity in effective coordination, concurring with a recent report from the World Bank (2022) on the nation's digitalisation initiatives. Our findings shed new light on the overlap of efforts across federal and state initiatives, and empirically demonstrate the importance of spatial context within EEs proposed by Autio et al. (2014). There is hence a need for a stronger integrative approach to policy coordination and implementation monitoring that encompasses the strategic policy-level down to the enterprise-level (Khan, 2013). The findings also expand the institutional view by empirically demonstrating that ecosystem mapping (Isenberg, 2016) should assess both the availability of initiatives within domains and their cross-domain integration, particularly in contexts with multiple institutional actors and where structural inequalities persist (Zahoro and Banele, 2024).

Selective gatekeeping of financial capital

A second mechanism shaping Sarawak's DEI ecosystem is the concentration of DFI initiatives on high-tech ventures. Our findings suggest that DFI instruments in Sarawak reflect a market-centric venture logic that prioritises ROI over inclusion. While this strategy aligns with Isenberg's finance domain (venture capital, angel investors, innovation funds) and may stimulate innovation, it exacerbates inequality by excluding the majority of local entrepreneurs in these developing economies (Ermawati, 2023). Such skewing undermines the ecosystem's diversity and resilience, as highlighted by Roundy et al. (2017), who warned of the risks of over-emphasising certain entrepreneurial pathways. Block et al. (2018) similarly note that conventional funding mechanisms frequently fail to serve diverse entrepreneurial profiles in developing settings.

This target group exclusion echoes broader concerns raised in the EE literature, in which informal and rural actors are relegated to the periphery of formal ecosystems (Bowen and Morris, 2019; Marinelli et al., 2023). By highlighting this selective gatekeeping, our findings refine Isenberg's model by showing that finance and investment within ecosystems must consider both their availability and their inclusivity. This calls for blended financing models that balance ROI-driven instruments with development financing mechanisms that support a wider range of ecosystem participants, thereby strengthening their diversity and resilience (Ermawati, 2023; Roundy et al., 2017).

Place-space mismatch and relational gaps

A critical finding of this study is the exclusion of rural and marginalised entrepreneurs from multiple domains,

including DHC, DFI, and DSI. Despite Sarawak's rural population (Tey et al., 2019), initiatives remain urban-centric and inaccessible to remote populations. This finding expands on Ramli and Williams (2024), who observed disparities in Malaysian entrepreneurial gaps among ethnic minorities, which we now extend through a geographical context perspective. Entrepreneurs' testimonies of being 'left out' highlight what Korsgaard et al. (2015) describe as a disconnection between place and space in rural entrepreneurship, which left unaddressed, would risk reproducing structural inequalities (Bowen and Morris, 2019) in the digital EE. This study highlights the structural and cultural accessibility challenges faced by rural entrepreneurial communities, building on previous work that calls for broader socio-economic considerations in entrepreneurial support initiatives for minority entrepreneurs (Memon, 2020; Smith and Owalla, 2023).

Similarly, DMA initiatives show that platform provision alone is insufficient without relational support, such as mentorship, platform support and capacity building. Entrepreneurs who accessed such relational capital reported more sustainable outcomes, underscoring Spigel's (2016) argument that social and network capital are central to ecosystem performance. The surfacing of this distinction suggests that DMA should not be designed as a one-off platform but as part of an integrated support system that sustains participation. The informal institutions mentioned by Roundy et al. (2017), such as social networks, trust-building and relational brokerage, need to be considered within infrastructural provision (Bong et al., 2025) in supporting the development of the DMA domain in these contexts. Our findings therefore extend ecosystem mapping literature by demonstrating that geographic exclusion and relational gaps are interconnected forms of institutional oversight. They reveal that inclusive DEI ecosystems require both decentralised, locally embedded delivery models (Astner and Roos, 2024; Gittins and McElwee, 2023; Korsgaard et al., 2015) that incorporate relational mechanisms that actively connect targeted entrepreneurs into the social networks they are situated in (Bong et al., 2026; Ramli and Williams, 2024).

Theoretical and methodological contribution

This paper contributes to the burgeoning field of digital entrepreneurship literature. By situating DEI mapping within the institutional lens and adapting Isenberg's framework in EEs (2010, 2016), the paper demonstrates its utility to the DEI ecosystem mapping. The work also contributes to existing digital EE literature (Bejjani et al., 2023; Elia et al., 2020; Stephens et al., 2022; Sussan and Acs, 2017) in highlighting the need for mapping of target groups within the DEI ecosystem. Our study shows how fragmentation, ROI-driven finance, urban bias and market accessibility are structural outcomes of institutional priorities, making

inclusivity an explicit criterion in ecosystem analysis. This refinement highlights that ecosystem effectiveness should be assessed by more than institutional strength or initiative numbers, drawing attention instead to how evenly they reach across entrepreneurial groups as a whole, and how well they connect across ecosystem domains.

Methodologically, the study contributes a regionally grounded approach for ecosystem mapping in a developing economy. Whereas prior digital EE frameworks (e.g., Elia et al., 2020; Sussan and Acs, 2017) provide valuable conceptualisations at the macro-level, our sequential design integrated desk mapping with stakeholder perspectives, providing a multi-level overview of how initiatives operate, whom they serve, and where deficiencies are present. This actor-centric method responds to calls for context-sensitive ecosystem research (Chethan and Ramesh, 2020; Hruskova et al., 2022; Salas Gironés et al., 2020) and offers a replicable model for studying DEIs in other developing settings.

Finally, the situating of Sarawak's DEI ecosystem within the broader Global South context illustrates how ambitious digitalisation policies interact with structural dynamics to produce uneven ecosystem outcomes. Its geography of low population density, rural terrain and uneven infrastructure is not unique, and comparable challenges are observed in other Global South contexts (Gumbo and Moos, 2024; Zahoro and Banele, 2024; Zhou and Cen, 2024). Sarawak thus serves as a critical test case for refining both institutional and ecosystem theory and practices in geographically dispersed, rural and infrastructure-constrained regions.

Conclusion

This study embarked on a comprehensive mapping of the DEI ecosystems in Sarawak, Malaysia within the broader context of emerging economies. Using an institutional perspective, we mapped the distribution of initiatives across ecosystem domains and target groups by adapting Isenberg's ecosystem framework (2016), allowing the examination of how institutional arrangements both enable and constrain digital entrepreneurial activity. By doing so, the study extends Isenberg's (2016) EE framework by adding a target-group dimension, explicitly making inclusivity an analytical focus. Our findings show that Sarawak's DEI ecosystem, while reflecting strong governmental commitment, remains fragmented across domains and target groups. Finally, the structured interviews with 14 implementers and entrepreneurs, further contextualised the systemic gaps in the DEI ecosystems, surfacing limited rural outreach, overlapping agency mandates and a finance bias toward tech-based entrepreneurs. Although there are clear commitments to fostering digital entrepreneurship in Sarawak, challenges pertaining to accessibility and inclusivity remain prominent. This study contributes to the broader understanding of DEI ecosystems in emerging economies by revealing the ecosystem dynamics in

Sarawak, a region with both strong digital entrepreneurship aspirations and unique socio-economic and infrastructural challenges, offering implications for other similar developing settings.

Our findings have crucial implications for policymakers and practitioners. From a policy perspective, this study highlights the implications of institutional oversight in the DEI ecosystem and the need for strategic collaboration between stakeholders in ecosystem building. Policies also need more concrete implementation monitoring to ensure the inclusive targeting of initiatives across key entrepreneur groups within the population. This is especially significant in developing economies where entrepreneurship is 'intertwined with economic development' (Sussan and Acs, 2017, p. 61), and hence should not be exclusive to only high-performing industries like science and technology (Roundy et al., 2017). For practitioners, the study emphasises the importance of collaborative partnerships and resourcing in drawing from the DEI ecosystem to avoid 'reinventing the wheel' in DEI ecosystem building. The adapted mapping thus provides policymakers with a diagnostic tool that shows which domains are present and which entrepreneurial groups are excluded, ensuring that the advantages of digital transformation are equitably distributed across all segments of the entrepreneurial society.

Limitations and future studies

This study interviewed initiative leaders and entrepreneurs in Sarawak across the six DEI ecosystem domains. Entrepreneurs were selected via snowball sampling recommended through DEI initiators to assess beneficiaries' experiences. Future research could expand to include beneficiaries and non-beneficiaries, exploring ways to improve ecosystem cohesiveness and creative strategies to help marginalised and rural businesses in the digital age. Secondly, the study is limited to Sarawak, Malaysia, providing unique insights into its DEI landscape. Future research could expand to cover the other DEI ecosystem for regional comparisons and a deeper understanding of DEIs in a rapidly digitalising Southeast Asia.

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Notes

1. Bumiputera comprises Indigenous ethnic groups accorded special recognition in Malaysia, accounting for 71.8% of Sarawak's population in 2020 (Sarawak Government, 2022).
2. While the terms 'entrepreneurship' and 'entrepreneurial' ecosystems are frequently used interchangeably in the literature, this study deliberately adopts the former. As Isenberg (2016) argues, 'entrepreneurship' is conceptually more precise because the ecosystem itself is not 'entrepreneurial' in nature; rather, it is the environment that fosters and sustains entrepreneurship.
3. Unlike other ecosystem domains that provide direct support to entrepreneurs, Digital Policy and Regulation (DPR) operates as an enabling condition shaping the regulatory and governance environment within which other domains function. As its influence is structural rather than initiative-specific, it is therefore not directly comparable to the other domains in frequency terms, and hence not included in the bar chart.

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Appendix I

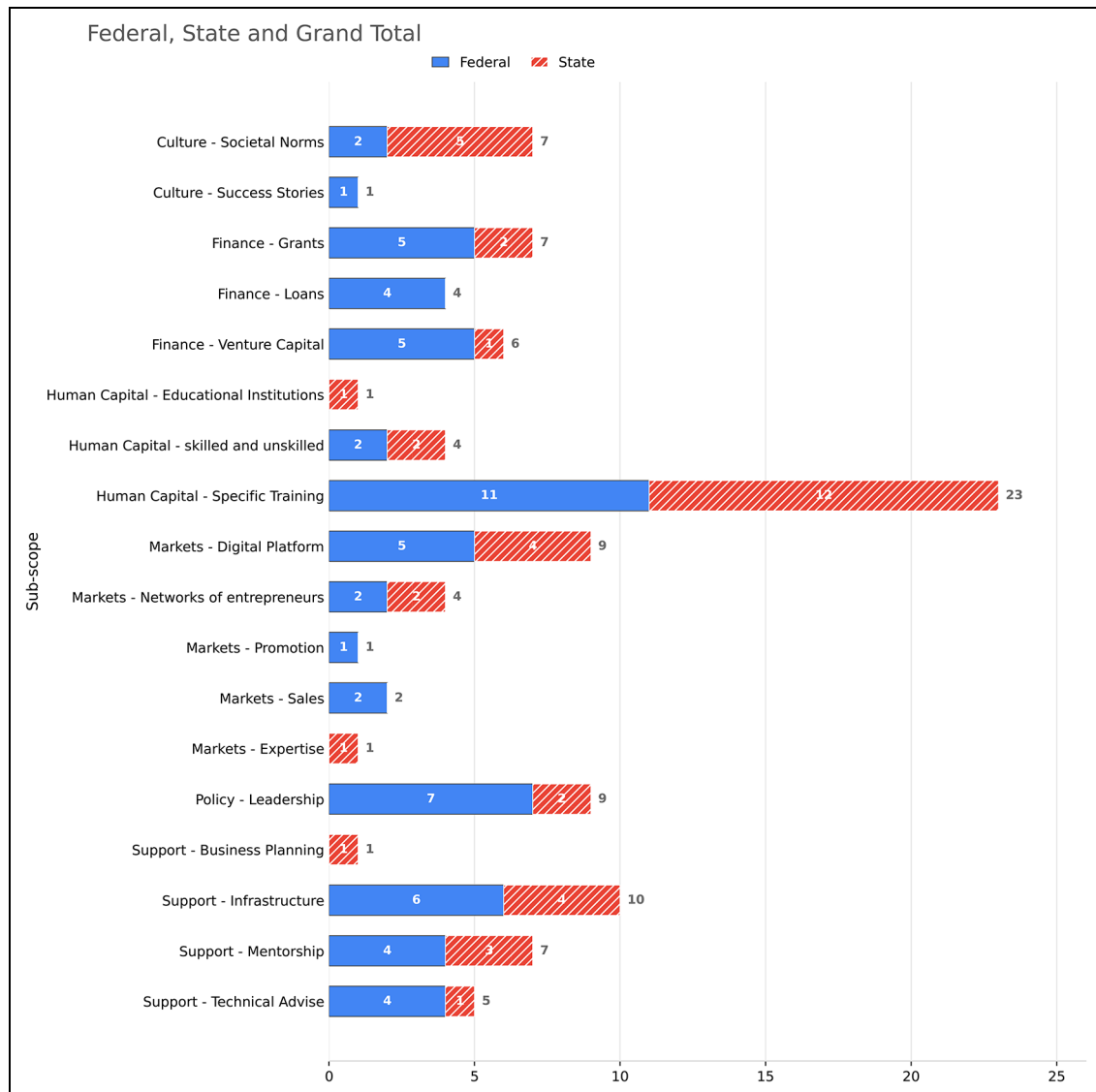
A comprehensive list of the 50 DEIs categorised into the ecosystem domains.

Digital Market Access	Digital Human Capital	Digital Support & Infrastructure	Digital Entrepreneurship Culture and Innovation	Digital Finance and Investment	Digital Policy and Regulations
eWanita	Digital Innovation Hub			GoDigital (Grant)	Post-Covid Development Strategy
dBazaar	Anjung Usahawan		Digital Kenyalang	Digital Accelerator Village	Sarawak Digital Economy Strategy
desamall	Digital Accelerator Village		eWanita	Digital Financing Initiative (Microleap)	National Entrepreneurship Policy
Timogah	Tegas Digital Village/ Tegas Digital Innovation Hub			MDV Liquidity Financing for Tech Start-ups	Malaysia Digital Economy Blueprint
Digital Kenyalang	TEGAS' Tech Immersion Programme			MDV Technology Acceleration And Commercialisation Scheme (MDV-TACT)	National E-Commerce Roadmap
SAGO Incubator			National Technology & Innovation Sandbox Fund		National Tourism Policy 2020-2030
Kamek Digital			Program Dropship dan Ejen (DNA)	MDV Commercialisation Financing Programme	Rural Development Policy (DPLB) 2030
MYStartup PreAccelerator	Chinese Cross Border Ecommerce Study Centre	MyStartup Accelerator program			Shared Prosperity Vision 2030
E-Kraf Bazar	Digital immersion adoption	MYStartup Pre-Accelerator		MYStartup Pre-Accelerator	The National 4IR Policy
Craft On The Go	The Sarawak Digital Enabler Program	MYStartup Dev		MYStartup Dev	
Shop Malaysia Online (Pelan Pemulihan Ekonomi Negara Jangka Pendek (PENJANA))	eUsahawan Komuniti	Micro Connector Programme		eTRADE Programme 2.0	
My Craft Shopee	eUsahawan Siswa	National Technology & Innovation Sandbox Fund		Program Pemerkasaan Usahawan Wanita (PUAN) Latihan dan Bimbingan Keuntungan Menu Tahun 2023 (PUAN)	
Program e-Dagang	eUsahawan Hab			Soft Financing for Digital and Technology (SFDT)	
MYStartup Bootcamp				Technology Advisory Service	
Program Dropship dan Ejen (DNA)		100 Go Digital (MDEC)		Bumiputera Enterprise Enhancement Programme (BEEP)	
Incubator Virtualisation Model (IVM)	Program Pemerkasaan Usahawan Wanita (PUAN) Latihan dan Bimbingan Keuntungan Menu Tahun 2023 (PUAN)	Incubator Virtualisation Model (IVM)			
	Pusat Ekonomi Digital (PEDI/ PIK/P1iM) Pusat Internet Malaysia				
	Pusat Internet Desa/ Telecentre (PID) / Rural Internet Centre				
	Rural ICT Guided Home-based Technopreneur (RiGHT)	Smart Village Initiative			
	SME Digital Accelerator Program	Technology Advisory Service			
	SME Digitalise!				
	Technopreneur Training Academy				
	#MyDigital Maker				

State InitiativeFederal Initiative

Appendix 2

Federal and state level breakdown of DEI ecosystem domains



Appendix 3

Glossary

DEI: digital entrepreneurship initiative
 EE: entrepreneurship ecosystem

DPR: digital policy and regulation
 DHC: digital human capital
 DM: digital market access
 DSI: digital support and infrastructure
 DFI: digital finance and investment
 DCI: digital entrepreneurship culture and innovation

EP: educational and public involvement
 ES: entrepreneurs and startups
 MSME: micro, small and medium enterprises
 RL: rural entrepreneurs
 SG: special groups
 TL: technology and innovation

Initiator: Federal

KKD: Ministry of Communications and Digital
 KUSKOP: Ministry of Entrepreneur Development and Cooperatives

MOSTI: Ministry of Science, Technology and Innovation
 MTEC: Malaysian Technology Development Corporation
 MOTAC: Ministry of Tourism, Arts and Culture
 MITI: Ministry of International Trade and Industry
 KKDW: Ministry of Rural & Regional Development
 MAFS: Ministry of Agriculture and Food Security
 MEWC: Ministry of Energy, Water and Communications

Implementer: Federal

MDEC: Malaysia Digital Economy Corporation
 MCMC: Ministry of Communication and Multimedia Commission
 BPES: Bahagian Pembangunan Ekosistem Keusahawanan
 INSKEN: Institut Keusahawanan Negara
 CEDAR: Centre for Entrepreneur Development and Research
 MDEC: Malaysia Digital Economy Corporation
 SME Corp: SME Corporation Malaysia
 MDC: Multimedia Development Corporation
 MTEC: Malaysian Technology Development Corporation
 NTIS: National Technology and Innovation Sandbox
 Kraftangan Malaysia: Kraftangan Malaysia
 Malaysia External Trade Development Corporation (MATRADE)
 MIDF: Malaysian Industrial Development Finance Berhad
 KKDW: Ministry of Rural & Regional Development
 BPEK: Bahagian Pembangunan Ekonomi Komuniti
 MFDB: Malaysian Fish Development Board
 KKMM: the Communications and Multi-Media Ministry
 PMB: Pos Malaysia Berhad
 MDV: Malaysia Debt Ventures Berhad

Initiator: State

SDEC: Sarawak Digital Economy Corporation
 TEGAS: Tabung Ekonomi Gagasan Anak Sarawak

MWCWBWFC: Minister of Welfare, Community Well-Being, Women, Family, and Childhood Development
 MINTRED: Ministry of International Trade, Industry and Investment
 MANRED: Ministry of Modernisation of Agriculture, Native Land and Regional Development
 SECA & Swin: Swinburne University & Sarawak E-Commerce Association
 TEGAS: Tabung Ekonomi Gagasan Anak Sarawak
 SAINS: The Sarawak Information Systems Sdn. Bhd.
 UTS: University of Technology Sarawak
 WFDS: Women and Family Department of Sarawak
 YPPB: Yayasan Peneraju Pendidikan Bumiputera

Implementer: State

SDEC: Sarawak Digital Economy Corporation
 YPPB: Yayasan Peneraju Pendidikan Bumiputera
 SMA: Sarawak Multimedia Authority
 TEGAS: Tabung Ekonomi Gagasan Anak Sarawak
 MWCWBWFC: Minister of Welfare, Community Well Being, Women, Family, and Childhood Development
 NRDA: Northern Region Development Agency
 TERAJU: Unit Peneraju Agenda Bumiputera (TERAJU) *Prime Minister's Office
 SAINS: The Sarawak Information Systems Sdn. Bhd.
 SECA & Swin: Swinburne University & Sarawak E-Commerce Association Hills
 WAT, RD: Hills, WATSarawak, Retrospective Discovery
 Spay: Sarawak Pay
 SAINS: The Sarawak Information Systems Sdn. Bhd.
 UTS & GDAIB: University of Technology Sarawak & Guangdong AIB Polytechnic
 WFDS: Women and Family Department of Sarawak
 TEGAS: Tabung Ekonomi Gagasan Anak Sarawak