

Bridging the Digital Divide: Assessing the Interplay of Digital Literacy, Infrastructure, and Policy in Shaping Sierra Leone's Digital Entrepreneurship Ecosystem

Alusine Boys Conteh ^{1*}  & Peter Jesse Saxo-Decker ²

¹ Business Education Unit, Faculty of Business & Entrepreneurship, Ernest Bai Koroma University of Science & Technology, Port Loko, Sierra Leone.

² Master of Professional Accounting, Shanghai National Accounting Institute, Shanghai, China.

* Corresponding author: Alusine Boys Conteh (contehalusineab@gmail.com)

Abstract

Sierra Leone's digital entrepreneurship ecosystem is emerging against a backdrop of significant structural constraints. National data place internet penetration at roughly 25.1 percent of the population, mobile penetration at 50.3 percent, and smartphone ownership among adults at 28.53 percent, with the country ranking 38th of 47 African nations on the International Telecommunication Union's ICT Development Index. Drawing on digital entrepreneurial ecosystem theory, digital divide theory, and institutional theory, this study develops three hypotheses and tests them with a survey of 200 digital and digitally enabled entrepreneurs and aspiring entrepreneurs in Freetown, Bo, and Makeni, supplemented by illustrative contextual interviews with entrepreneurs and key informants. Digital literacy was rated effective by 35% of respondents, infrastructure by 30%, and the policy and regulatory framework by only 12.5%, while half of respondents (50%) could not characterise the policy environment at all. Overall assessments of the ecosystem were the most negative of the four measures, with 40% identifying a clear gap and only 10% describing conditions as effective. Chi-square goodness-of-fit tests and 95% confidence intervals show that these distributions differ significantly from an even spread of opinion (all $p < .01$) and that policy uncertainty is significantly higher than uncertainty about literacy or infrastructure. The findings suggest that policy and regulatory clarity, more than raw infrastructure or literacy alone, may be the most under-addressed dimension of the ecosystem. The study concludes with theoretical contributions, evidence-linked applications, and recommendations for the Ministry of Communication, Technology and Innovation (MOCTI), the Directorate of Science, Technology and Innovation (DSTI), and development partners on sequencing future ecosystem-building investment.

Keywords: Digital entrepreneurship, Digital divide, Entrepreneurial ecosystem, Digital literacy, ICT infrastructure, Policy and regulation, Sierra Leone.

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1. Introduction

Digital technologies are increasingly recognised as a route through which small and youth-led enterprises in low-income countries can access markets, reduce transaction costs, and participate in regional and global value chains (Camps, Kraus, Thomas, Tiberius, & Jones, 2026; Obi et al., 2024). Nambisan (2017) argued that digital technologies change not only the tools of entrepreneurship but also the nature of the entrepreneurial process and its outcomes, a view that has since stimulated a large literature on digital entrepreneurial ecosystems (Bejjani, Göcke, & Menter, 2023; Sussan & Acs, 2017). In Africa, however, the promise of digital entrepreneurship sits uneasily alongside persistent structural constraints. Friederici, Wahome, and Graham (2020) show that African digital entrepreneurs succeed less by dreaming of global dominance than by adapting platforms to local markets and to infrastructure that remains unreliable, scaling through relationships rather than through exponential growth. Sierra Leone's government has signalled clear intent to build a digital economy. Since 2018 it has established the Directorate of Science, Technology and Innovation (DSTI) and the Ministry of Communication, Technology and Innovation (MOCTI), guided by the National Innovation and Digital Strategy and the 2024–2030 Medium-Term National Development Plan, which names technology as one of the country's "Big Five Game Changers" (Ecofin Agency, 2025). Concrete initiatives have followed, including the Felel TechCity innovation hub, the Sierra Leone Innovation Investment Fund (SLIIF), the Redsalt Angel Investor Network, and the International Trade Centre's READY Salone programme (Ecofin Agency, 2025; International Trade Centre, 2025). Yet the infrastructural and human-capital foundations for this ambition remain thin. Internet penetration stood at only 25.1 percent of the population in 2024, and an estimated 60 percent of Sierra Leoneans remained entirely outside the telecom network (Sierraloaded, 2026). While 4G network coverage reached roughly 81.6 percent of the population by 2024, actual internet usage lagged far behind, pointing to affordability, digital literacy, and device-ownership barriers rather than physical network availability as the binding constraints (Ecofin Agency, 2026). The pattern is regional as well as national. The GSMA (2024) reports that only 46% of adults in sub-Saharan Africa use mobile internet services, that the region has the world's largest usage gap, and that device affordability and a lack of digital skills are the leading barriers to adoption among the unconnected.

The motivation for this study is that aggregate evidence, although valuable, cannot show how entrepreneurs themselves experience these conditions. Cross-country panel studies indicate that infrastructure and human capital are among the strongest correlates of digital technology adoption in sub-Saharan Africa (Astuti & Ayinde, 2025), and that human capital, venture capital, infrastructure, systems, and support jointly drive entrepreneurship development on the continent in the long run (Abdulai & Hussain, 2024). Qualitative work, in turn, warns that digital entrepreneurship in the region often fails to achieve formal integration because of institutional voids (Parrott, Pereira, Jarrar, Hachard, & Rossi, 2025). What remains missing is entrepreneur-level evidence on how literacy, infrastructure, and policy conditions are perceived together within a single low-connectivity ecosystem. The significance of such evidence is practical as well as scholarly. Governments and development partners in Sierra Leone must decide how to sequence scarce public and donor funds across skills, networks, and regulation, and an ecosystem-level diagnosis grounded in entrepreneurs' own assessments can inform that decision. The problem is sharpened by the way the ecosystem has been supported to date. A 2025 tech-startup scoping report found that many donor-supported organisations have coached startups to win grants and pitch competitions but have had far less success in helping ventures transition into scalable, investor-ready enterprises (InvestSalone, 2025). Prior to this study, the mechanisms through which literacy, infrastructure, and policy conditions affect entrepreneurial behaviour and outcomes had not been empirically documented at the ecosystem level in Sierra Leone, leaving policymakers without clear evidence on how to sequence investment across the

three dimensions. The general objective of the study is to assess how digital literacy, infrastructure, and policy and regulatory frameworks interact to shape the development of Sierra Leone's digital entrepreneurship ecosystem, and to generate evidence-based recommendations for sequencing ecosystem-building interventions. Five specific objectives follow from this aim: to assess entrepreneurs' perceptions of digital literacy and its relationship to business formation, survival, and growth; to examine how entrepreneurs perceive infrastructural conditions, including network coverage, affordability, electricity reliability, and device access; to evaluate the extent to which entrepreneurs perceive existing policy and regulatory frameworks as enabling or constraining; to examine how the three dimensions interact in shaping overall ecosystem outcomes; and to generate policy and institutional recommendations for sequencing digital-literacy, infrastructure, and regulatory interventions. To address these objectives, the study uses a survey of 200 entrepreneurs, supplemented by illustrative interviews. The remainder of the paper reviews the literature and develops hypotheses (Section 2), describes the national context (Section 3), sets out the methodology (Section 4), reports results (Section 5), discusses the findings (Section 6), presents contributions and applications (Section 7), and concludes (Section 8).

2. Literature Review, Theoretical Framework, and Hypotheses

2.1 Digital entrepreneurship and ecosystems in resource-constrained contexts

The concept of the digital entrepreneurial ecosystem (DEE) emerged from the convergence of two research streams: entrepreneurial ecosystem research, which emphasises the interdependent actors and conditions that support venture creation in a place, and digital entrepreneurship research, which examines how digital technologies and platforms reshape entrepreneurial opportunities. Sussan and Acs (2017) proposed an integrated DEE concept built around digital infrastructure governance, digital user citizenship, digital entrepreneurship, and digital markets. Bejjani et al. (2023) later reviewed the field systematically and concluded that DEE research remains dispersed and conceptually ambiguous, offering a framework of ecosystem attributes to organise future work. Camps et al. (2026) similarly synthesise the digital entrepreneurship literature and propose an integrative framework, while Alzamel (2024) stresses that resilient digital entrepreneurship depends on ecosystems, decent work, and wider socioeconomic dynamics. Evidence on how ecosystem elements relate to outcomes is growing but uneven. A recent meta-analysis by Queissner, Stolz, and Weiss (2025) synthesises quantitative studies linking entrepreneurial ecosystem elements to entrepreneurial activity, confirming that the ecosystem perspective has empirical traction while also showing that effects differ across elements. Zheng, Sun, Ren, and Chang (2024) examine the effect of the digital entrepreneurial ecosystem on startup performance in China, a setting with far denser infrastructure than most of Africa. Evidence from low-connectivity settings is thinner, and it is in these settings that the interaction among ecosystem elements is least well understood. Research on Africa consistently highlights infrastructure as a binding constraint. Madichie, Bolat, and Taura (2021), studying media-technology and agri-technology cases in West Africa, found infrastructure to be a main challenge and stressed partnerships within the ecosystem as a condition for broadly shared benefits. Astuti and Ayinde (2025), analysing 48 sub-Saharan countries between 2006 and 2022, found that mobile subscriptions grew consistently while fixed broadband and fixed telephony stagnated, and that infrastructure, electricity access, and human capital were among the most important correlates of adoption. Abdulai and Hussain (2024), using data from 54 African countries for 2000 to 2021, report that ecosystem elements such as human capital, venture capital, infrastructure, systems, and support promote entrepreneurship development in the long run, although short-run effects were not significant. This pattern matters for Sierra Leone because it implies that infrastructure and skills investments may take time to be reflected in entrepreneurs' experience.

Skills and digital literacy form the second strand. Bergholz, Fünér, Lubczyk, Sternberg, and Bersch (2024) point to the joint importance of infrastructure and skills for digital entrepreneurship in rural and urban areas. The GSMA (2024) identifies a lack of digital skills and literacy as the second-biggest barrier to mobile internet use in sub-Saharan Africa. Together these findings suggest that connectivity alone does not translate into entrepreneurial capability, which is consistent with the Sierra Leonean pattern of high network coverage but low usage. The third strand concerns institutions and policy. Parrott et al. (2025) find that digital entrepreneurship in sub-Saharan African informal economies enables market access and micro-innovation but often fails to secure formal integration because of institutional voids, and they recommend that policymakers develop supportive infrastructure and financing mechanisms tailored to hybrid ventures. Stein, Evers, and O’Gorman (2026) show that institutional entrepreneurs can help create conditions for digital entrepreneurship in the development of a fintech ecosystem. Omoga, Ongang’a, Kosgei, and Mengwa (2026) propose a multi-path value-creation model for digital entrepreneurship in resource-constrained ecosystems, which is consistent with the view that no single lever is sufficient. For Sierra Leone specifically, earlier work has mapped the digital and entrepreneurial ecosystem (United Nations Capital Development Fund [UNCDF], 2021), and the 2025 scoping report documents the gap between pitch-readiness and investor-readiness (InvestSalone, 2025). Neither source, however, reports a structured assessment of how entrepreneurs perceive literacy, infrastructure, and policy together.

2.2 Theoretical framework

The study draws on three complementary theoretical traditions, and each informs a specific part of the hypotheses and analysis. The first is digital entrepreneurial ecosystem theory. Entrepreneurial ecosystem theory treats infrastructure, policy, human capital, finance, markets, and culture as interdependent domains that jointly determine entrepreneurial outcomes in a place, and the digital extension argues that digital and traditional ecosystem elements increasingly co-evolve rather than operate as separate spheres (Bejjani et al., 2023; Sussan & Acs, 2017). The study adopts this framing to treat literacy, infrastructure, and policy as interacting domains within one ecosystem, and it uses the theory to motivate the expectation that the overall assessment of the ecosystem reflects all three domains together (Hypothesis 3). The second tradition is digital divide theory, which distinguishes first-level divides in access to devices and connectivity, second-level divides in skills and effective usage (DiMaggio & Hargittai, 2001), and third-level divides in the outcomes and benefits derived from use (van Deursen & Helsper, 2015). Sierra Leone’s national data illustrate the layered divide. Fourth-generation coverage reached roughly 81.6 percent of the population by 2024, yet only 25.1 percent of the population actually used the internet (Ecofin Agency, 2026; TS2 Tech, 2026). The study uses the multi-level framework to interpret which level entrepreneurs themselves identify as most binding, and it informs the expectation that skills-related perceptions will be more favourable and better formed than perceptions of structural conditions (Hypothesis 1). The third tradition is institutional theory. It holds that the formal and informal rules of the game, including regulation, government coordination, and enforcement, shape entrepreneurial activity independently of resource availability (North, 1990; Scott, 2014). The study uses institutional theory to interpret entrepreneurs’ perceptions of the policy and regulatory environment and to situate them against national evidence that ecosystem support has been oriented more toward competition-based support than toward scalable, investor-ready growth (InvestSalone, 2025). The theory informs the expectation that unclear or poorly communicated rules will produce high uncertainty among entrepreneurs (Hypothesis 2).

2.3 Hypothesis development

Digital divide theory and the evidence on skills barriers suggest that entrepreneurs have direct, daily experience of their own digital competence, and so can evaluate it with some confidence, whereas structural conditions are experienced indirectly and unevenly. Evidence from the region that infrastructure remains a binding constraint (Astuti & Ayinde, 2025; Madichie et al., 2021) implies that infrastructure will be rated less favourably than literacy, and the institutional voids documented by Parrott et al. (2025) imply that the policy environment will be rated least favourably of all. The first hypothesis follows:

H1: *Entrepreneurs will rate digital literacy more favourably than infrastructure and the policy and regulatory framework.*

Institutional theory predicts that when rules are opaque, actors cannot form clear judgments about them. Because Sierra Leone's policy architecture is new and its implementation has been uneven (Ecofin Agency, 2025; InvestSalone, 2025), uncertainty should be highest for policy. The second hypothesis follows:

H2: *The share of respondents unable to characterise the dimension will be highest for the policy and regulatory framework.*

The DEE perspective holds that outcomes arise from the combination of ecosystem elements, so a general judgment of the ecosystem should be more critical than any single element if shortfalls in several elements compound one another. The third hypothesis follows:

H3: *The share of respondents identifying a gap in the overall ecosystem will exceed the share identifying a gap in each individual dimension.*

2.4 Research gap and conceptual model

Taken together, the literature shows that digital entrepreneurship in sub-Saharan Africa is shaped by infrastructure, skills, and institutions (Abdulai & Hussain, 2024; Astuti & Ayinde, 2025; Parrott et al., 2025), but most evidence comes from cross-country aggregates, from higher-connectivity economies, or from qualitative case work. The Sierra Leonean literature consists mainly of ecosystem mapping and scoping reports (InvestSalone, 2025; UNCDF, 2021). To the authors' knowledge, no prior study has combined entrepreneur-level survey evidence on digital literacy, infrastructure, and policy perceptions in a single low-connectivity West African ecosystem and used it to derive a sequencing logic for intervention. This is the gap the present study addresses. The conceptual model that guides the analysis therefore treats digital literacy (a second-level divide factor), infrastructure (a first-level divide factor), and policy and regulatory clarity (an institutional factor) as three perceived dimensions of the ecosystem, each expected to contribute to the overall assessment of the ecosystem. The model assumes interaction among the dimensions, so that strength in one may not compensate for weakness in another. This model is referred to in the discussion (Section 6) and in the agenda for future research (Section 8).

3. Sierra Leone's Digital Entrepreneurship Ecosystem: Context and Achievements

Sierra Leone's digital economy sits at the intersection of rapid institutional development and persistent structural constraint. On the institutional side, the government has since 2018 built a recognisable digital-economy architecture. DSTI leads innovation policy and public-sector digitisation (Directorate of Science, Technology and Innovation, 2025), MOCTI oversees the broader communications and technology agenda, and the Small and Medium Enterprise Development Agency (SMEDA) supports enterprise development more broadly (Ecofin Agency, 2025). The 2024–2030 Medium-Term National Development Plan names technology as one of five national priorities (Ministry of Communication, Technology and Innovation [MOCTI], 2025), and the government has advanced SLIIF, a blended-finance vehicle intended to mobilise capital,

strengthen infrastructure, and develop future-ready talent (Ecofin Agency, 2025). The National Innovation and Digital Strategy provides the policy framework for these efforts (MOCTI, 2024). The ecosystem has recorded meaningful, if early-stage, achievements. The establishment of DSTI, MOCTI, and SMEDA has created a dedicated institutional architecture for digital-economy policy that did not previously exist, and flagship initiatives such as the Felel TechCity innovation hub, SLIIF, and the Redsalt Angel Investor Network represent concrete steps toward mobilising capital and physical space for startups (Ecofin Agency, 2025). Sierra Leonean startups have also gained recognition in regional competitions, with fintech and healthtech ventures advancing to international finalist stages. In telecommunications, an estimated US\$400 million has been invested in infrastructure, including fibre expansion across most districts, with a second subsea fibre-optic cable planned (Ecofin Agency, 2026). On the structural side the picture is far more constrained. As of 2024, mobile penetration stood at 50.3 percent and internet usage at just 25.1 percent of the population, even though basic network coverage was nearly universal, with 2G reaching 96 percent of the population and 3G reaching 97.2 percent (Ecofin Agency, 2026). Roughly 60 percent of Sierra Leoneans remained outside the telecom network as of 2026 (Sierraloaded, 2026). The combination of comparatively strong policy intent and institutional architecture with persistently weak population-level digital access and skills is the tension this study set out to examine directly with entrepreneurs. A 2025 scoping report cautions, moreover, that the innovation-support system remains oriented toward helping startups win grants and pitch competitions rather than toward building scalable, investor-ready enterprises (InvestSalone, 2025), a caution that is consistent with the finding reported in Section 5.4 that entrepreneurs rated overall ecosystem conditions more critically than any single underlying dimension.

4. Methodology

4.1 Research design

The study employed a quantitative, cross-sectional survey design as its primary and analytic core. A structured questionnaire was administered to digital and digitally enabled entrepreneurs to measure perceptions of digital literacy, infrastructure, policy and regulatory conditions, and the overall ecosystem. To add contextual depth and to help interpret the survey distributions, the study also drew on complementary semi-structured interviews with a small number of entrepreneurs and key informants. These interviews were not analysed as a formal second data strand and are not used to triangulate or confirm the survey results inferentially; they serve an illustrative and interpretive function only, and are reported separately in Section 5.6. The study is therefore best described as a survey-based study with supporting contextual interviews, not as a mixed-methods design.

4.2 Population, sample size, and sampling

The target population comprised digital and digitally enabled entrepreneurs and aspiring entrepreneurs operating in e-commerce, fintech, agritech, and digital services. A sample of 200 respondents was drawn from three cities: Freetown, the capital and the main concentration of innovation hubs and investors, and Bo and Makeni, two of the country's major secondary urban centres. The three cities were chosen to capture variation in infrastructure quality and ecosystem density between the capital and the secondary cities. The sample size was set using Cochran's (1977) formula for estimating a proportion in a large population, $n = z^2 pq / e^2$, with $z = 1.96$ for 95% confidence, $p = 0.5$ as the most conservative assumption, and a tolerable margin of error of 7 percent. This yields approximately 196 respondents, which was rounded to 200. At this sample size the maximum 95% margin of error for any reported proportion is about ± 6.9 percentage points.

4.3 Instruments and data sources

The survey collected perception data on digital literacy, infrastructure, and policy and regulatory conditions, together with an overall assessment of the ecosystem, using a four-category response scale: effective or adequate, gap exists, still developing, and do not know or no opinion. Business-performance indicators were collected alongside these measures. All four perception items were answered by the same 200 respondents. The complementary interviews consisted of semi-structured conversations with a purposive subsample of survey respondents ($n = 12$) and with key informants ($n = 6$) drawn from DSTI, MOCTI, the National Telecommunications Authority (NaTCA), SMEDA, a telecom operator, and an innovation hub. Interview topics covered lived experience of infrastructural, skills-related, and regulatory barriers; how entrepreneurs learn about policy and regulation; and how they describe the overall ecosystem. Interviews were conducted in English and Krio, audio-recorded where consent was given, and summarised in structured notes. They were analysed using thematic summarisation (not formal coding or triangulation) to generate illustrative quotations and contextual observations. Secondary data were drawn from NaTCA, MOCTI, the ITU ICT Development Index, and DataReportal (2024).

4.4 Analytical techniques

Survey responses were first summarised using frequencies and percentages. To move beyond frequency tables, two inferential procedures were applied to the response distributions. First, a chi-square goodness-of-fit test was used for each dimension to test the null hypothesis that responses are spread evenly across the four categories. Second, 95% Wilson confidence intervals were computed for each proportion, and non-overlapping intervals were used as an informal indicator of differences between dimensions in testing H1 to H3. The complementary interview material was summarised thematically and is reported descriptively in Section 5.6 to illustrate, not to test, the survey patterns.

5. Results

This section presents the descriptive results of the entrepreneur survey ($N = 200$) for the three core dimensions and the overall assessment, followed by the inferential tests and the assessment of the hypotheses.

5.1 Digital literacy

Respondents were asked to characterise the current state of digital literacy among Sierra Leonean digital entrepreneurs. Just over a third (35%) rated digital literacy as effective or adequate, while a quarter (25%) identified a persistent gap. A further quarter (25%) described digital literacy as still developing, and 15 percent were unable to characterise it (Table 1 and Figure 1).

Table 1: Perceptions of Digital Literacy ($N = 200$)

Response category	n	% ($N = 200$)
Effective / adequate	70	35.0%
Gap exists	50	25.0%
Still developing	50	25.0%
Don't know / no opinion	30	15.0%

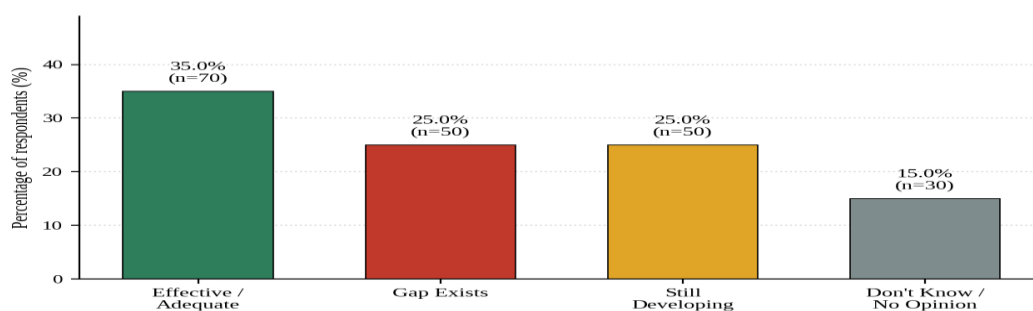


Figure 1. Perceptions of Digital Literacy (N = 200)

5.2 Infrastructure

On infrastructure, responses were more evenly, and more critically, distributed. Thirty percent of respondents rated infrastructure as effective or adequate, while an equal share (30%) identified a persistent gap. A further 30 percent were unable to characterise infrastructure conditions, the highest uncertainty after policy, while only 10 percent described infrastructure as still developing (Table 2 and Figure 2).

Table 2: Perceptions of Infrastructure (N = 200)

Response category	n	% (N = 200)
Effective / adequate	60	30.0%
Gap exists	60	30.0%
Don't know / no opinion	60	30.0%
Still developing	20	10.0%

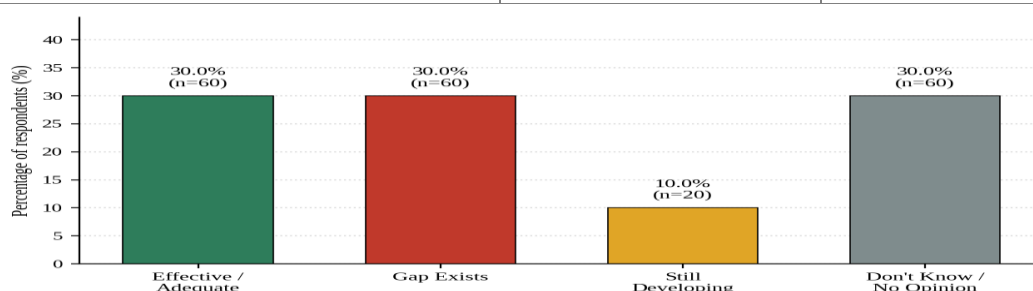


Figure 2: Perceptions of Infrastructure (N = 200)

5.3 Policy and regulatory framework

Perceptions of the policy and regulatory environment were the most uncertain of the three dimensions. Half of all respondents (50%) reported that they did not know or had no clear opinion on the effectiveness of current policy and regulatory frameworks. A quarter (25%) described policy as still developing, while effective or adequate and gap-exists responses were each given by only 12.5 percent, the lowest effective rating of the three dimensions (Table 3 and Figure 3).

Table 3. Perceptions of Policy and Regulatory Framework (N = 200)

Response category	n	% (N = 200)
Effective / adequate	25	12.5%
Gap exists	25	12.5%
Don't know / no opinion	100	50.0%
Still developing	50	25.0%

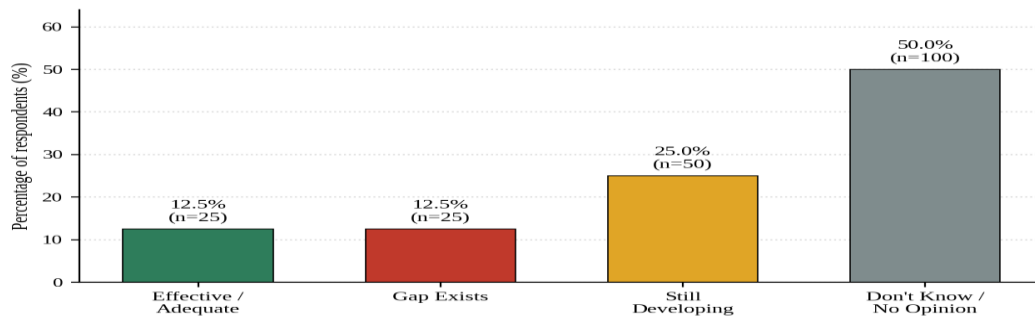


Figure 3. Perceptions of Policy and Regulatory Framework (N = 200)

5.4 Overall assessment of the ecosystem

When asked to assess the digital entrepreneurship ecosystem overall, respondents were considerably more critical than in their assessments of any single underlying dimension. Only 10 percent rated the ecosystem as effective, while 40 percent identified a clear gap, the largest gap share recorded for any of the four measures. A further 35 percent were unable to characterise the ecosystem, and 15 percent described it as still developing (Table 4 and Figure 4).

Table 4: Overall Assessment of the Digital Entrepreneurship Ecosystem (N = 200)

Response category	n	% (N = 200)
Effective / adequate	20	10.0%
Gap exists	80	40.0%
Don't know / no opinion	70	35.0%
Still developing	30	15.0%

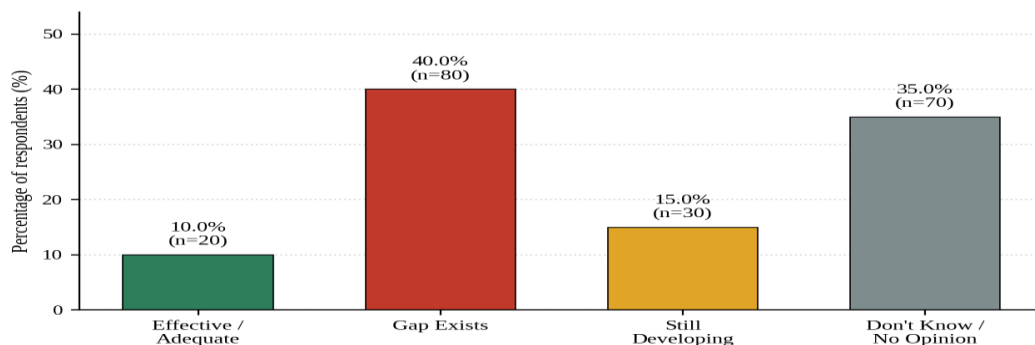


Figure 4: Overall Assessment of the Digital Entrepreneurship Ecosystem (N = 200)

5.5 Cross-dimensional comparison and inferential tests

Comparing across the four measures reveals a consistent pattern. Uncertainty rose sharply as questions moved from the concrete and experiential (literacy, 15%) to the structural and less directly observable (infrastructure, 30%; policy, 50%), before falling for the more general and more salient question of overall ecosystem conditions (35%), alongside a sharp rise in explicit gap responses to 40%. Policy was the dimension that combined the lowest effective rating (12.5%) with the highest uncertainty (50%). Chi-square goodness-of-fit tests indicate that the response distribution differs significantly from an even spread across the four categories for every measure: digital literacy, $\chi^2(3, N = 200) = 16.00$, $p = .001$; infrastructure, $\chi^2(3, N = 200) = 24.00$, $p < .001$; policy, $\chi^2(3, N = 200) = 75.00$, $p < .001$; and overall assessment, $\chi^2(3, N = 200) = 52.00$, $p < .001$. The policy distribution departs most strongly from uniformity, reflecting the concentration of responses in the uncertain category. Table 5 reports the 95% confidence intervals for the two categories most relevant to the hypotheses.

Table 5: Inferential Summary: 95% Wilson Confidence Intervals and Chi-Square Tests (N = 200)

Measure	Effective / adequate	Gap exists	Don't know	$\chi^2(3), p$
Digital literacy	35.0% [28.7, 41.8]	25.0% [19.5, 31.4]	15.0% [10.7, 20.6]	16.00, .001
Infrastructure	30.0% [24.1, 36.7]	30.0% [24.1, 36.7]	30.0% [24.1, 36.7]	24.00, < .001
Policy and regulation	12.5% [8.6, 17.8]	12.5% [8.6, 17.8]	50.0% [43.1, 56.9]	75.00, < .001
Overall ecosystem	10.0% [6.6, 14.9]	40.0% [33.5, 46.9]	35.0% [28.7, 41.8]	52.00, < .001

Literacy was rated effective by significantly more respondents than policy (35.0% against 12.5%, non-overlapping intervals), but its advantage over infrastructure (35.0% against 30.0%) is within the margin of sampling error. H2 is supported, because the uncertain share for policy (50.0%) is clearly above that for infrastructure (30.0%) and literacy (15.0%), with non-overlapping intervals. H3 is supported for literacy and policy, since the overall gap share (40.0%) exceeds the gap shares for literacy (25.0%) and policy (12.5%) with non-overlapping intervals, but only directionally for infrastructure (30.0%), where the intervals overlap slightly.

Table 6: Summary of Hypothesis Assessment

Hypothesis	Statement (abbreviated)	Result	Basis
H1	Literacy rated more favourably than infrastructure and policy	Partially supported	Literacy 35.0% vs policy 12.5% (non-overlapping); vs infrastructure 30.0% (overlapping)
H2	Uncertainty highest for policy	Supported	Policy 50.0% [43.1, 56.9] vs infrastructure 30.0% and literacy 15.0%
H3	Overall gap share exceeds each dimension's gap share	Largely supported	Overall 40.0% vs literacy 25.0% and policy 12.5%; directional vs infrastructure 30.0%

5.6 Complementary Interview Findings

The complementary interviews (12 entrepreneurs; 6 key informants) were not designed to test the hypotheses but to help interpret the survey distributions. Three themes recurred.

Theme 1: Policy is experienced as remote and undisclosed. Consistent with the 50% "don't know" share in Table 3, most entrepreneur interviewees could not name the National Innovation and Digital Strategy or describe licensing or tax rules relevant to their ventures. Several described learning about regulation only when a problem arose:

"I don't know the policy. I only hear about it when there is a problem with registration or tax. Nobody explains it to us." (E-commerce entrepreneur, Freetown)

A key informant at an innovation hub confirmed that policy communication is not systematically channelled through hubs:

"We host the startups, but we are not given policy briefings to pass on. The information stays in Freetown." (Hub manager)

This supports the interpretation in Section 6 that policy opacity, rather than policy content alone, shapes overall assessments.

Theme 2: Infrastructure is experienced as uneven rather than absent. Interviewees rarely described connectivity as simply present or absent; they described it as variable by location, time, and cost, matching the even three-way split in Table 2:

"In Freetown it is okay, but when I travel to Bo for deliveries the network changes. Electricity is the bigger problem for my shop." (Agritech entrepreneur, Bo)

"Coverage is there, but the data is expensive for a small business." (Digital services entrepreneur, Makeni)

Theme 3: Literacy is seen as improving but business-oriented skills are thin. Interviewees generally rated basic digital competence as better than a few years ago, consistent with the comparatively favourable literacy rating in Table 1, but distinguished this from the skills needed to scale:

"Young people can use phones and social media. But managing an online business, pricing, records that is different." (Fintech entrepreneur, Freetown)

These observations are illustrative only. They are consistent with the survey patterns but do not constitute independent corroboration, and no claim of triangulation or mixed-methods integration is made.

6. Discussion

The results offer three principal insights. First, digital literacy, while still identified as a gap by a quarter of respondents, was the dimension entrepreneurs rated most positively and about which they expressed the least uncertainty. This is consistent with H1 and with the view from digital divide theory that skills are experienced directly. It also suggests that literacy may be a comparatively more tractable near-term intervention area than infrastructure or policy. The result should not be overstated, however, because the advantage over infrastructure was not statistically distinguishable at this sample size, and a rating of effective does not mean that skills are sufficient for scaling a venture. The GSMA (2024) and Bergholz et al. (2024) both indicate that skills remain a significant constraint on digital entrepreneurship, so the favourable rating likely reflects the self-selected nature of a sample of active digital entrepreneurs, who are by definition more digitally capable than the general population. Second, infrastructure perceptions were split almost evenly between adequate, gap, and uncertain. This mirrors the national pattern in which near-universal network coverage coexists with low actual usage (Ecofin Agency, 2026), and it agrees with regional evidence that infrastructure and electricity are decisive correlates of digital adoption (Astuti & Ayinde, 2025) and a recurring challenge for West African digital ventures (Madichie et al., 2021). Entrepreneurs appear to experience infrastructure less as a binary of present or absent and more as a variable, unevenly distributed condition, which fits Friederici et al.'s (2020) observation that African digital entrepreneurs customise their business models around infrastructure limitations rather than waiting for them to be resolved. The comparatively low share describing infrastructure as still developing (10%) may indicate that entrepreneurs do not yet perceive a clear improvement trajectory, although the survey cannot establish this. Third, and most strikingly, policy and regulatory frameworks were the dimension entrepreneurs understood least well, with half of all respondents unable to offer a view, which supports H2. Combined with the finding that overall ecosystem assessments were markedly more negative than those of the underlying dimensions, which supports H3 for literacy and policy, this points to a compounding effect consistent with the conceptual model in Section 2.4: entrepreneurs' negative overall impression of the ecosystem appears to be driven disproportionately by the opacity of the policy and regulatory environment, even though policy was not the dimension most frequently rated as an outright gap. These findings align with, and extend, existing scoping evidence that Sierra Leone's ecosystem-support institutions have been more effective at building pitch and competition readiness than the market and investment readiness that ultimately depends on a clear, well-understood regulatory environment (InvestSalone, 2025). They also

support the digital divide framing adopted in Section 2.2. The gap between broad infrastructure availability and low reported confidence in that infrastructure, together with widespread uncertainty about policy, is more consistent with second- and third-level divides in skills, confidence, and institutional clarity than with a simple first-level access gap. Finally, the finding that no single dimension was rated clearly effective by a majority is in line with Omoga et al.'s (2026) argument that sustainable digital entrepreneurship in resource-constrained ecosystems requires multiple, coordinated pathways, and with Queissner et al.'s (2025) conclusion that ecosystem elements matter jointly for entrepreneurial activity.

7. Contributions and Applications

7.1 Theoretical contributions

The study makes three theoretical contributions. First, it extends digital entrepreneurial ecosystem theory (Bejjani et al., 2023; Sussan & Acs, 2017) to a low-connectivity, early-stage ecosystem by supplying primary, entrepreneur-reported evidence on how literacy, infrastructure, and policy are perceived together. The results in Table 5 show that perceptual clarity differs systematically across ecosystem dimensions, which suggests that ecosystem models should treat the clarity of the institutional environment, and not only its content, as an ecosystem attribute. Second, it contributes to digital divide theory by showing that, among active entrepreneurs, the binding constraints are better described by second- and third-level divides in confidence, skills, and institutional clarity than by first-level access alone, since the highest uncertainty and lowest effective rating attach to the institutional rather than the technical dimension (Tables 3 and 4). Third, it contributes to institutional theory by providing quantitative evidence that opaque rules can be observed in entrepreneurs' own assessments, with 50% of respondents unable to characterise the policy framework (Table 3, Figure 3), and by indicating how such opacity may feed into a negative overall judgment (Table 4, Figure 4).

7.2 Practical contributions and applications

The practical contribution lies in a sequencing logic for policy and investment, and Table 7 links each application to the evidence on which it rests. For government, the findings indicate that regulatory clarity and outreach should be treated as a distinct, near-term intervention and not only as a by-product of regulatory reform. With half of respondents unable to characterise the policy environment (Table 3, Figure 3), MOCTI and DSTI could publish plain-language guides to the National Innovation and Digital Strategy and to licensing, taxation, and data rules relevant to digital ventures, and could use innovation hubs as outreach channels. For skills programmes, digital literacy was the most positively rated dimension (Table 1, Figure 1), which suggests that existing efforts, such as those of READY Salone, are gaining traction and warrant continued investment, with a shift in emphasis from basic competence toward business-oriented digital skills. For infrastructure providers and regulators, the even split of adequate, gap, and uncertain responses (Table 2, Figure 2) indicates that investment should be paired with better entrepreneur-facing communication about coverage, cost, and reliability improvements as they occur, since a third of respondents were unable to assess infrastructure at all. For ecosystem-support organisations, blended-finance vehicles such as SLIIF, and angel networks such as the Redsalt Angel Investor Network, the overall negative assessment (Table 4, Figure 4), read alongside the scoping evidence (InvestSalone, 2025), supports a reorientation of programmes from pitch competitions toward market and investment readiness. Finally, the pattern across all four measures supports stronger coordination among DSTI, MOCTI, SMEDA, and NaTCA so that policy clarity, infrastructure investment, and literacy programming are sequenced and communicated jointly, and it supports a standing monitoring framework that repeats the survey instrument periodically to determine whether policy-perception gaps narrow over time.

Table 7: Evidence-Linked Applications

Application	Supporting evidence	Primary actors	Horizon
Policy and regulatory communication	50% unable to assess policy; 12.5% effective (Table 3, Figure 3)	MOCTI, DSTI, NaTCA	Near term
Sustain and deepen digital-literacy programmes	Highest effective rating, 35% (Table 1, Figure 1)	DSTI, READY Salone, hubs	Near to medium term
Entrepreneur-facing infrastructure communication	Equal 30% split: adequate, gap, uncertain (Table 2, Figure 2)	NaTCA, telecom operators	Medium term
Reorient support toward market and investment readiness	40% overall gap; 10% effective (Table 4, Figure 4); InvestSalone (2025)	SLIIF, RAIN, hubs, SMEDA	Medium term
Cross-agency coordination and monitoring	Pattern across Tables 1 to 5	DSTI, MOCTI, SMEDA, NaTCA	Ongoing

8. Conclusion

This study set out to assess how digital literacy, infrastructure, and policy interact to shape Sierra Leone's digital entrepreneurship ecosystem. Drawing on a survey of 200 entrepreneurs, the findings show a nuanced picture. Digital literacy is the most positively regarded of the three dimensions, infrastructure is perceived as unevenly distributed, and the policy and regulatory environment is the least understood, with half of entrepreneurs unable to offer a clear assessment. Chi-square tests confirmed that these response patterns depart significantly from an even spread of opinion, and confidence intervals showed that uncertainty about policy is significantly higher than uncertainty about literacy or infrastructure. Overall perceptions of the ecosystem were considerably more negative than perceptions of any single dimension, which points to a compounding relationship between policy opacity and overall entrepreneurial confidence. Of the three hypotheses, H2 was supported, H3 was largely supported, H1 was partially supported. The theoretical implications are that digital entrepreneurial ecosystem models should account for the clarity and communication of institutions as well as their content, that the digital divide in entrepreneurial settings is better described by second- and third-level divides than by access alone, and that institutional theory's emphasis on the rules of the game can be observed directly in entrepreneurs' perceptions. The practical implication is that closing Sierra Leone's digital entrepreneurship gap will depend less on any single intervention than on improving the clarity and communication of the policy and regulatory environment alongside continued investment in literacy and infrastructure. This sequencing implication has direct relevance for MOCTI, DSTI, and Sierra Leone's development partners.

Several limitations qualify these conclusions. The sample of 200 entrepreneurs is concentrated in Freetown, Bo, and Makeni and may not represent conditions in more remote districts, where connectivity and institutional presence are weaker. The sampling frame is not a complete register, so the results are indicative of the surveyed population and not nationally representative. The design is descriptive and perception-based, so it captures subjective assessments and not objective, independently verified measures of literacy, infrastructure, or regulatory quality. The four-category scale limits statistical power, and the repeated ratings by the same respondents mean that comparisons between dimensions are indicative and not formally tested. The cross-sectional design cannot establish causality or show how perceptions change over time, and the high share of uncertain responses, while analytically informative, reduces the number of respondents who express an evaluative view. The complementary interviews were illustrative and were not analysed as a formal qualitative strand, so the study

does not claim mixed-methods integration. These limitations point to a clear agenda for future research. First, respondent-level cross-tabulations and ordinal logistic regression should be used to examine whether perceptions differ by city, sector, gender, and firm age. Second, perception measures should be paired with objective connectivity, device-ownership, and regulatory-compliance data, and with business-performance outcomes such as survival and revenue growth, in line with the third-level divide. Third, longitudinal designs should track whether policy clarity improves as MOCTI and DSTI implement the national strategy, and a repeated survey would also allow the effect of specific interventions to be assessed. Fourth, sampling should extend to rural districts and to informal digital ventures, which Parrott et al. (2025) show to be central to digital entrepreneurship in the region. Fifth, comparative work across fragile and post-conflict West African ecosystems would show whether the pattern of policy opacity observed here is specific to Sierra Leone or common to early-stage ecosystems.

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