Digital Inequality and Inclusive Development in an Increasingly Connected World

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Abstract

Digital connectivity has expanded dramatically, yet access to a network does not guarantee meaningful participation in digital society. Digital inequality increasingly concerns the quality and affordability of connectivity, access to capable devices, digital skills, accessibility, safety, language, institutional support, and the capacity to translate online activity into educational, economic, civic, and social benefits. This editorial argues that inclusive digital development requires moving beyond binary measures of who is online toward evidence about the conditions under which people can use digital systems effectively and convert connectivity into valued outcomes. First-level inequalities in access interact with second-level differences in skills and patterns of use and with outcome-level inequalities in who benefits. Infrastructure therefore remains necessary but is insufficient. Research and practice should prioritize longitudinal measurement, meaningful-connectivity indicators, accessibility-by-design, device affordability, rural and underserved populations, digital skills, inclusive public services, locally relevant content, and rigorous evaluation of development outcomes. Digital inclusion should ultimately be judged by whether people possess realistic capabilities to participate safely and productively in increasingly digital institutions and economies.

Keywords: digital inequality; digital inclusion; meaningful connectivity; digital skills; ICT4D; accessibility; inclusive development

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1.0 Introduction

1.1 Context and Problem Framing

Digital infrastructure has expanded at extraordinary scale, but connectivity remains deeply unequal in its availability, quality, affordability, and usefulness. Mobile broadband coverage now reaches much of the world, yet network coverage is not equivalent to effective internet use, and substantial gaps remain among low-income, rural, older, less educated, disabled, and otherwise disadvantaged populations. The International Telecommunication Union increasingly frames the policy objective as universal and meaningful connectivity rather than simple network access, emphasizing quality, availability, affordability, devices, skills, and security as interdependent conditions (International Telecommunication Union, 2024, 2025a). This shift reflects a broader evolution in digital-divide research. Early scholarship distinguished those with access from those without it, but subsequent research demonstrated that inequalities continue among connected users through differences in skills, autonomy, devices, usage, and outcomes (Hargittai, 2002; van Dijk, 2005).

Digital inequality matters because online participation is increasingly intertwined with employment, education, banking, health information, government services, social networks, and access to markets. The consequences of exclusion therefore grow as institutions assume that people can authenticate digitally, navigate applications, receive electronic payments, compare information, learn remotely, or interact through smartphones. Warschauer (2003) argued that meaningful access is embedded in social resources, literacy, content, and institutions rather than being supplied by hardware alone. Helsper's (2012) corresponding-fields model similarly connects digital inequalities to existing social, economic, cultural, and personal resources. Connectivity can therefore amplify opportunity for people who possess complementary resources while offering limited benefit to those whose access is unstable, expensive, unsafe, or difficult to use.

1.2 Why the Issue Matters

The proposition advanced here is that inclusive digital development must be evaluated through the capabilities people gain, not simply the connections they possess. First-level divides concern access and material resources; second-level divides concern skills and patterns of use; and third-level or outcome divides concern the benefits people obtain from digital participation (van Deursen & Helsper, 2015). These layers interact. A household may technically have mobile internet but rely on one low-storage device shared among several people, avoid video because data are expensive, lack confidence in online forms, encounter inaccessible interfaces, or remain vulnerable to scams. The relevant question is therefore not whether connectivity exists, but whether individuals can use it safely, effectively, and autonomously to pursue educational, economic, civic, and social goals.

2.0 Current Landscape

2.1 Connectivity

The current digital-inclusion landscape reflects a transition from infrastructure expansion toward multidimensional measurement. Material access now includes device ownership, device quality, maintenance, software, connection stability, and the autonomy to use technology when needed. van Deursen and van Dijk (2019) show that inequalities in material access persist even in highly connected societies, while their earlier multidimensional access model demonstrates that motivation, physical access, skills, and use form sequential but interacting components of digital participation (van Deursen & van Dijk, 2015). The ITU's universal and meaningful connectivity framework institutionalizes a comparable multidimensional view at the international level (International Telecommunication Union, 2024).

2.2 Affordability

Skills form a second major domain. Hargittai (2002) established the importance of variation in users' ability to find and evaluate information online, challenging assumptions that younger or connected users necessarily possess advanced skills. van Deursen and van Dijk (2014) distinguish operational, information-navigation, social, creative, and strategic capabilities, illustrating that digital literacy extends beyond basic device operation. Hargittai (2010) further shows considerable variation among young adults often described collectively as digital natives. These differences matter because complex online tasks such as applying for work, managing finances, verifying information, or accessing public services require more than routine messaging or entertainment use.

2.3 Digital Skills

Outcome inequalities have consequently become central to current research. Robinson et al. (2015) argue that digital inequalities intersect with broader social inequality, while van Deursen et al. (2017) describe the compound and sequential nature of internet inequalities. People with greater education, income, social support, and occupational opportunities may be better positioned to convert digital resources into valued outcomes. This helps explain why connectivity can coexist with persistent socioeconomic inequality rather than automatically reducing it.

2.4 Differences in Digital Outcomes

Development research adds an institutional perspective. Heeks (2010) argues that the developmental contribution of ICT depends on how technologies interact with wider economic and social systems, while Qureshi (2015) emphasizes that technological diffusion should be judged by whether it improves human and social development. World Bank (2016) similarly concluded that digital technologies generate larger dividends when complemented by effective institutions, skills, and enabling environments. Contemporary ICT4D therefore increasingly treats infrastructure as one element within broader systems of capability, governance, affordability, and local relevance.

3.0 Critical Challenges

3.1 Multidimensional Inequality

Affordability remains a foundational inequality because both service prices and device costs determine whether nominal coverage becomes meaningful use. ITU data show continuing gaps across and within countries, particularly for fixed broadband and for lower-income households (International Telecommunication Union,

2025b). Even when entry-level mobile access is affordable, intensive use for education, remote work, video, cloud services, or digital entrepreneurship can require much larger data allowances. Device affordability is similarly consequential because low-cost phones may lack storage, battery life, screen size, accessibility features, or processing capacity required by contemporary applications.

Geography continues to shape both availability and quality. Rural populations face lower network density, higher infrastructure costs, unreliable electricity, fewer repair services, and less competition among providers. Salemink et al. (2017) show that rural digital inequalities emerge through interactions among infrastructure, adoption, and local socioeconomic conditions. A coverage map can therefore overstate inclusion when connections are congested, intermittent, or too slow for modern services.

3.2 Measurement

Skills and education create a second-level divide among connected users. Digital competence is not evenly distributed and is strongly associated with education, experience, age, and social support. van Deursen and van Dijk (2014) demonstrate that different types of internet skills have different determinants, while Hargittai (2010) shows substantial variation even among young users. Skills gaps become more consequential as services move from simple information websites toward multi-step authentication, digital payments, self-service portals, and automated decision processes.

Gender, age, disability, and language can deepen exclusion when technologies reflect majority users. Hilbert (2011) cautions that the gender digital divide varies by socioeconomic context and cannot be reduced to one universal pattern, while Antonio and Tuffley (2014) synthesize persistent gendered barriers in access, skills, and participation. Accessibility introduces another dimension: people with visual, auditory, motor, cognitive, or age-related impairments may face design barriers even when devices and connectivity are available. Lazar et al. (2015) show that digital accessibility depends on organizational process and policy as well as technical standards.

3.3 Rural and Regional Disparities

Digital safety also affects meaningful participation. Fear of fraud, harassment, privacy loss, identity theft, or financial scams can discourage use, especially where people have limited support when harms occur. The ITU's meaningful-connectivity framework therefore includes security as a core dimension rather than a secondary consideration (International Telecommunication Union, 2025a). Locally relevant content and language are equally important: users derive fewer benefits when services, educational resources, interfaces, and public information are not available in languages or cultural forms they can use.

3.4 Platform Dependence

Finally, measurement remains inadequate. Binary indicators such as household internet access or subscriber counts cannot reveal whether people have sufficient speed, devices, autonomy, skills, or opportunity to benefit. Third-level inequalities are especially difficult to measure because outcomes such as improved earnings, educational attainment, civic participation, or health access depend on many factors beyond technology. Stronger causal and longitudinal research is needed to distinguish digital participation from broader socioeconomic advantage.

4.0 Discussion and Priorities

4.1 Integrative Discussion

Digital inequality should be understood as a cumulative capability problem. Infrastructure determines what connections are technically possible; prices determine whether households can sustain them; devices constrain which applications can run; skills shape whether people can complete tasks; institutions determine how services are designed; and socioeconomic position affects whether digital participation can be converted into benefits. Weakness at any one stage can reduce the value of the others.

This helps explain why connectivity can reproduce existing inequality. People with higher incomes can purchase faster service, newer devices, private workspaces, training, and technical assistance. People with more education may find it easier to evaluate information, navigate complex interfaces, or use digital tools strategically. Employers and schools may reward advanced digital practices, further increasing returns to existing advantage. The internet is therefore not an equalizing resource in isolation; its effects depend on complementary material and social resources (Robinson et al., 2015; Helsper, 2012).

Policy can also generate exclusion unintentionally when digital channels replace rather than complement accessible offline alternatives. An online benefit system may reduce administrative costs while increasing burdens for users with low literacy, disabilities, unstable identification documents, shared phones, or limited data. Similarly, remote education may expand reach while reproducing inequality through differences in devices, household space, parental support, connectivity, and teacher capacity. Inclusive development therefore requires institutional design that recognizes heterogeneous users rather than treating all connected citizens as equally equipped.

The concept of meaningful connectivity provides a useful organizing principle because it prevents infrastructure from becoming a proxy for inclusion. Yet the framework should be linked to outcomes. Safe, affordable, high-quality connectivity is valuable because it expands people's capabilities; the ultimate test is whether people can obtain services, learn, communicate, work, transact, create, and participate on terms that are reasonably comparable to those available to better-resourced groups.

Complementary scholarship informing this synthesis includes Donner (2015); GSMA. (2024); International Telecommunication Union. (2024); International Telecommunication Union. (2025a); International Telecommunication Union. (2025b); Ragnedda (2013); Scheerder (2017); Tsatsou (2011); UNESCO. (2023); Unwin (2009); Wei (2012); World Bank. (2016); and World Bank. (2021). These works broaden the evidentiary base considered across the field.

4.2 Research and Practice Priorities

The first priority is longitudinal measurement. Cross-sectional surveys identify who is connected at a point in time but reveal less about how changes in prices, devices, employment, education, or service design alter digital participation. Panel studies can examine whether improved connectivity produces sustained gains and which groups remain unable to translate access into outcomes.

Second, meaningful-connectivity indicators should be incorporated into national and local measurement. Availability, speed, reliability, data allowance, device quality, affordability, autonomy, skills, and safety should be measured together where feasible. The ITU's multidimensional framework provides a strong basis for this shift (International Telecommunication Union, 2024, 2025a).

Third, accessibility-by-design should become routine in both public and commercial digital services. Accessibility should be tested with representative users, including people with disabilities and older adults, rather than inferred from formal technical compliance. Organizational procurement and development processes should make accessibility a quality requirement from the outset (Lazar et al., 2015).

Fourth, research should focus explicitly on rural, low-income, linguistically marginalized, and otherwise underserved populations. Infrastructure interventions should be evaluated not only for coverage but for service quality, affordability, maintenance, adoption, and local economic use. Community networks and shared facilities may remain valuable in settings where individual household access is not immediately viable.

Fifth, digital-skills programs should distinguish basic operation from information, communication, creative, safety, and strategic skills. Training should be connected to concrete goals such as job search, entrepreneurship, public services, education, and financial management rather than generic device use. Evaluations should measure behavioural and socioeconomic outcomes rather than course completion alone.

Sixth, inclusive digital public services should preserve workable assistance and correction channels. Institutions should evaluate whether authentication, language, accessibility, and device requirements exclude intended users. Finally, digital-development research should compare actual outcomes against credible counterfactuals. The field needs stronger evidence about when connectivity improves education, earnings, public-service access, financial resilience, and participation—and when complementary investments are necessary before those gains can occur.

4.3 Implications for the Journal's Scope

Digital inclusion should be treated as an empirical and interdisciplinary research domain rather than as a purely normative aspiration. Strong studies will connect connectivity with education, income, geography, gender, disability, age, language, institutional design, and developmental outcomes. Quantitative access indicators are useful, but they should be complemented by research on the quality and meaning of access in everyday life.

Particularly valuable contributions include longitudinal analyses, comparative studies, evaluation of affordability interventions, rural connectivity research, accessibility studies, digital-skills measurement, inclusive public-service design, and ICT4D work that links technical deployment to socioeconomic outcomes. Research should make explicit which level of the digital divide it addresses and avoid interpreting increased access as equivalent to improved welfare.

The field also benefits from mixed-method work capable of explaining why apparently similar connectivity conditions produce different outcomes across groups or locations. Digital inequality is generated by interactions among infrastructure, institutions, markets, households, and individual capabilities. Research that integrates these levels can provide a more credible basis for inclusive development policy than studies focused on adoption alone.

4.4 Conclusion

The expansion of digital infrastructure is a major achievement, but it does not mark the end of the digital divide. As networks become ubiquitous, inequality shifts toward the conditions of connection and the benefits that users can obtain from it. Affordability, devices, skills, accessibility, safety, language, institutional support, and service design increasingly determine whether connectivity becomes a genuine developmental resource.

A multidimensional view changes both measurement and policy. It redirects attention from subscriber counts toward meaningful use, from devices toward autonomy and capability, and from online presence toward educational, economic, civic, and social outcomes. It also clarifies why disadvantaged groups may remain disadvantaged after becoming connected: technologies operate within pre-existing distributions of income, education, power, and institutional access.

Inclusive digital development should therefore be judged by whether people can participate effectively in institutions that increasingly assume digital competence. Infrastructure remains indispensable, but its value depends on complementary investments in affordability, skills, accessible design, local content, safety, and responsive public services. The most important question is no longer simply who is connected, but who can convert digital connection into real opportunity and who still encounters barriers after the network arrives.

5.0 Declarations

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Prof. Miriam Cole and Dr. Elias Courtney contributed to the conceptual development, literature synthesis, critical interpretation, drafting, and revision of the editorial.

5.2 Funding

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5.3 Competing Interests

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5.4 Data Availability

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5.5 AI Use Disclosure

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