**Abstract**

**This paper investigates the use of Socio-Technical Systems Theory as a framing tool for Information and Communication Technology for Development (ICT4D), especially in relation to how it is used to underpin attempts to close the digital divide as well as contribute to socio-economic progress. Through an analysis of published literature and case studies, the study underscores the necessity for socio-technical alignment, participatory design, and community engagement with respect to ICT4D projects to make them sustainable and successful. Our key findings suggest that though new technologies including artificial intelligence (AI) and blockchain hold transformation potential, they are still bound by infrastructural and digital literacy wanting. Digital inclusion is significantly correlated with improvements in quality of life, the report also states, highlighting the importance of focusing efforts to address supply-side and demand-side issues. Study limitations are secondary data used and focusing on emerging areas which might limit transferability. The paper ends up with some strategic policy-prescriptive recommendations for policymakers and practitioners towards advancing the socio-technical integration of ICT4D interventions, and suggestions for further research including social construction of algorithmic bias or ethical implications of technology uptake**

**Keywords:”ICT4D “,”Digital Divide”,” Socio-Technical Systems Theory”,” Socio-Technical Systems Theory”,” Technology Adoption”**

**Title**

**Exploring Socio-Technical Systems Theory in ICT4D: Bridging the Digital Divide and Promoting Socio-Economic Development**

**Problem Statement**

Although Information and Communication Technology for Development (ICT4D) initiatives have much to offer, there are still many challenges associated with their implementation impact. The digital divide lives on, in illustrated contrast by the lack of access to ICT infrastructure, the discrepancy in literacy rates and availability of digital technologies, and inequity of expenditure. These factors continue to disappoint socio-economic development (Salemink et al., 2017; Henderson et al., 2020). Rural areas, meanwhile, suffer from poor broadband connections, lack access to affordable devices and have few opportunities for digital skills training. This hinders their potential to use ICT for education, healthcare or procuring livelihoods (Wavehill, 2020). These barriers underscore a need for policies that can address both supply and demand-side obstacles to universal acceptance of new technology.

Theoretical frameworks such as Socio-Technical Systems Theory offer valuable insights into how technological systems and social structures interact, arguing the importance of embedding ICT solutions in local socio-economic contexts (Bijker & Law, 1992). However, existing initiatives often fail to bring socio-technical thinking into full play. As a result, adoption remains localized, sustainability low and the projects themselves are poorly scalable. For example, although research has shown that participation-based design enhances community ownership and trust in projects entrance of users is inconsistent across various ICT4D projectst (Kamal et al., 2019). Moreover, while emerging technologies like artificial intelligence (AI) and blockchain hold out hope for developing more efficient means of production and better transparency yet their use is restricted by infrastructural socioeconomic conditions find artificial barriers (Freitag et al., 2021).

Access to the digital world is an important challenge fulfill development goals equitably. Digital inclusion projects accessible governance and delivery of public services have shown promise for improving people's living standards (Alhassan & Adam, 2021). But these programs continue to suffer because of digital divides in both infrastructure and literacy that limit their effectiveness, particularly in rural areas underserved by the internet (Wavehill, 2020). This study seeks to explore these issues by critically reviewing how the Socio-Technical Systems Theory framework holds in practice for implementing ICT4D projects, using literature from around the world. By integrating a systematic review of existing research reports with case studies, the research aims to uncover conditions affecting success in ICT4D and present practical recommendations on how to bridge the digital revolution. The study also examines the implications of emerging technologies in the field of ICT4D and addresses the moral and practical issues associated with their widespread adoption. Its purpose is to enrich the academic discussion on ICT4D projects from both theoretical and empirical perspectives. At the same time, it offers insights into socio-technical integration for ICT4D to policy makers, developers and students.

**1.Introduction**

The integration of Information and Communication Technology (ICT) into development initiatives has brought global economy, politics, and industries quite some change, and brings hitherto unimagined opportunities for innovation in connectivity socio-economic progress and so on. As a core element of contemporary development strategies, ICT makes possible access to education, healthcare and other public services (Ezike, 1994). But not everyone benefits the same from ICT, which has led characteristic digital divides that further accelerate inequities in resource access, opportunity and service provision (Salemink, 2017; Henderson, 2020). Most marked is this divide in developing regions, where unequal I CT infrastructure intermediary costs of technology diffusion such as digital illiteracy or reduced affordability for marginalized communities to participate meaningfully in the digital economy all act as barriers.

Bridging the digital divide by eliminating such barriers and disparities is vital to achieving sustainable development and reducing economic inequalities. ICT4D (Information and Communication Technology for Development) programs try to exploit technology s advantages to improve living standards, nurture public inclusion, and push development toward a more sustainable course. They all are formed round theoretical models, which offer insights into the adoption, establishment, and impact of ICT in different socio-economic settings. Among these models, the sociology of technology has won growing popularity as a useful approach for understanding interaction between technical systems and society. This idea stresses that whatever technological solutions are devised must be in harmony with the social, cultural, organizational surroundings in which they are to be put to work (Bijker and Law, 1992). By concentrating on socio-technical alignment, ICT4D initiatives can meet the special challenges faced by people in need and assure themselves that technical measures will not be lost to calamity.

While ICT4D initiatives have shown potential, they also face mountains of challenges. These initiatives are hampered by the "digital divide," a gap between those who can easily acquire needed infrastructure, digital literacy, and computer use skills and those who cannot. For example, rural regions may suffer from poor broadband links either with adequate coverage only on occasions when others may not be conducting video interviews, a lack of affordable devices as rural residents can support others from the city who are so trained to let them use their computer at least at first becomes all but impossible to find places where one need not keep him / herself perfectly still or do anything othe As new technology continues to emerge and evolve like artificial intelligence (E-I), blockchain and Internet of Things (IoT), it both provides opportunities for ICT4D initiatives and brings a host of new challenges. While this technology could greatly optimize resource allocation, bring about transparent benefits or improvements in services delivered and possibly that other areas would open for becoming a productive workforce again after following many successful measures at home to improve wellbeing (Freitag et al., 2021), it is presently locked up by bottlenecks in infrastructure and society.

This paper investigates the various theoretical frameworks of ICT for developing countries within the field Information Systems. With a focus on Socio-Technical Systems Theory, this cross-disciplinary study is also a theorisation which uses existing literature and case studies to uncover why some projects succeed, how others fail and what advice can be drawn from this evidence in general terms for those people doing related work elsewhere. In addition to reviewing existing literature, we also pay attention to the three key themes – participatory design, community engagement and socio-technical alignment – that are crucial to how far forward and in what direction local need s are put forward; this enables a certain amount of scaling rural services at national level without high environmental costs or pollution problems so commonly found in poor areas where they can Nor does our work steal away future generations 'fuel resources when whole industries have been buried underground. Furthermore, the study examines the role of emerging technologies in advancing ICT4D objectives and considers ethical and practical challenges.

By evaluating literature and case studies, this study aims to take on from where other behaviour critical research left off and to put forward some ideas for future scholars, policymakers, and developers to ponder. The study provided some striking examples of how hard people had to work just to acquire basic ICT skills, and how so remote are the institutions that provide these teachings today; it again illustrated the fact that rural grassroots professionals brought together in an environment with access not only to Old World knowledge but also New World skill sets could soar far above their previous accomplishments. This study serves to fill that gap by shedding light on how ICT can be used for development even in relatively poor areas but which have nonetheless had social development.

**2.Literature Review**

Literature Review

Based on the Socio-Technical Systems Theory framework, the literature review examines the theoretical foundations and empirical research on Information and Communication Technology for Development (ICT4D). It delves into the application of this particular spirit theory. Key themes explored in this chapter include participation in development, socio-technical alignment and participatory design, digital divide themes, new technologies and their potential impacts on large scale rural economic development projects.

**Theoretical Foundations of ICT4D**

There are several theoretical bases for ICT4D research that illuminate the use, realization and impacts of technology. One of these is the Socio-Technical Systems Theory. It emphasizes the interplay between technological systems and social structures, but it advocates for alignment of technical solutions with organisational and societal needs (Bijker & Law, 1992).This theory has been widely applied to ICT4D projects. An intervention is sustainable and culturally appropriate when the technology fits smoothly into local life. For example, Henderson et al. (2020) stress the importance of socio-technical alignment in rural SMEs. Their results show how ICT adoption can increase resilience and competitiveness if combined with local practices.

Another valuable lens for understanding ICT adoption is offered by the Diffusion of Innovations Theory (Rogers, 2003). This tries to tell us how modern technology becomes part of rural communities, and stresses factors such as comparative angles and advantages or compatibility and complexity. This framework has been used by Salemink et al. (2017) in their study of rural broadband initiatives. They found that adoption rates are determined by infrastructure availability as well as the way technology is perceived to contribute efficiency and other benefits. However, in many cases the theory fails to address cultural and social barriers which are vital in ICT4D settings. (Bijker & Law, 1992).

**Addressing the Digital Divide**

In ICT4D, the digital divide still poses a moral challenge, particularly in rural areas that are still not well-served or areas with few existing facilities. Wavehill and the BEIS (2019) studies indicate that societal development is being held back by disparities in access to ICT infrastructure, digital literacy and money. Availability of ready and cheap broadband past a certain point in the upstream direction leads not only to supply side failures but also feeds more data back into fault-tolerant circuits carrying traffic in both directions (Morris et al., 2022). Success depends on local conditions. To do this, businesses and communities have to depend on reliable infrastructure, the need for government policies.

**Participatory Design and Socio-Technical Alignment**

Participatory design becomes an essential part of ICT 4 D, through which end-users are involved in decisions about technology and how it is implemented. According to Kamal et al. (2019) studies, participatory methods can help ensure higher rates of adoption and make non-governmental organizations sustainable. For instance, in rural Pakistan, telemedicine platforms have impacted a great many people thanks to the communities involved at every stage of their development--this includes planning; overcoming cultural barriers; building trust among those who use them.

ICT4D initiatives can be further enhanced by aligning technical and social spheres, to ensure that technological solutions are woven into their local socio-economic settings. In their case studies in rural Wales, Henderson et al. (2020) demonstrate that small-and medium-sized enterprises (SMEs) benefit from embracing ICT when certain conditions pertain, for example: aligning digital tools with current business practices and adding digital education points. However, there are still some differences in how this integration occurs--especially where lack of resources restrict progress.

**Emerging Technologies in ICT4D**

Emerging technologies like artificial intelligence (AI), blockchains and the Internet of Things (IoT) still bring new possibilities to ICT development projects. According to the report, artificial intelligence (AI) systems can help to regulate resource accumulation and decision making. Meanwhile, blockchain technology increases the security and transparency of financial transactions (Freitag et al., 2021). For example, the technology has been used in agricultural projects to streamline supply chain management. This cuts transaction charges and makes everything much more efficient (Zhang et al., 2019). Nonetheless, the introduction of these technologies necessitates infrastructure and digital literacy especially in developing regions--improvements at a fundamental level.

**Digital Inclusion and Quality of Life**

It has been shown that quality of life is closely related to inclusion and active cooperation in information technology use. For example, compared with those who are not involved in digital communities, people who participate mostly in surfing the web are likely to have spent higher proportions of their time on active interactions joined by fewer passive viewers (Alhassan et al., 2011). The evidence suggests that by facilitating inclusive networks people take greater part in public decision-making, feel less alienated from society and more fulfilled as individuals. For example, financial institutions that offer independent identification and teller services should be established to ensure everyone has access to ICT (Schukat et al., 2011). Yet no matter how cheap the devices may become or how low tariffs drop for mobile calling, there remains a large gap between quality-of-life expectations based on access to ICTs and real possibilities for achieving them. this cannot be eliminated so easily by having more aggressive government intervention (Alhassan & Adam, 2011). However, the large digital divide between different strata of society in particular regions remain a crucial barrier.

**Impact of ICT4D on Socio-Economic Development**

Despite the obstacles, ICT4D initiatives demonstrated to be a major mover in improving socio-economic outcomes, particularly in education, healthcare and financial inclusion. Medical services on-line have indeed extended the provision of health care delivery to remote areas where doctors cannot visit at all through eliminating travel costs and giving more access time or information about one's medical problem (Kamal et, al., 2019). Similarly, mobile phones allow finance for poor communities and entrepreneurship opportunities among them; from needing banking services to cope with life, people in poverty can leap into marketplaces both large or small(Chatterjee et, 2020). But these initiatives are not without their problems, including challenges of affordability, accessibility, and cultural difference.

**3.Methodology**

This study employs a qualitative research design rooted in the **Socio-Technical Systems Theory** framework, which emphasizes the interdependence between technological systems and social structures. The theory advocates for the alignment of technical solutions with organizational and societal needs, making it particularly relevant for ICT4D initiatives where the success of technological interventions depends on their integration into local socio-economic contexts (Bijker & Law, 1992; Henderson et al., 2020). By focusing on socio-technical alignment, this methodology seeks to explore how ICT4D initiatives can effectively bridge the digital divide and foster socio-economic development in underserved regions.

The data collection process involves a systematic review of existing literature and case studies to examine the application of Socio-Technical Systems Theory in ICT4D initiatives. A systematic literature review was conducted using academic databases such as Google Scholar, IEEE Xplore, and SpringerLink, with keywords including "Socio-Technical Systems Theory," "ICT4D," "digital divide," "technology adoption," and "socio-economic development" (Snyder, 2019). Peer-reviewed articles, reports, and case studies were selected based on their relevance to the research objectives and their focus on socio-technical principles. Additionally, archival data from established sources such as the Network Readiness Index Report and DESI database were utilized to analyse ICT adoption and socio-economic impacts (Fernández-Portillo et al., 2020; Alhassan & Adam, 2021). Case studies were chosen to provide practical insights into ICT4D projects that explicitly incorporate socio-technical principles, such as participatory design and community engagement. Selection criteria included geographical diversity, project scope, and documented outcomes (Kamal et al., 2019, Schukat & Heise, 2021).

The data analysis process was conducted in two stages: **thematic coding** and **comparative analysis**. Thematic coding was used to identify recurring patterns and themes in the collected data, such as participatory design, socio-technical alignment, barriers to technology adoption, and the role of emerging (Lythreatis et al., 2021). These themes were further divided into socio-economic factors, technological factors, and organizational factors to provide a comprehensive understanding of the challenges and opportunities in ICT4D projects. For example, socio-economic factors were categorized into subthemes such as education, healthcare, and financial inclusion, while technological factors were divided into infrastructure, digital literacy, and affordability. This detailed categorization allowed for a nuanced understanding of the socio-technical dynamics in ICT4D initiatives.

Comparative analysis was employed to evaluate the effectiveness of socio-technical approaches across different ICT4D initiatives. This involved comparing case studies to identify commonalities and differences in their implementation and outcomes. For instance, projects that emphasized participatory design were compared to those that relied on top-down approaches to assess their relative success in achieving socio-technical alignment (Du & Wang, 2024)Archival data, such as broadband penetration rates and digital literacy indices, were also analysed to identify correlations between ICT adoption and socio-economic outcomes (Fernández-Portillo et al., 2020). This comparative approach provided insights into the contextual factors that influence the success of ICT4D initiatives and highlighted best practices for achieving socio-technical alignment.

To enhance the validity of the findings, **triangulation** was used by cross-referencing data from multiple sources, including academic literature, case studies, and archival data. Triangulation ensured that the analysis was robust and accounted for different perspectives on the socio-technical dynamics of ICT4D initiatives. For example, findings from case studies were corroborated with statistical data from archival sources to validate the observed trends and patterns. This multi-faceted approach strengthened the reliability of the conclusions drawn from the analysis.

Ethical considerations were integral to the research process to ensure the integrity and credibility of the study. All sources of data, including academic articles, reports, and case studies, were properly cited in accordance with APA guidelines, ensuring respect for intellectual property rights and avoiding plagiarism. The criteria for selecting literature, case studies, and archival data were clearly defined and documented to ensure transparency and reproducibility. Efforts were made to minimize bias in data selection and analysis by choosing case studies that represent a diverse range of geographical regions and socio-economic contexts. For case studies involving sensitive data, measures were taken to anonymize the information to protect the privacy of individuals and organizations. Additionally, cultural sensitivity was prioritized by incorporating insights from studies that explicitly addressed cultural barriers and enablers in ICT adoption (Kamal et al., 2019).

The Socio-Technical Systems Theory framework guided the analysis by evaluating the alignment of ICT solutions with local socio-economic contexts, identifying gaps in participatory design and community engagement, and proposing recommendations for enhancing the socio-technical integration of ICT4D initiatives. By focusing on the interplay between technological systems and social structures, this methodology aims to provide insights into the practical application of Socio-Technical Systems Theory in ICT4D. The expected outcomes include highlighting best practices in aligning technological solutions with social structures, identifying barriers to socio-technical integration, and proposing strategies for overcoming these challenges. The findings are expected to contribute to the academic discourse on ICT4D and provide practical recommendations for policymakers and practitioners to enhance the impact of ICT4D initiatives.

**4.Results**

Findings from this paper, which is based on the Socio-Technical Systems Theory framework, serve as important contributions to the administration and direction of ICT4D projects in socio-technical alignment. By analyzing literature as well as specifics from case studies, this section presents some key themes, patterns and results illustrating how technological systems interact with their societies in ICT4D projects.

**4.1. Socio-Technical Alignment in ICT4D Initiatives**

The analysis underscores that technology solutions should be handled and adapted to local socioeconomic backgrounds. This is the process and mode in which ICT4D initiatives are brought about. For example, studies show that participatory design approaches, which are when community stakeholders participate in the development and deployment of ICT solutions, produce higher adoption rates and more sustainable implementations (Kamal et al., 2019, Schukat & Heise, 2021)Such projects, like telemedicine platforms in rural Pakistan, may mean improved health delivery and lowered resistance to technology adoption thanks to their greater trust development and community involvement.

**4.2. Barriers to Technology Adoption**

Despite the potential of ICT4D initiatives, substantial challenges to technology adoption remain. They include failures on the supply side, such as outages of broadband service, and challenges on demand: for example, people not being able (or willing) to learn new skills in computers and turn themselves digital (Wavehill, 2020; Henderson et al., 2020).Because, for instance, rural Welsh SMEs face problems leveraging ICT due to low speeds of internet access and lack of knowledge about digital tools (Morris et al., 2022). These challenges are an indication of the absolute necessity to intervene specifically to bridge both infrastructural and knowledge gaps.

**4.3. Role of Emerging Technologies**

New technologies including artificial intelligence (AI), blockchain, and the Internet of Things (IoT), have revolutionary potential as new ICT4D tools. AI-driven indirect control devices can allocate resources and decisions for optimum effect, while blockchain enhances financial transaction transparency and adds safety into them (Freitag et al., 2021) However the use of these newer technologies requires fundamental advances in digital literacy, Internet Infrastructure and so forth, especially within developing areas (Verma & Gustafsson, 2020)

**4.4. Digital Inclusion and Quality of Life**

Digital inclusion is vitally important to improving the quality of life of those in underserved communities. However, studies have shown that access to information and communication technologies (ICTs) brings considerable benefits for individual well-being in general, digital inclusion itself encourages democracy and reduces social exclusion, especially among certain marginalized groups (Alhassan & Adam, 2021).

**4.5. Case Study Insights**

Case studies analysed in this research provide practical examples of successful ICT4D initiatives:

* **Telemedicine in Rural Pakistan**: The adoption of telemedicine services was facilitated by trust-building measures and community engagement, resulting in improved healthcare access and reduced resistance to technology (Kamal et al., 2019).
* **Digital Connectivity for Rural SMEs in Wales**: Access to reliable broadband enabled rural businesses to compete in globalized marketplaces, although challenges related to digital literacy and infrastructure remain (Morris et al., 2022).
* **ICT Adoption by Women Entrepreneurs in India**: ICT tools empowered rural women by providing access to markets, reducing transaction costs, and fostering entrepreneurship, despite socio-cultural barriers (Chatterjee et al., 2020).

**4.6. Emerging Themes**

By way of illustration, initiatives which make ICTs accessible to low-income people (a case in point here is the lowering of mobile telephone charges and prices for handsets) have been shown to improve quality of life by broadening access in education, health care, and employment opportunities. Unexpected discoveries from the analysis include algorithmic awareness as one new dimension of the digital, data inequality (Lythreatis et al., 2021). These emergent themes argue for further study into what it means when adopting ICTs is not only ethically problematic itself but also how algorithmic biases negatively impact groups on the margins.

**4.7. Quantitative Insights**

Archival data analysis reveals significant correlations between ICT adoption and socio-economic outcomes. For example, digital inclusion and ICT access explain more than 60% of individual IT usage, while all three constructs (digital inclusion, ICT access, and IT usage) account for approximately 75% of the variance in QoL (Alhassan & Adam, 2021). These findings underscore the importance of integrating digital inclusion strategies into national development policies.

**4.8 Conclusion of Results**

The results show that sociotechnical alignment is crucial to succeed in ICT4D initiatives. If we really want to bridge the digital divide, we must eliminate barriers to technology adoption while identifying innovative ways of exploiting emerging technologies and promoting digital inclusion on a broad front. These results provide a starting point for the discussion section, where we will look explore implications of these findings upon theory, practice, and policy.

**5.Discussion**

Based on the Socio-Technical Systems Theory framework, the study concludes that these findings have something important and valuable to add to understanding not just ICT4D initiatives but also how their alignment may be social and technical in nature. This chapter outlines the research findings ' implications for scholars, practitioners and policymakers. it also highlights limitations of study and areas of future research.

**5.1 Implications for Theory**

In Socio-Technical Systems Theory perspective the findings help to strengthen relevance of this theory in explaining ICT4D initiative where human activities are embedded in and extended by technological systems. By showing how participatory design and community engagement became significant, the findings contribute to discussions about socio-technical alignment itself. For example, the great success of telemedicine services in rural Pakistan proves how forestalling resistance to technology adoption through trust-building measures and local participation can bear fruit (Kamal et al., 2019). This is in line with our argument: socio-technical alignment is not only good design practice but also vital when it comes to sustainability projects of ICT4D. Furthermore, the emergent themes of algorithmic awareness and data inequities bring out new dimensions. (Lythreatis et al., 2021) These findings suggest that future theoretical frameworks should consider ethical implications of ICT adoption and the impact biases built into algorithms are likely to have upon marginalized communities.

**5.2 Implications for Practice**

Policymakers, practitioners and organizations involved in ICT4D initiatives will find this research invaluable. Its findings stress that to promote technology adoption, interventions need to be focused will be required on both the supply and demand sides. Just like for example as in the case of this research, whereas rural Welsh SMEs face various problems such as unreliable broadband connectivity, lack of digital skills, resistance from staff and so on, these obstacles effectively prevent them from realising the benefits of ICTs for economic growth (Morris et al., 2022). While adopting these technologies, national development strategies should be at the forefront of consideration. Policymakers should also strive to guarantee their universal and fair treatment. The research also suggests that it is important to promote digital inclusivity to ensure a good life. It was found that initiatives to make ICTs affordable lower the cost of mobile phone calls and mobile phones have had a positive effect on education provision, health care and economic opportunities (Alhassan & Adam, 2021). To make digital technology available to everyone, professionals should concentrate on projects that solve problems of affordability or accessibility--especially in lesser-developed areas. Lastly, this research also seems to have shown that community engagement and trust building activities which result from approaches to design in which the government or technology provider involves residents, businesses, etc. can be effective in generating success for ICT4D initiatives in terms of their practical implementation and their future maintenance.

Initiatives that provide affordable access to ICTs, such as lower mobile tariffs and handset prices, have been shown to enhance education, healthcare, and economic opportunities (Alhassan & Adam, 2021). Practitioners should focus on designing ICT4D projects that address affordability and accessibility challenges, particularly in underserved regions. Additionally, the success of participatory design approaches in fostering community engagement and trust suggests that ICT4D initiatives should involve local stakeholders in the planning and implementation process to ensure their relevance and sustainability.

**5.3 Implications for Policy**

As a result of this research, policies are needed that will help to eliminate poverty through information technology strategies (ICT4D). Governments need to take multi-pronged approaches which include investment in ICT infrastructure and digital literacy projects together with legal and regulatory frameworks in order to create conditions that promote the spread of new technologies. For example, policies that encourage the private sector to expand broadband coverage on a contractual basis can help deal with supply-side failures; meanwhile initiatives which give out grants for learning digital skills may help to overcome barriers from the demand side (Wavehill, 2020). In addition, the relationship between ICT adoption and socio-economic results, observable through historical data, demonstrates the importance of incorporating digital inclusion strategies into national development policies (Fernández-Portillo et al., 2020).

**5.4 Limitations of the Study**

Though the findings are valuable, this study has its limitations. To begin with, reliance on such secondary sources such as archives and case studies might mean there is slippage in catching up with what's happening in real time, or subtle changes of meaning over background noise. For example, the materials for this analysis of telemedicine services in rural Pakistan are all from documentary outcomes -- which isn't necessarily fair on evolving challenges and opportunities (Kamal et al., 2019). Furthermore, the selection of case studies is likely to have a bias. This is because projects that were successful more often had documentation of outcomes than those which might be equally or less ambitious. Thus, the findings and best practice are likely to be overemphasized while lessons learned from failures overlooked.

Thirdly, the study mainly concerns developing regions, which could potentially limit how generalizable its conclusions are. For example, the difficulties facing rural SMEs in Wales--in contrast to those of urban-based or national businesses (Morris et al., 2022) warrant more than just a little thought. Finally, the emerging themes of algorithmic awareness and data inequalities, though important, need further investigation before they can be properly understood in terms of what their implications might be for ICT4D initiatives (Lythreatis et al., 2021)

**6. Recommendations for Future Research**

In the future, we will address these weaknesses by applying mixed methods. Taking advantage of both qualitative and quantitative methods will allow us to capture real-time developments as well as the nuances historically situated. As an example, longitudinal studies of ICT4D initiatives can provide impetus for understanding what it takes to achieve their long-term sustainability and impact. Comparative research across different regions and socio-economic contexts can thus help to broaden our findings while also identifying local opportunities and challenges distinct from the rest.

Ways to improve ICT adoption. Research should also be conducted into such ICT ethical issues as stratifying power contributors and the impacts of data inequality. This includes an examination of the effects these problems have on marginalized communities, as well as suggestions for measures that counteract them. Finally, the role of new technologies--such as AI and Blockchain in ICT4D enterprises requires more in-depth exploration. How they can be extended into practical use at community level or made accessible, available and affordable to everyone if possible.

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