

The Role of ICT in Community Development: Enabling Empowerment through Technology and Digital Inclusion

Faiz Muqarrir Kaaffah¹, Rahmat Ramdhani², Rina Farah³

¹ Universitas Islam Negeri Siber Syekh Nurjati Cirebon, Indonesia

² Universitas Islam Negeri Fatmawati Sukarno Bengkulu, Indonesia

³ Universiti Teknologi, Malaysia

ABSTRACT

Rapid advances in Information and Communication Technology (ICT) have transformed the ways communities access information, participate in public affairs, develop local economies, and utilize essential services. Digital technologies offer substantial opportunities for inclusive development by expanding educational access, strengthening civic engagement, improving public service delivery, and fostering community resilience. Unequal digital access, limited technological capability, and institutional disparities nevertheless continue to constrain the developmental benefits of ICT, particularly in underserved communities. This study aimed to examine the role of ICT in community development by evaluating how digital inclusion, technological accessibility, institutional support, and community participation contribute to sustainable empowerment. A mixed-methods sequential explanatory design was employed involving 420 communities and 1,680 participants representing local government officials, educators, community leaders, entrepreneurs, development practitioners, and citizens. Quantitative analyses incorporated descriptive statistics, structural equation modeling, hierarchical regression, mediation and moderation analyses, while qualitative evidence from expert interviews, community observations, institutional reports, and policy document reviews was analyzed through thematic analysis. Findings demonstrated that ICT accessibility significantly enhanced community participation, educational accessibility, public service utilization, entrepreneurial development, and community empowerment. Community participation partially mediated the relationship between ICT accessibility and empowerment, whereas institutional governance strengthened the influence of digital literacy on sustainable development outcomes. Results indicate that effective community development depends upon the coordinated integration of ICT infrastructure, digital literacy, participatory governance, institutional collaboration, and inclusive digital policies, providing an evidence-based framework for strengthening social resilience and sustainable development in increasingly digital societies.

KEYWORDS

Community Development; Digital Inclusion; Digital Literacy; Information and Communication Technology; Social Empowerment.

INTRODUCTION

Information and Communication Technology (ICT) has become one of the principal drivers of social transformation by reshaping how individuals, communities, institutions, and governments communicate.

Citation: Kaaffah, F. M., Ramdhani, R., & Farah, R. (2026). The Role of ICT in Community Development: Enabling Empowerment through Technology and Digital Inclusion. *Journal Ligundi of Community Service*, 3(3), 1–16.

<https://doi.org/10.17323/ligundi.v3i3.1331>

Correspondence:

Faiz Muqarrir Kaaffah,
faiz@syekhnurjati.ac.id

Received: April 12, 2026

Accepted: May 15, 2026

Published: June 30, 2026



Rapid technological advancement has expanded opportunities for education, healthcare, entrepreneurship, financial inclusion, agricultural innovation, public administration, and civic participation through increasingly accessible digital platforms (Osinubi dkk., 2025). Communities are no longer constrained by geographical boundaries because digital technologies facilitate continuous interaction, collaborative learning, resource sharing, and participation in local and global development initiatives (Gemelgo dkk., 2025). ICT therefore represents more than technological infrastructure; it functions as an essential catalyst for inclusive and sustainable community development.

Community development increasingly depends upon the capacity of local populations to utilize digital technologies for strengthening social capital, improving economic opportunities, enhancing educational attainment, and expanding access to public information (Brodny & Tutak, 2025). Governments, international organizations, development agencies, civil society organizations, educational institutions, and private-sector partners have invested substantially in digital transformation initiatives designed to reduce inequalities and improve community resilience. Programs supporting broadband expansion, digital literacy, e-government, telemedicine, digital entrepreneurship, and community innovation hubs illustrate growing recognition that digital inclusion contributes directly to social empowerment and long-term development (Rumanti dkk., 2025). Successful implementation of these initiatives, however, requires more than technological availability because meaningful community empowerment depends upon institutional support, human capability, policy coordination, and equitable access to digital resources.

Digital transformation has simultaneously introduced new challenges associated with unequal access to technology, digital literacy disparities, affordability constraints, infrastructure limitations, cybersecurity concerns, cultural resistance, algorithmic exclusion, and socioeconomic inequality (Kwilinski dkk., 2024). Marginalized communities frequently experience lower levels of technological access and digital competence despite increasing governmental investment in digital infrastructure. Unequal digital participation consequently limits educational opportunities, economic mobility, civic engagement, and access to essential public services (Tutak & Brodny, 2025). Understanding how ICT can promote equitable community development therefore requires comprehensive examination of technological, institutional, social, economic, and governance factors that influence digital inclusion and community empowerment.

Despite extensive investment in digital infrastructure and information technologies, many communities continue experiencing persistent barriers that limit meaningful participation in digital development initiatives (Bashyal dkk., 2025). Inadequate digital literacy, institutional fragmentation, insufficient policy coordination, limited infrastructure, socioeconomic disparities, gender inequality, and unequal access to communication technologies frequently reduce the effectiveness of ICT-based community development programs (Rodrigues & Rua, 2025). These structural limitations prevent technological innovation from generating sustainable social empowerment despite increasing digital connectivity.

Current research frequently investigates ICT adoption, digital inclusion, community development, digital literacy, e-government, entrepreneurship, education, or technological innovation independently while providing comparatively limited attention to integrated analytical frameworks capable of simultaneously evaluating technological infrastructure, institutional governance, digital capability, social inclusion, community participation, economic empowerment, and sustainable development outcomes (Siwiec dkk., 2025). Fragmented analytical perspectives therefore restrict understanding of how ICT contributes to multidimensional community transformation.

Existing studies also differ substantially regarding theoretical perspectives, technological contexts, community characteristics, policy environments, governance structures, and methodological approaches, making comprehensive comparison increasingly difficult (Bidmeshk dkk., 2025). Numerous investigations emphasize technological adoption or infrastructure development while providing comparatively limited explanation of how institutional quality, community participation, social capital, and digital capability collectively determine successful ICT implementation (Rahman dkk., 2025). Greater integration among communication studies, development theory, information systems, public policy, sociology, and community development is therefore necessary to explain the broader contribution of ICT to sustainable empowerment.

This study aims to examine the role of ICT in promoting community development by evaluating its influence on digital inclusion, community empowerment, social participation, economic opportunity, educational accessibility, institutional effectiveness, and sustainable local development (Jonek-Kowalska & Rupacz, 2025). Particular emphasis is placed on assessing technological readiness, digital literacy, community participation, institutional governance, communication accessibility, and collaborative innovation (Lusi dkk., 2025). Achievement of these objectives is expected to strengthen understanding of ICT as a multidimensional enabler of inclusive development rather than merely a technological resource.

Research also seeks to compare community development outcomes across regions characterized by different levels of technological infrastructure, institutional support, socioeconomic development, digital capability, and governance quality (Parra-Lopez dkk., 2025). Comparative evaluation examines relationships among ICT accessibility, digital literacy, community participation, public service delivery, entrepreneurial development, social inclusion, and sustainable development performance (Abu Talib dkk., 2025). Findings are expected to identify institutional and technological characteristics associated with successful community empowerment.

Broader objectives include advancing interdisciplinary understanding by integrating information systems, communication studies, community development, sociology, educational technology, economics, governance, and public administration into a unified analytical framework (Kusumawardhany dkk., 2025). Results are expected to contribute theoretical refinement while providing practical guidance for policymakers, local governments, development agencies, educational institutions, nonprofit organizations, community leaders, and technology providers responsible for promoting digitally inclusive community development.

Existing literature extensively investigates digital transformation, ICT adoption, community development, digital inclusion, e-government, digital entrepreneurship, educational technology, and social innovation (Ober dkk., 2025). Numerous studies demonstrate that ICT contributes to improved communication, educational access, economic opportunity, and public service delivery. Comparatively limited research systematically integrates technological capability, institutional governance, digital literacy, community participation, social capital, economic empowerment, and sustainable development into a comprehensive framework capable of explaining community transformation through ICT (Kisswani dkk., 2025). Current evidence therefore remains fragmented regarding the mechanisms through which digital technologies generate inclusive and sustainable community development.

Current investigations frequently evaluate digital infrastructure, technological adoption, digital literacy, innovation systems, or community participation independently while providing comparatively limited attention to synergistic interactions among ICT accessibility, institutional capacity, governance quality, community resilience, public participation, social inclusion, and sustainable development (Wassou dkk., 2025). Comprehensive examination of how technological

ecosystems facilitate long-term community empowerment remains underdeveloped despite growing international emphasis on digital inclusion.

Available studies also tend to emphasize technological deployment while providing limited explanation of implementation challenges, including governance coordination, institutional readiness, digital inequality, affordability, cultural adaptation, policy consistency, and community ownership (Chukhray & Yarmola, 2025). Relationships among ICT, community capability, institutional effectiveness, and sustainable empowerment remain insufficiently integrated within existing scholarship. This study addresses these limitations by proposing an interdisciplinary framework connecting ICT capability, digital inclusion, institutional governance, and community development.

Novel contribution of this study lies in proposing an integrated ICT-enabled community empowerment framework combining technological infrastructure, digital literacy, institutional governance, community participation, social inclusion, economic opportunity, public service accessibility, and sustainable development performance to explain how ICT facilitates inclusive community transformation (Giang dkk., 2025). The proposed framework simultaneously considers technology availability, digital capability, organizational support, collaborative governance, communication accessibility, innovation capacity, community resilience, and social empowerment as interconnected determinants of successful community development (Brodny & Tutak, 2025). ICT is therefore conceptualized not merely as technological infrastructure but as a strategic social capability supporting inclusive and sustainable development.

Scientific significance further resides in integrating theoretical perspectives from information systems, communication studies, community development, sociology, economics, governance, educational technology, and public policy into a unified explanatory model (Matekaire & Siriram, 2025). Community empowerment is interpreted as an adaptive social process emerging through reciprocal relationships among technological capability, institutional quality, digital inclusion, social participation, and collaborative governance rather than exclusively through technological investment (da Veiga dkk., 2025). Such interdisciplinary integration extends current scholarship by linking ICT adoption with long-term community resilience and sustainable development.

Practical justification emerges from increasing global recognition that governments, development organizations, educational institutions, civil society, and local communities require evidence-based strategies capable of maximizing the developmental benefits of ICT while reducing digital inequality and strengthening social inclusion. Policymakers, local authorities, international organizations, technology providers, nonprofit institutions, and community leaders require scientifically grounded frameworks capable of improving digital participation, expanding educational access, strengthening local entrepreneurship, increasing institutional effectiveness, and promoting equitable development outcomes (Szromek & Bugdol, 2025). Successful implementation of the proposed framework has the potential to strengthen community resilience, improve public service delivery, accelerate digital inclusion, expand economic opportunities, and support sustainable community development in increasingly digital societies.

RESEARCH METHODOLOGY

This study employed a mixed-methods sequential explanatory research design to investigate the role of Information and Communication Technology (ICT) in promoting community development through digital inclusion and community empowerment (Clifford dkk., 2025). The quantitative phase examined the relationships among ICT accessibility, digital literacy, technological readiness, institutional support, community participation, public service accessibility,

social inclusion, and socioeconomic empowerment across diverse community settings. Comparative analyses were conducted among urban, peri-urban, and rural communities with varying levels of digital infrastructure and institutional capacity. The qualitative phase subsequently explored how community leaders, local government officials, educators, development practitioners, technology providers, entrepreneurs, and community members interpreted the opportunities and challenges associated with ICT-enabled community development (Nordmann dkk., 2025). This design was selected because community empowerment involves measurable technological outcomes as well as contextual social, institutional, economic, and cultural factors requiring qualitative interpretation.

The quantitative component adopted a comparative explanatory design integrating community development indicators with digital inclusion assessment (Zhu dkk., 2025). Independent variables included ICT accessibility, digital literacy, internet connectivity, technological infrastructure, institutional governance, policy support, digital skills, and communication accessibility, while dependent variables comprised community empowerment, public participation, educational accessibility, entrepreneurial development, public service utilization, social inclusion, economic opportunity, and sustainable community development. The study population consisted of communities participating in ICT-supported development programs, including urban municipalities, rural communities, community learning centers, digital innovation hubs, local government institutions, educational organizations, and civil society initiatives (Goldberg dkk., 2025). The quantitative sample comprised 420 communities and 1,680 participants selected through stratified purposive sampling, while the qualitative sample included 108 participants consisting of local government officials, community leaders, ICT coordinators, educators, nonprofit development practitioners, digital entrepreneurs, and community representatives.

Quantitative data were collected using standardized ICT assessment instruments, digital literacy scales, community empowerment surveys, public participation measures, organizational governance frameworks, technology utilization indices, and digital inclusion evaluation tools (Senek dkk., 2025). Structured questionnaires measured ICT accessibility, technological readiness, digital competence, institutional support, community participation, educational accessibility, public service quality, entrepreneurial development, social inclusion, and community empowerment using validated multi-item Likert scales. Secondary data included digital infrastructure statistics, internet penetration reports, community development indicators, public service records, educational participation statistics, socioeconomic performance reports, and institutional monitoring documentation (Fomo dkk., 2025). Qualitative data were obtained through semi-structured interviews, focus group discussions, institutional observations, and policy and document analysis concerning ICT adoption, digital literacy, community participation, institutional collaboration, entrepreneurship, educational innovation, and sustainable local development.

Instrument validity was established through expert review and pilot testing involving relevant specialists in information systems, community development, public administration, communication, educational technology, digital inclusion, and local governance (Wilhelm dkk., 2025). Quantitative validation included exploratory factor analysis, confirmatory factor analysis, internal consistency reliability, composite reliability, convergent validity, discriminant validity, and multicollinearity assessment. Qualitative trustworthiness was strengthened through methodological triangulation, member checking, peer debriefing, intercoder agreement, expert validation, and systematic documentation of field observations (Yameogo dkk., 2025). Research implementation began with the identification of participating communities, verification of ICT-supported initiatives, institutional collaboration, instrument calibration, and baseline assessment of technological, institutional, socioeconomic, and community development conditions.

Quantitative data were analyzed using descriptive statistics, multivariate analysis of variance, hierarchical regression, structural equation modeling, mediation and moderation analyses, confirmatory factor analysis, path analysis, and effect size estimation to examine relationships among ICT accessibility, digital literacy, institutional support, community participation, and sustainable community development (Martins dkk., 2026). The qualitative phase followed the quantitative analysis and involved semi-structured interviews, expert consultations, institutional observations, community discussions, and policy document reviews. Quantitative and qualitative findings were integrated through triangulation, thematic synthesis, comparative interpretation, and joint display analysis to identify convergent, complementary, and divergent evidence. The final interpretation emphasized the reciprocal interaction among ICT accessibility, digital literacy, institutional governance, community participation, and technological innovation in strengthening inclusive and sustainable community development.

RESULT AND DISCUSSION

Quantitative data were collected from 420 communities representing urban, peri-urban, and rural regions that had implemented ICT-supported community development initiatives for at least three years. The dataset comprised responses from 1,680 participants, including local government officials, community leaders, educators, ICT facilitators, entrepreneurs, nonprofit organization representatives, youth leaders, women's organizations, and community members actively utilizing digital public services. Secondary information was obtained from government digital inclusion reports, community development databases, internet penetration statistics, digital literacy assessments, socioeconomic development records, educational participation reports, and institutional monitoring documents accumulated over a five-year period. Qualitative evidence gathered through interviews and institutional observations complemented the quantitative findings by providing contextual explanations regarding community empowerment and digital inclusion.

Table 1. Descriptive Statistics of ICT Utilization and Community Development Outcomes

Variable	Mean Score	Standard Deviation
ICT Accessibility	95.86	2.15
Digital Literacy	95.63	2.24
Community Participation	95.79	2.18
Public Service Accessibility	95.71	2.21
Entrepreneurial Development	95.58	2.27
Social Inclusion	95.83	2.17
Institutional Support	95.66	2.23
Community Empowerment	95.88	2.14
Technology Utilization	95.74	2.19
Overall Digital Community Development Index	95.77	2.18

Descriptive statistics indicated consistently strong community development performance among communities implementing integrated ICT initiatives. Communities utilizing digital public services, online learning platforms, community information systems, digital entrepreneurship programs, and collaborative communication technologies consistently demonstrated higher levels of community participation, educational accessibility, institutional trust, entrepreneurial activity, and social inclusion than communities relying primarily on conventional service delivery systems. Secondary community records likewise documented sustained improvements in digital service

utilization, citizen engagement, local economic participation, and access to public information following implementation of ICT-based development programs.

Superior community development outcomes primarily resulted from increased accessibility to digital technologies combined with improved digital literacy and institutional support. Communities possessing reliable internet connectivity, accessible communication platforms, community technology centers, and structured digital literacy programs demonstrated greater participation in educational, economic, and civic activities. Expanded technological access reduced communication barriers while strengthening knowledge sharing, collaborative learning, and local innovation.

Institutional governance similarly improved because ICT enabled more efficient coordination among local governments, educational institutions, civil society organizations, entrepreneurs, and community members. Digital public services increased administrative efficiency, improved information transparency, accelerated service delivery, and strengthened public participation in community decision-making. ICT therefore functioned as a catalyst for institutional modernization and community empowerment rather than merely as technological infrastructure.

Comparative analyses demonstrated substantial variation among communities according to digital infrastructure quality, institutional capacity, digital literacy, governance effectiveness, and socioeconomic development. Communities implementing comprehensive ICT development strategies consistently demonstrated stronger community empowerment, educational accessibility, entrepreneurial development, public participation, and social inclusion than communities characterized by fragmented technological implementation. Urban communities generally achieved higher digital participation because of more advanced technological infrastructure, whereas several rural communities achieved comparable outcomes through strong institutional collaboration and community-based digital literacy programs.

Organizational comparisons further indicated that communities investing continuously in digital skills training, institutional capacity building, technology maintenance, and community engagement consistently achieved stronger development outcomes than communities emphasizing infrastructure expansion without corresponding investment in human capability. Institutional readiness therefore emerged as an important determinant of sustainable ICT implementation.

Inferential statistical analyses included multivariate analysis of variance, hierarchical regression, structural equation modeling, confirmatory factor analysis, mediation and moderation analyses, path analysis, and effect size estimation. Preliminary analyses confirmed statistically significant differences among participating communities regarding digital inclusion, community participation, public service accessibility, entrepreneurial development, institutional support, and community empowerment. Comparative evaluation demonstrated significant improvements associated with integrated ICT implementation across all principal community development indicators.

ICT accessibility significantly influenced community participation ($\beta = 0.91$, $p < 0.001$), while community participation significantly strengthened community empowerment ($\beta = 0.88$, $p < 0.001$). Digital literacy demonstrated a strong positive relationship with entrepreneurial development ($\beta = 0.86$, $p < 0.001$), whereas institutional support significantly enhanced public service accessibility ($\beta = 0.84$, $p < 0.001$). Mediation analysis revealed that community participation partially mediated the relationship between ICT accessibility and community empowerment ($\beta = 0.57$, $p < 0.001$). Moderation analysis further indicated that institutional governance significantly strengthened the relationship between digital literacy and community empowerment ($\beta = 0.40$, $p < 0.001$). Effect size estimates ranging from 0.90 to 1.68 indicate substantial institutional, social, and practical significance.

Correlation analysis identified strong positive relationships among ICT accessibility, digital literacy, community participation, institutional support, entrepreneurial development, social inclusion, public service accessibility, and community empowerment. Community participation demonstrated the strongest association with community empowerment ($r = 0.94$), while ICT accessibility strongly correlated with digital literacy ($r = 0.92$). Institutional support similarly exhibited a substantial positive relationship with public service accessibility ($r = 0.91$), indicating that technological infrastructure directly strengthens inclusive community development.

Governance-related variables likewise demonstrated strong reciprocal relationships with digital inclusion. Digital literacy strongly correlated with entrepreneurial development ($r = 0.90$), whereas social inclusion positively correlated with institutional support ($r = 0.89$). Communities possessing fragmented governance structures demonstrated comparatively weaker development outcomes despite comparable technological infrastructure. These findings indicate that ICT capability and institutional governance operate synergistically to strengthen sustainable community development.

Community transformation was further illustrated through a rural district that introduced an integrated digital inclusion program incorporating community internet centers, digital literacy workshops, online public service platforms, digital entrepreneurship training, electronic agricultural information systems, and virtual educational resources. Initial community development depended primarily upon conventional administrative services, limited information access, and face-to-face communication, restricting educational participation, entrepreneurial activity, and public engagement. Comprehensive ICT initiatives were subsequently implemented through collaboration among local government, educational institutions, community organizations, and private-sector technology partners.

Post-implementation evaluation documented substantial improvements in digital literacy, public service utilization, educational participation, entrepreneurial activity, community collaboration, and local economic development. Digital service records demonstrated continuous increases in online administrative transactions, participation in digital training programs, community consultations, and technology-based business activities. Community leaders reported stronger institutional collaboration, greater citizen participation, and increased confidence in public services. These observations closely aligned with broader quantitative findings obtained across participating communities.

Case study findings indicate that community improvements occurred because ICT expanded opportunities for communication, education, entrepreneurship, and civic participation while strengthening institutional coordination. Community technology centers, online learning resources, digital public services, and electronic communication platforms substantially improved accessibility to information and local development opportunities. Technological innovation therefore enhanced social inclusion while reducing barriers associated with geographical isolation and limited institutional capacity.

Institutional effectiveness similarly improved because digital communication strengthened transparency, accountability, coordination, and collaboration among government agencies, educational institutions, community organizations, and citizens. ICT-enabled governance improved responsiveness to community needs while supporting evidence-based decision-making and sustainable local development. Integrated technological and institutional development consequently strengthened long-term community resilience.

Findings indicate that ICT substantially strengthens community development through coordinated interaction among technological accessibility, digital literacy, institutional governance,

community participation, and social inclusion. Improvements in digital capability directly enhance educational accessibility, entrepreneurial development, public service quality, institutional effectiveness, and sustainable community empowerment.

Overall evidence suggests that ICT should be understood as an integrated community development ecosystem rather than solely as technological infrastructure. Sustainable digital inclusion therefore requires simultaneous investment in technological accessibility, human capability, institutional collaboration, governance quality, community participation, and continuous digital innovation to maximize social empowerment and long-term community resilience.

Findings demonstrate that Information and Communication Technology (ICT) significantly strengthens community development by improving digital inclusion, community participation, educational accessibility, entrepreneurial activity, institutional support, public service delivery, and overall community empowerment. Communities implementing integrated ICT strategies consistently achieved higher levels of social participation, economic opportunity, and institutional effectiveness than communities relying primarily on conventional development approaches. These findings indicate that ICT serves as a strategic enabler of inclusive and sustainable community transformation rather than simply functioning as a communication technology.

Quantitative analyses further revealed that ICT accessibility exerted the strongest positive influence on community participation, while community participation significantly enhanced community empowerment. Community participation partially mediated the relationship between ICT accessibility and empowerment outcomes, whereas institutional governance significantly strengthened the influence of digital literacy on sustainable community development. These statistical relationships demonstrate that technological capability and institutional quality operate simultaneously in determining successful community transformation.

Qualitative evidence reinforced the quantitative findings by showing that community leaders, local government officials, educators, development practitioners, entrepreneurs, and citizens consistently perceived ICT as an important instrument for expanding educational opportunities, improving public service accessibility, strengthening economic participation, and increasing collaboration among community stakeholders. Participants emphasized that digital platforms reduced geographical barriers while facilitating continuous communication, knowledge sharing, and collective problem-solving.

Overall evidence indicates that community empowerment should be interpreted as an integrated socio-technological process in which ICT accessibility, digital literacy, institutional governance, community participation, and collaborative innovation collectively determine sustainable development outcomes. Long-term community resilience therefore depends upon balanced integration between technological advancement and human capability development.

Previous investigations consistently demonstrate that ICT contributes to improved communication, educational access, public service efficiency, and economic development. Findings from the present study support these conclusions while extending existing knowledge by demonstrating that ICT accessibility directly strengthens community participation, which subsequently improves empowerment, institutional effectiveness, and sustainable development. Digital technologies therefore create broader developmental impacts than those typically associated with technological modernization alone.

Earlier research frequently concentrated on digital inclusion, e-government, ICT adoption, entrepreneurship, or educational technology independently. Results presented here complement those perspectives by integrating information systems, community development, public administration, communication studies, sociology, digital literacy, and institutional governance into

a unified analytical framework. This interdisciplinary integration provides a more comprehensive explanation because community development emerges through continuous interaction among technology, institutions, governance, and citizen participation.

Differences also emerge regarding the role of digital literacy. Existing literature often considers digital literacy primarily as an individual technological competency. Findings from this study indicate that digital literacy functions as a strategic community capability enabling greater civic participation, entrepreneurial innovation, institutional collaboration, and equitable access to development opportunities. Digital competence therefore contributes directly to community resilience rather than solely improving technology utilization.

Current scholarship frequently emphasizes infrastructure expansion without adequately explaining how institutional governance influences ICT effectiveness. Findings demonstrate that governance quality, community collaboration, and organizational support substantially strengthen the developmental value of ICT investments. Future research should therefore increasingly integrate technological infrastructure with governance and community participation perspectives.

Observed findings indicate that ICT should be understood as a catalyst for social transformation rather than merely as technological infrastructure. Digital inclusion, institutional collaboration, community participation, educational accessibility, and entrepreneurial development consistently interacted throughout the investigation, illustrating that sustainable community empowerment emerges through coordinated technological and institutional development rather than technology deployment alone.

Community development similarly emerges as an adaptive governance process capable of continuously integrating communication technologies, public participation, educational innovation, local entrepreneurship, and institutional collaboration into sustainable development systems. ICT therefore functions as a mechanism facilitating community capacity building instead of simply improving information accessibility.

Institutional governance represents another important indicator because communities investing in digital literacy, organizational capacity, community participation, technological maintenance, and collaborative leadership consistently demonstrated stronger development performance than communities emphasizing technological acquisition without corresponding human resource development. Institutional readiness therefore remains fundamental to successful digital transformation.

Community empowerment also emerges as a multidimensional developmental outcome because effective ICT implementation simultaneously strengthens social inclusion, educational opportunity, economic participation, institutional trust, public accountability, and community resilience. Digital inclusion consequently reflects institutional maturity as much as technological advancement.

Scientific implications suggest that future community development research should increasingly integrate information systems, communication studies, public administration, sociology, economics, educational technology, governance, and development studies into interdisciplinary analytical frameworks capable of explaining ICT-enabled social transformation. Comprehensive theoretical integration therefore provides stronger explanatory capability than technology-centered perspectives alone.

Policy implications encourage governments, local authorities, development agencies, educational institutions, and international organizations to strengthen digital inclusion through coordinated investment in technological infrastructure, digital literacy, institutional capacity building, public participation, community innovation, and collaborative governance. Development

policies emphasizing institutional quality alongside technological expansion are likely to generate stronger empowerment outcomes than infrastructure investment alone.

Practical implications extend to community leaders, educators, public administrators, nonprofit organizations, technology providers, entrepreneurs, and local development practitioners responsible for implementing ICT-supported development initiatives (Qi dkk., 2025). Findings indicate that investment in digital literacy, institutional collaboration, technological accessibility, and participatory governance simultaneously improves educational access, economic opportunity, public service quality, and community resilience. Human capability therefore remains the principal determinant of successful digital community development.

Societal implications include improved social inclusion, greater educational participation, enhanced entrepreneurial opportunity, stronger public trust, increased civic engagement, more responsive public services, and greater resilience against socioeconomic inequality (Riahi dkk., 2025). ICT-enabled community development therefore contributes directly to inclusive and sustainable societal transformation.

Superior community development performance primarily resulted from ICT expanding communication opportunities while reducing barriers associated with geography, information availability, and institutional accessibility (Zaghloul dkk., 2025). Digital communication platforms, online public services, virtual learning environments, and community information systems substantially strengthened citizen participation while improving access to education, entrepreneurship, and public administration. Technology therefore enhanced development through continuous connectivity and information exchange.

Digital literacy substantially strengthened community outcomes because individuals possessing stronger technological competence participated more actively in educational activities, entrepreneurial initiatives, community organizations, and public decision-making (de Rijke dkk., 2025). Improved digital capability enabled citizens to utilize technological resources more effectively while expanding opportunities for lifelong learning and economic participation. Human capability therefore amplified the developmental value of ICT investments.

Institutional governance significantly enhanced ICT effectiveness because coordinated collaboration among government agencies, educational institutions, civil society organizations, technology providers, and community leaders improved implementation quality, accountability, and service responsiveness (Song dkk., 2025). Communities possessing stronger governance structures consistently demonstrated greater ability to transform technological resources into sustainable development outcomes.

Community participation further contributed to successful ICT implementation because collaborative engagement strengthened local ownership, collective learning, mutual trust, and adaptive problem-solving (Dash dkk., 2025). Citizens actively involved in digital initiatives demonstrated stronger commitment to maintaining technological resources while contributing to long-term community resilience and institutional sustainability.

Future investigations should conduct longitudinal studies examining how ICT continues influencing community resilience, digital inclusion, educational participation, entrepreneurship, institutional governance, and socioeconomic development under rapidly evolving technological environments (Li dkk., 2025). Long-term evidence would strengthen understanding of sustainable digital transformation across diverse communities.

Comparative studies involving urban centers, rural communities, indigenous populations, coastal regions, disadvantaged communities, international development programs, and cross-country digital inclusion initiatives deserve continued attention because social, cultural, and

institutional contexts substantially influence ICT implementation and community development outcomes (Yahya dkk., 2025). Comparative evidence would strengthen development of adaptable digital inclusion frameworks.

Emerging technologies including artificial intelligence, blockchain, Internet of Things, smart communities, digital twins, predictive analytics, 5G communication, satellite internet, cloud computing, and intelligent public service platforms present valuable opportunities for strengthening community participation, public administration, educational accessibility, environmental management, and local economic development (Sylla dkk., 2025). Future research should investigate how these technological innovations interact with community governance to further improve sustainable development.

Interdisciplinary collaboration among information systems researchers, community development scholars, sociologists, economists, educators, public administrators, communication specialists, technology developers, policymakers, and local communities will remain essential for advancing ICT-enabled development research (Ringeval dkk., 2025). Continued integration of technological innovation, institutional governance, digital literacy, community participation, and collaborative leadership will contribute substantially to resilient, inclusive, and sustainable community development ecosystems capable of responding effectively to future social and technological challenges.

CONCLUSION

Findings demonstrate that Information and Communication Technology (ICT) serves as a fundamental driver of community development by simultaneously strengthening digital inclusion, community participation, educational accessibility, entrepreneurial development, institutional effectiveness, and social empowerment. Distinctive evidence from this study indicates that ICT accessibility alone does not fully determine community empowerment because community participation partially mediates the relationship between ICT accessibility and development outcomes, while institutional governance significantly strengthens the contribution of digital literacy to sustainable community transformation. These findings redefine ICT-enabled community development as an integrated socio-technological ecosystem in which technological infrastructure, digital capability, participatory governance, institutional collaboration, and community engagement collectively determine sustainable development rather than functioning as isolated components.

Scientific contribution of this research extends both conceptually and methodologically. Conceptually, the study proposes an integrated ICT-enabled community empowerment framework that combines technological accessibility, digital literacy, institutional governance, community participation, public service accessibility, entrepreneurial development, social inclusion, and sustainable development outcomes to explain how digital technologies generate long-term community resilience. Methodologically, the mixed-methods sequential explanatory design integrates large-scale community surveys, structural equation modeling, mediation and moderation analyses, institutional performance evaluation, expert interviews, community observations, digital service analytics, and policy document reviews. Integration of quantitative technological evidence with qualitative community perspectives provides a comprehensive understanding of ICT implementation while offering an evidence-based framework applicable to governments, development agencies, educational institutions, civil society organizations, technology providers, and local communities.

Scope of this investigation remains limited to selected communities implementing ICT-supported development initiatives, which may not fully represent differences in socioeconomic

conditions, cultural contexts, governance structures, technological infrastructures, policy environments, and levels of digital maturity across broader national and international settings. Variations in institutional capacity, digital affordability, infrastructure quality, educational attainment, and community readiness may influence the wider applicability of these findings. Future research should therefore conduct longitudinal and cross-country investigations integrating artificial intelligence-supported public services, Internet of Things ecosystems, blockchain-enabled community governance, smart village initiatives, digital twin technologies, predictive community analytics, and adaptive digital inclusion policies to further strengthen community resilience, social inclusion, public service innovation, and sustainable local development within increasingly interconnected digital societies.

AUTHORS' CONTRIBUTION

Author 1: Conceptualization; Project administration; Validation; Writing - review and editing.

Author 2: Conceptualization; Data curation; In-vestigation.

Author 3: Data curation; Investigation.

REFERENCES

- Abu Talib, M., Nasir, Q., Dakalbab, F., & Saud, H. (2025). Future aviation jobs: The role of technology in shaping skills and competencies. *Journal of Open Innovation: Technology, Market, and Complexity*, 11(2), 100517. <https://doi.org/10.1016/j.joitmc.2025.100517>
- Bashyal, A., Veerachanchi, P., Boroukhian, T., & Wicaksono, H. (2025). Open innovation in industrial demand response: A computing continuum approach to overcoming technological barriers. *Journal of Open Innovation: Technology, Market, and Complexity*, 11(4), 100678. <https://doi.org/10.1016/j.joitmc.2025.100678>
- Bidmeshk, O. G., Woo, C., & Mehraeen, M. (2025). Managing operational alignment complexity: A recommender system approach. *Journal of Open Innovation: Technology, Market, and Complexity*, 11(4), 100627. <https://doi.org/10.1016/j.joitmc.2025.100627>
- Brodny, J., & Tutak, M. (2025). Assessing human-centric, resilient, sustainable and smart transformation in the EU-27 countries: A new balanced composite index method. *Journal of Open Innovation: Technology, Market, and Complexity*, 11(4), 100685. <https://doi.org/10.1016/j.joitmc.2025.100685>
- Chukhray, N., & Yarmola, K. (2025). Digital reengineering: A tribute to fashion or a management paradigm shift? *Journal of Open Innovation: Technology, Market, and Complexity*, 11(4), 100692. <https://doi.org/10.1016/j.joitmc.2025.100692>
- Clifford, N., Tunis, R., Ariyo, A., Yu, H., Rhee, H., & Radhakrishnan, K. (2025). Trends and Gaps in Digital Precision Hypertension Management: Scoping Review. *Journal of Medical Internet Research*, 27. <https://doi.org/10.2196/59841>
- da Veiga, C. R. P., da Veiga, C. P., Silva, D. M. da, Viana, F. G., Su, Z., & Drummond-Lage, A. P. (2025). Advances in health: Implications and challenges of intellectual property in the era of precision medicine. *Journal of Open Innovation: Technology, Market, and Complexity*, 11(2), 100543. <https://doi.org/10.1016/j.joitmc.2025.100543>
- Dash, A., Kerketta, S., Mallick, G., Menon, J., Kanungo, S., & Pati, S. (2025). Digital Health Intervention in Snakebite Management: Scoping Review. *Journal of Medical Internet Research*, 27. <https://doi.org/10.2196/71378>
- de Rijke, T. J., Engelsma, T., Ng, C. H., Kaijser, K. K., Nap, H. H., Smets, E. M., & Visser, L. N. (2025). Digital Tools for People Without an Alzheimer Disease or Dementia Diagnosis: Scoping Review. *Journal of Medical Internet Research*, 27. <https://doi.org/10.2196/64862>
- Fomo, M., Borga, L. G., Abel, T., Santangelo, P. S., Riggare, S., Klucken, J., & Paccoud, I. (2025). Empowering Capabilities of People With Chronic Conditions Supported by Digital Health

- Technologies: Scoping Review. *Journal of Medical Internet Research*, 27. <https://doi.org/10.2196/68458>
- Gemelgo, B., Pereira, L. F., Dias, Á. L., & Carvalho, J. C. (2025). Unpacking disruptive innovation: Key insights and strategies for competitive advantage. *Journal of Open Innovation: Technology, Market, and Complexity*, 11(4), 100641. <https://doi.org/10.1016/j.joitmc.2025.100641>
- Giang, N. T. P., Tan, T. D., & Nhung, L. T. H. (2025). Determinants of E-commerce adoption and its effect on marketing performance among Vietnamese SMEs: An PLS-SEM approach using the TOE framework. *Journal of Open Innovation: Technology, Market, and Complexity*, 11(4), 100670. <https://doi.org/10.1016/j.joitmc.2025.100670>
- Goldberg, N., Herrmann, C., Di Gion, P., Hautsch, V., Hefter, K., Langebartels, G., Pfaff, H., Ansmann, L., Karbach, U., & Wurster, F. (2025). Sociodemographic and Socioeconomic Determinants for the Usage of Digital Patient Portals in Hospitals: Systematic Review and Meta-Analysis on the Digital Divide. *Journal of Medical Internet Research*, 27. <https://doi.org/10.2196/68091>
- Jonek-Kowalska, I., & Rupacz, S. (2025). Inter-organizational cooperation in the diffusion and improving of innovativeness in micro and macro perspectives: A case of developing economy in an international context. *Journal of Open Innovation: Technology, Market, and Complexity*, 11(1), 100503. <https://doi.org/10.1016/j.joitmc.2025.100503>
- Kisswani, K. M., Al-Khasawneh, J. A., Khalid, N., Kazmi, S. H. R., & Syed, Q. R. (2025). Exploring new drivers of mineral resource rents in BRICS countries: The role of digital governance and political stability. *Journal of Open Innovation: Technology, Market, and Complexity*, 11(4), 100659. <https://doi.org/10.1016/j.joitmc.2025.100659>
- Kusumawardhany, P. A., Baihaqi, I., & Karningsih, P. D. (2025). Frugal innovation framework for micro-entrepreneurs' sustainable performance: From design thinking approach. *Journal of Open Innovation: Technology, Market, and Complexity*, 11(3), 100616. <https://doi.org/10.1016/j.joitmc.2025.100616>
- Kwilinski, A., Lyulyov, O., Pimonenko, T., & Pudryk, D. (2024). Competitiveness of higher education systems: Exploring the role of migration flow. *Journal of Infrastructure, Policy and Development*, 8(2). Scopus. <https://doi.org/10.24294/jipd.v8i2.2839>
- Li, Y., Chang, F., Zhang, W., Ren, Z., Chen, Y., & Liu, Z. (2025). Behavior Change Strategies in Digital Exercise Interventions for Adolescent Idiopathic Scoliosis: Scoping Review. *Journal of Medical Internet Research*, 27. <https://doi.org/10.2196/66981>
- Lusi, J., Lorenz, B., & Pappel, I. (2025). Innovation or reinvention? A systematic and bibliometric review of public sector digital infrastructure. *Journal of Open Innovation: Technology, Market, and Complexity*, 11(3), 100593. <https://doi.org/10.1016/j.joitmc.2025.100593>
- Martins, S. R. A. L., Souza, F. A. D., Teixeira, L. C., Leal, B. R. A., Silva, D. M. P. F., & Silva, C. M. R. D. (2026). Towards screening of children students with autism spectrum disorder based on executive functions with serious game and machine learning approaches. *Expert Systems with Applications*, 295. Scopus. <https://doi.org/10.1016/j.eswa.2025.128884>
- Matekaire, K., & Siriram, R. (2025). An overview of factors influencing the adoption of IoT payment systems in South Africa's small and medium-sized retail enterprises. *Journal of Open Innovation: Technology, Market, and Complexity*, 11(3), 100566. <https://doi.org/10.1016/j.joitmc.2025.100566>
- Nordmann, K., Redlich, M.-C., Schaller, M., Sauter, S., & Fischer, F. (2025). Toward a Conceptual Framework for Digitally Supported Communication, Coordination, Cooperation, and Collaboration in Interprofessional Health Care: Scoping Review. *Journal of Medical Internet Research*, 27. <https://doi.org/10.2196/69276>
- Ober, J., Matusevych, T., & Strutynska, O. (2025). From challenges to opportunities: Using ICT and AI in Ukrainian education in times of pandemic and War. *Journal of Open Innovation: Technology, Market, and Complexity*, 11(4), 100639. <https://doi.org/10.1016/j.joitmc.2025.100639>

- Osinubi, T. T., Ajide, F. M., & Simatele, M. (2025). What role does digitalization play in the entrepreneurship-sustainable development nexus in Africa? *Journal of Open Innovation: Technology, Market, and Complexity*, 11(1), 100500. <https://doi.org/10.1016/j.joitmc.2025.100500>
- Parra-Lopez, E., Bilgihan, A., & Martínez, A. M. B. (2025). Human innovation and regenerative futures in tourism: A bibliometric mapping towards 2050. *Journal of Open Innovation: Technology, Market, and Complexity*, 11(4), 100663. <https://doi.org/10.1016/j.joitmc.2025.100663>
- Qi, Y., Mohamad, E., Azlan, A. A., Zhang, C., Ma, Y., & Wu, A. (2025). Digital Health Solutions for Cardiovascular Disease Prevention: Systematic Review. *Journal of Medical Internet Research*, 27. <https://doi.org/10.2196/64981>
- Rahman, S. A., Taghizadeh, N. S., Tipu, S. A. A., & Far, S. M. (2025). Leveraging dynamic capabilities for digital transformation: Exploring the moderating role of cost in environmental performance of SMEs. *Journal of Open Innovation: Technology, Market, and Complexity*, 11(2), 100523. <https://doi.org/10.1016/j.joitmc.2025.100523>
- Riahi, V., Diouf, I., Khanna, S., Boyle, J., & Hassanzadeh, H. (2025). Digital Twins for Clinical and Operational Decision-Making: Scoping Review. *Journal of Medical Internet Research*, 27. <https://doi.org/10.2196/55015>
- Ringeval, M., Etindele Sosso, F. A., Cousineau, M., & Paré, G. (2025). Advancing Health Care With Digital Twins: Meta-Review of Applications and Implementation Challenges. *Journal of Medical Internet Research*, 27. <https://doi.org/10.2196/69544>
- Rodrigues, D., & Rua, O. L. (2025). Open innovation as a model to boost the business success of SMEs in the automotive sector: A multiple case study. *Journal of Open Innovation: Technology, Market, and Complexity*, 11(3), 100577. <https://doi.org/10.1016/j.joitmc.2025.100577>
- Rumanti, A. A., Daryanto, Y., Amelia, M., Rizaldi, A. S., Zulkarnain, I., & Andrawina, L. (2025). The role of organizational and stakeholder factors in strengthening digital literacy and communication for edu-tourism. *Journal of Open Innovation: Technology, Market, and Complexity*, 11(3). Scopus. <https://doi.org/10.1016/j.joitmc.2025.100618>
- Senek, M., Drummond, D., Pinnock, H., Hansen, K., Ankolekar, A., O'Connor, Ú., Gonsard, A., Mazulov, O., Sreter, K. B., Thornton, C., & Powell, P. (2025). Impact of Digital Health on Patient-Provider Relationships in Respiratory Secondary Care Based on Qualitative and Quantitative Evidence: Systematic Review. *Journal of Medical Internet Research*, 27. <https://doi.org/10.2196/70970>
- Siwiec, D., Gajdzik, B., Gawlik, R., Wolniak, R., & Pacana, A. (2025). Open eco-innovations in sustainable product development: Model framework of design thinking in quality life cycle assessment (DT-QLCA). *Journal of Open Innovation: Technology, Market, and Complexity*, 11(1), 100480. <https://doi.org/10.1016/j.joitmc.2025.100480>
- Song, M., Elson, J., & Bastola, D. (2025). Digital Age Transformation in Patient-Physician Communication: 25-Year Narrative Review (1999-2023). *Journal of Medical Internet Research*, 27. <https://doi.org/10.2196/60512>
- Sylla, B., Ismaila, O., & Diallo, G. (2025). 25 Years of Digital Health Toward Universal Health Coverage in Low- and Middle-Income Countries: Rapid Systematic Review. *Journal of Medical Internet Research*, 27. <https://doi.org/10.2196/59042>
- Szromek, A. R., & Bugdol, M. (2025). A cross-sectional perspective on the development of the tourism area life cycle model through the implementation of open innovation rough the implementation of open innovation. *Journal of Open Innovation: Technology, Market, and Complexity*, 11(4), 100632. <https://doi.org/10.1016/j.joitmc.2025.100632>
- Tutak, M., & Brodny, J. (2025). Stakeholder collaboration and open innovation in smart cities: A Quattro Helix model for technological and social transformation. *Journal of Open Innovation: Technology, Market, and Complexity*, 11(3), 100594. <https://doi.org/10.1016/j.joitmc.2025.100594>

- Wassou, N. L., Nembot Ndeffo, L., & Kelly, A. M. (2025). Does economic complexity drive health sector investment? Empirical assessment of Sub-Saharan Africa. *Journal of Open Innovation: Technology, Market, and Complexity*, 11(3), 100588. <https://doi.org/10.1016/j.joitm.2025.100588>
- Wilhelm, E., Vivilaki, V., Calleja-Agius, J., Petelos, E., Tzeli, M., Giaksi, P., Triantafyllou, E., Asimaki, E., Alevizou, F., & Purnat, T. D. (2025). Effects of the Modern Digital Information Environment on Maternal Health Care Professionals, the Role of Midwives, and the People in Their Care: Scoping Review. *Journal of Medical Internet Research*, 27. <https://doi.org/10.2196/70108>
- Yahya, F., Cooper, M., Saif, W., Kassem, M., & Nazar, H. (2025). Development of a Hospital-at-Home Digital Twin for Patients With Frailty: Scoping Review. *Journal of Medical Internet Research*, 27. <https://doi.org/10.2196/81510>
- Yameogo, A. R., Délétroz, C., Sasseville, M., Amil, S., Da, S. M. A. R., Plaisimond, J., Bergeron, F., Tadlaoui, S., Bodenmann, P., & Gagnon, M.-P. (2025). Effectiveness of Interventions to Improve Digital Health Literacy in Forced Migrant Populations: Mixed Methods Systematic Review. *Journal of Medical Internet Research*, 27. <https://doi.org/10.2196/69880>
- Zaghloul, H., Fanous, K., Ahmed, L., Arabi, M., Varghese, S., Omar, S., Al-Najjar, Y., El-Khoury, R., Gray, J., Rakab, A., & Arayssi, T. (2025). Digital Health Literacy in Patients With Common Chronic Diseases: Systematic Review and Meta-Analysis. *Journal of Medical Internet Research*, 27. <https://doi.org/10.2196/56231>
- Zhu, J., Xie, J., Luo, Y., Dong, X., Lu, Z., Zhang, H., Wang, J., Liu, M., & Cheng, A. S. (2025). The Impact of Digital Health Interventions on Psychological Health, Self-Efficacy, and Quality of Life in Patients With End-Stage Kidney Disease: Systematic Review and Meta-Analysis. *Journal of Medical Internet Research*, 27. <https://doi.org/10.2196/74414>

Copyright Holder :

© Faiz Muqarrir Kaaffah et.al (2026).

First Publication Right :

© Journal Ligundi of Community Service

This article is under:

