Contribution of Community Informatics in Rural Communities to Development

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Abstract

Community informatics (CI) refers to the deployment of Information and Communication Technologies (ICTs) in communities to meet community needs, simplify day-to-day tasks, and close digital divides, among other benefits. In practice, CI is focused on the use of information and ICTs in community development efforts to enable and empower community processes to achieve community social, economic, cultural and political goals. Conversely, community development involves encouraging democratic participation, fostering sustainable growth, advocating for human rights, increasing economic opportunities, and supporting equality and social justice by organising, educating, and empowering individuals within their local communities. This paper established the contribution of CI to the development of rural communities with reference to Kaliro district as a case study area. Kaliro district is one among the many communities in rural Uganda where the standard of living and degree of affordable connectivity present unique challenges and opportunities for community informatics. The district presents significant milestones towards integrating ICT initiatives to foster growth and development. Using participative case study design as part of a mixed-methods research approach, responses from 173 CI users and 33 district workers were collected via a questionnaire survey and interviews, followed by analysis and the representation of the quantitative results in tables, while the qualitative results were discussed in themes.

The study found that CI plays a pivotal role in advancing the development of rural communities across the social, economic, cultural, and political spheres. On the social front, CI initiatives were instrumental in forging stronger community bonds and networks, facilitating rapid dissemination of information, and encouraging the exchange of knowledge. Economically, they boosted commerce and entrepreneurial ventures, heightened economic comprehension, increased the efficiency and effectiveness of service provision, minimised costs associated with operations, spurred job creation, enhanced income opportunities, and led to the inception of new CI projects beneficial for local businesses. Culturally, these initiatives not only showcased local traditions beyond geographical boundaries but also augmented cultural consciousness, tourism, and nurtured the freedom for cultural expression within Kaliro district. Politically, CI supported government initiatives, advanced human rights advocacy, disseminated governmental information broadly, simplified tracking political progressions and contributed to the political steadiness in the district. Study findings showed that communities leverage CI and its infrastructure to keep up with information about government programs, health, environment, education, personal development, economic living, empowerment, and democracy, among others in a sense that triggers development. However, there is a general literature gap on the theoretical contributions to CI despite its established practical applications demonstrated in the findings of this paper.

Keywords: Community informatics; Community development; ICT4D; Rural communities, Kaliro district.

Introduction

Community informatics (CI) refers to the deployment of Information and Communication Technologies (ICTs) in communities with a goal of meeting community information needs, simplifying day-to-day tasks, closing digital divides, among other benefits (Clement et al., 2012; Gurstein, 2013; Song et al., 2016). Their deployment is one of the many efforts intended to bring about development in communities because ICTs enable and support community processes, and in turn contribute to the achievement of community social, economic, cultural and political goals (Gurstein, 2013; Rhinesmith, 2019). Use of CI can support development outcomes such as positive transformation and the achievement of significant goals across physical, economic, environmental, social, and demographic dimensions (Society for International Development, 2021). In developing countries, CI initiatives like telecentres have been fundamental in fostering development in rural communities to a significant extent, especially at their inception (Ahsan, 2008). In rural Uganda for example, telecentres such as Nakaseke Multi-Purpose Community Telecenter (NMCT) in Nakaseke district, Buwama Multi-media Community Centre (BMCC) in Mpigi district, Nabweru Telecentre in Wakiso district and Kawolo Telecentre in Buikwe district greatly attest to this fact, as they greatly facilitated rural access to information and ICT services to foster socio-economic development prior their dismal state (Nampijja, 2013). This dismal failure is linked to issues of effectiveness and sustainability (Liyanage, 2009) brought about by operational challenges (Githinji, 2022b), stakeholder dynamics (Bailey & Ngwenyama, 2009; Mishra & Shah, 2023; Manh et al., 2023), content relevance (Bailey, 2009), and socio-economic contexts (Githinji, 2022b). Moreover, telecentres struggle with inadequate infrastructure, poor connectivity, unreliable power supply, outdated technology, operating in isolation from their communities, and limited funding and resources, hindering their ability to maintain operations and expand services (Githinji, 2022b); Bailey & Ngwenyama, 2009; Manh et al., 2023).

This paper draws reference to Kaliro district in Uganda—a case study that demonstrates the impact of CI on rural development. The limited access to traditional infrastructure and reliance on subsistence farming make the implementation of CI especially significant to the community of Kaliro district. So far, in spite of the hurdles of irregular electricity and limited internet access, the district has experienced a remarkable transformation with the implementation of various Community Informatics (CI) initiatives. These include: ICT training centres; internet cafes; computer/phone service centres; network service centres; multimedia libraries; e-financial service centres; telecommunication secretarial service centres; Wi-Fi hotspots; among others (Kirya & Lutaaya, 2023). These initiatives have provided residents with a variety of means to access information and digital services and has triggered a shift towards participative democracy and sustainable development (Jayaprakash & Pillai, 2022). It's worth noting that CI initiatives have also been introduced in other communities within the district, such as education centres, healthcare centres, and District Local Government (DLG) administration, among others (Kirya & Lutaaya, 2023). In the education centres, for example, ICT laboratories, ICT-enabled teaching and learning, the Internet, biometric technologies, and websites are common. In the healthcare environment healthcare information systems, internet, health ICT infrastructure, and biometric technologies are the most common. At different levels of DLG

administration, prominent informatics include: RDC ICT infrastructure; internet; district web portal; DLG ICT infrastructure; and information systems (Kirya & Lutaaya, 2023).

These different forms of CI are channels through which information concerning communities is delivered. As such, communities are able to keep up with information about government programs, health, environment, education, personal development, economic living, empowerment, and democracy, among others (Kirya, 2022). The purpose of this study was to establish the contribution of community informatics to the development of rural communities with reference to Kaliro district as a case study area.

Review of literature

Community informatics has emerged as an instrumental factor in the development of rural communities worldwide. The expanding use of ICTs in communities fosters progress by cultivating participatory democracy, advancing sustainable development, championing human rights, enhancing economic prospects, and supporting equality and social justice through the organisation, education, and empowerment of masses (Gilchrist & Taylor, 2016). CI strives to bring about development through the use of ICTs and information systems capable of translating the essence of how the community should function (Saad-Sulonen & Horelli, 2010). In addition, CI facilitates self-development, autonomous management, and the strengthening of local community capabilities as predicted by Gurstein (2007) and Saad-Sulonen and Horelli (2010).

Community informatics contributes to enhancing democracy, supporting the development of social capital, and building well connected communities where people experience new positive social change (Azzopardi & Grech, 2012). It directly engages in efforts that aim to empower rural communities and bridge the digital divide between rural and urban communities along a variety of issues such as digital connectivity, economic status, social status, among others (Saad-Sulonen & Horelli, 2010). CI is a strategy to overcome technological disparities for the betterment of the community (Songan et al., 2005). Studies have also demonstrated that CI initiatives have a positive impact on reinforcing social networks, enhancing social capital, and fostering socio-economic development in local communities (Noor et al., 2020; Kamuzora, 2010). CI is critical in reshaping community governance models, prioritising rural residents and interactive discussions resulting in community engagement and development (Yangang & Hu, 2021).

Community informatics is credited for offering a community-driven approach to the design and use of ICTs (Saad-Sulonen & Horelli, 2010) to foster sociotechnical innovation around social systems and facilitate integration of advancements in ICT infrastructures in rural communities (Carroll et al., 2015). This approach is of great benefit to individuals doing professional and business work today because it encourages and supports local innovation and facilitates the design of appropriate strategies and technologies that support innovation processes such as knowledge acquisition, assimilation and processing (Gurstein, 2013). The impact of CI is also significant in agriculture, education, economic development, employment, e-governance, service delivery mechanisms, healthcare, climate change, capacity building and empowerment (Kumar & Singh 2012). In education, for example, the use of ICTs like personal

laptops, tablets, e-readers, interactive flipped classrooms, ipads, and smart boards, enhances teaching, learning and literacy development and in turn contributes to achieving overall delivery of education in learning institutions (Alsied & Pathan, 2015; Beilefeldt, 2012; Bishop & Verleger, 2013; Bryant et al., 2015; Cheung & Slavin, 2013; Enyedy, 2014; Project Tomorrow, 2012; Sangani, 2013; Song, 2014; Strayer, 2012; Turel & Johnson, 2012).

In the agriculture industry, CI initiatives that use wireless technologies ease communication and deliver useful information to farmers about agriculture on aspects relating to; animal care, crop care, fertilisers, pest control, feedstock inputs, seed sourcing and market prices (Kumar & Singh 2012). Global Positioning Systems (GPS) are useful in creating geographical boundaries, cartography, and measurements, and play a crucial role in detailed agricultural practices. Automated systems, including mobile applications for smartphones in the farming sector, and RFID-based livestock tracking, significantly enhance the efficiency, yield, and eco-friendliness of agricultural operations (World Bank, 2015; Food and Agriculture Organisation, 2013; Sylvester, 2013; Qu et al., 2018).

Towards economic development and e-governance, CI is a strategy penetrating geographical boundaries and bringing rural underprivileged communities closer to global economic systems using appropriate CI (Kumar & Singh, 2012; Qu et al., 2018; Rahaman, 2020; Yonazi, 2012). With the help of ICTs, rural communities can access new markets, expand their business activities, and create new job opportunities (Jato, 2022). ICTs are deployed to address poverty through effective use of e-governance and ICT application in revenue management and public governance (Kumar & Singh, 2012; Yonazi, 2012; Ziaie, 2013). Community informatics is also known for its strong civic drive, which is the reason why CI initiatives are mostly deployed in events entailing capacity building and empowerment (Saad-Sulonen & Horelli, 2010; Kumar & Singh, 2012). These technologies facilitate interactions among people within communities, thereby mitigating social exclusion and expanding the local communities' view on nationwide or worldwide events (Kumar & Singh, 2012; Shin & Shin, 2012). Towards service delivery mechanisms, CI initiatives have had an overlay contribution in availing access to knowledge for societal innovation enabled by internet access which is also relevant in storing large datasets and enabling timely communication (Kumar & Singh, 2012).

In the healthcare sector, CI that employ digital health information systems empower healthcare workers and organisations to meet the urgent health demands of rural populations (Kumar & Singh, 2012). This is particularly crucial for isolated areas and those underserved by medical professionals and facilities. By enabling distant consultations, diagnoses, and treatments, these systems bridge gaps in healthcare accessibility (Kumar & Singh, 2012; Yonazi, 2012). In managing climate change, CI enhance the resilience of community livelihood systems to climate-related events by leveraging CI technologies such as geographic information systems and positioning and modeling tools (Kumar & Singh, 2012).

Generally, the reviewed literature demonstrates that CI has significant impact on humanity, regardless of life dimension. It emphasizes the critical role of various CI initiatives in steering sustainable development of rural communities through the use of ICTs to enhance social capital, promote economic growth, bridge digital disparities, and foster innovation by promoting experimentation and collaboration to identify new and creative solutions to challenges in the

community. It highlights the idea of deploying ICTs in rural settings as a targeted strategy for fostering development and empowering rural communities. Despite its practical visibility and impact in developing countries, there remains a gap of theoretical works specifically addressing the impact of CI to rural development. This gap underscores the need for further research to enrich our understanding of CI's contribution to rural development, particularly in contexts like rural Uganda. The study aimed to bridge this gap by investigating the impact of CI within the Kaliro district, Eastern Uganda, to enhance the nascent CI concept in both theory and practice.

Theoretical framework

The concept of Community Informatics (CI) is considered unique because its focus is on ICTs deployed in communities and their impact on development (Gurstein, 2011). This uniqueness extends to the theories used in CI research, such as the Theory of Organised Activity (TOA) by Holt (1997) and the Capability Approach (CA) by Sen (2000), which are commonly applied to assess developments in organised communities. Both theories apply to sociological research especially where the intention is to analyse and explain objects of social reality concerning human action and society from a sociological perspective (Macionis & Linda, 2010). Considering the scope of this study, the researcher preferred operationalising Sen and Nussbaum's (2003) Capability Approach by adopting Kleine's (2010) Choice Framework (CF) as an analytical tool that is well-suited for the scope of this study.

The CF explicitly and systemically operationalises the CA whilst maintaining its esscential conceptual richness in the field of ICT4D (Kleine, 2010). Its fundamental intent is to critically assess the contribution of ICT4D (Coelho et al., 2015). Because of its proven effectiveness in several domains, a number of researchers continuously adopt the CF and other CA normative theories to effectively design and evaluate ICT4D projects (Stillman & Denison, 2014). The CF suggests a thorough top-down and bottom-up evaluation of ICTs and use of participatory methods to determine and enhance ICT4D project outcomes (Kleine, 2010). In the framework, Kleine (2010) observed that ICTs have significant impacts, yet researchers face challenges in demonstrating this in a measurable and meaningful way. Therefore, she identified ten tangible resources or variables that should studied to understand the interaction between people and ICTs (Kleine, 2010). These resources include social, cultural, psychological, health, information, educational, natural, financial, geographical, and material resources (Kleine, 2010; Coelho et al., 2015).

The framework was preferred for this study because of its social richness in CI. It not only provides an improved theoretical reference for this study, but also advances its objective for research and development (Stillman & Denison, 2014). The framework is conceptually rich and reliable for this study as it makes it possible for the researcher to analyse and understand how ICTs impact people's well-being in the community and where necessary, develop a strong justification for the need to invest in ICT projects (Stillman & Denison, 2014; Kleine, 2010; Coelho et al., 2015).

Description of methods

Research design and approach

This study used a participative case study design with mixed-methods methodological research approach to guide research processes and carry out the investigations. Mixed-methods is a research paradigm that promotes the methodical integration of quantitative and qualitative data within a single investigation (Wisdom & Creswell, 2013). It was preferred because of its flexibility, adaptability to several study designs and collects rich comprehensive data (Davis, 2021). On the other hand, participative case study design offers a rich approach to investigating a single case using participative methods such as interview, survey and observation as well as replicating study findings across similar cases (Widdowson, 2011; Kabir, 2016). Participative case study design is a combination of participative and case study designs. Participative design is fronted by Kleine's (2010) Choice framework (theoretical framework adapted for this study) to evaluate the impact of ICT4D, and involves use of participative methods (interview, survey and observation) to obtain relevant information from people and communities (Kleine, 2010; Stillman & Denison, 2014).

Study area

The study was conducted in Kaliro district, located in Eastern Uganda and specifically within the Sub-counties including: *Gadumile; Kisinda; Nansololo; Kasokwe; Namugongo; Buhinda; Bumanya; Budomero; and Bukamba* and Town councils of *Kaliro, Nawaikoke and Namwiwa,* which comprise the district. The district was a case study area representing a majority of rural communities with similar and related demographics. The choice for Kaliro district as a case study was premised on the ease and convenience of accessibility and being one among the many districts in rural Uganda experiencing a remarkable transformation with the implementation of various CI initiatives.

Study population

The study group comprised of 206 CI study participants obtained from the sub counties and town councils comprising the case study area. Of these, 173 were CI users who occasionally used information about their community to make decisions. These were selected randomly from the community using a random sampling method (each individual CI user within the sub-counties and town councils comprising the study area was assigned a random number after which they were selected randomly to participate in the study). These individuals were engaged through survey questionnaires for their responses. The remaining 33 participants were district workers selected purposively using the expert sampling approach. This approach ensured that only individuals with an informed view about CI at management and technical level are consulted. These participants were engaged through one-on-one face interviews.

Data collection tools

This study used an interview guide, survey questionnaire and observation guide as tools for data collection. The interview guide was semi-structured and used to collect in-depth qualitative data regarding the contributions of community informatics in Kaliro district from key respondents (district workers). The researchers also issued questionnaires to CI users in the community to obtain views on the contributions of community informatics to development in Kaliro district. On

the other hand, the observation guide covered key areas for observation such as the use and significance of CI to the community.

Data collection, analysis and presentation

The study was conducted between February 2021 and February 2022. Quantitative and qualitative data obtained from the mixed-methods were analysed using SPSS version 20.0 (Statistical Package for data analysis) and thematic analysis respectively. Quantitative data were presented quantitatively in form of tables whereas qualitative data was presented under themes and sub themes for interpretation and discussion. Qualitative reports were presented objectively with consideration of respondents' anonymity where necessary. The sub themes reported the CI contribution to development across the various "lines of development" (social, economic, cultural and political) based on the findings arising from the analysis and interpretation of the data from the data collection tools—the interview guide, survey questionnaire and observation guide.

Results and discussions

In this section, data from a study group of 206 CI stakeholders consisting of 173 CI users and 33 district workers were presented in form of tables and themes, interpreted and discussed accordingly.

Table 1: Distribution of respondents' participation according to gender

Gender	no.	%
Male	133	64.6
Female	73	35.4
Total	**206**	**100.0**

 Source: Field data (2022)

The findings showed a significant upward difference in the number of male participants, 133 (64.6%) in the study compared to their female counterparts, 73 (35.4%). These findings greatly speak to the prevalent trend reported in CI and other ICT related studies regarding the aspect of gender participation in ICT4D. For instance, an evaluation study of telecentres in South Africa conducted by the Acacia programme highlighted that women were using the telecentres less frequently than men, even when the telecentres had female staff and materials specifically aimed at women (Association for Progressive Communications (APC), 2023). According to same study, this lower usage by women was mainly attributed to cultural barriers, high levels of illiteracy, and lower income levels. The cause was mainly attributed to cultural inhibitions, low income levels among women, and high rates of illiteracy.

Similar research suggests that women possess distinct information needs and exhibit diverse technological preferences compared to men (APC, 2008). As a result, they often encounter more significant challenges when accessing technology. One major barrier lies in the

affordability of connectivity costs as many women, especially in low-income and rural areas, struggle to pay for internet access, thus limiting their ability to use digital tools and resources. This financial burden is heightened by other obstacles such as limited access to devices, low computer literacy rates, and socio-cultural constraints. These findings underscore the importance of boosting ICT efforts aimed at promoting women's inclusion in various ICT advancements across developing nations. Notably, recent studies have indicated that women are displaying growing interest in ICT utilization, which has aided them in combatting illiteracy, expanding employment prospects, and enhancing their awareness of gender-related concerns and rights (Williams & Artzberger, 2019; Mackey & Petrucka, 2021; Aguboshim, Obiokafor & Nwokedi, 2022; Miranda, 2023).

Table 2: Distribution of respondents' participation according to age

n=206

Age group	no.	%
21-30 years	41	19.9
31-40 years	97	47.1
41-50 years	52	25.2
Above 50 years	16	7.8

Source: Field data (2022)

According to the data presented in Table 2, 138 (67.0%) of the respondents were aged between 21-40 years, indicating that a majority of the participants in this study were young adults, while only a minority (aged 36–40 years) represented older adults. This high participation rate is not surprising as youth are generally more interested in and enthusiastic about technology than older adults and elderly individuals, 68 (33.0%). Similar facts were reported by the United Nations' *World Youth Report*, which among other reports recognized that young people around the globe are quick to adopt and leverage new technologies and digital connectivity to advance social development (United Nations, 2020). This exposure to digital tools can nurture a generation more equipped to participate in a globalized economy and contribute innovatively to societal challenges.

Table 3: Respondents' participation according to level of academic qualification attained versus their gender

n=206

Academic qualification	no.	%	Female	%	Male	%
Certificate	60	29.1	18	30.0	42	70.0
Diploma	90	43.7	41	45.6	49	54.4
Bachelor's degree	35	17.0	13	37.1	22	62.9
Postgraduate	21	10.2	08	38.1	13	61.9

Source: Field data (2022)

From Table 3 above, the highest percentage of respondents, 90 (43.7%) had a diploma, 41 (45.6%) of them being female and 49 (54.4%) male. 60 (29.1%) had a Certificate indicating completion of Secondary School Education, 18 (30.0%) of them being female and 42 (70.0%) male. Only 35 (17.0%) had a Bachelor's degree, 13 (37.1%) being female and 22 (62.9%) male. The least, 21 (10.2%) of these had a postgraduate qualification, 8 (38.1%) being female and 13 (61.9%) male.

The data reveal a fairly balanced distribution among respondents holding diplomas, with men (54.4%) slightly outnumbering women (45.6%). In contrast, for other educational achievements such as certificates, bachelor's degrees, and postgraduate qualifications, men significantly outnumber women. The data further reveal that the proportion of men increases as the level of academic qualification rises, with the exception of the diploma level, where the gender distribution is more balanced.

Despite the gender disparities evident in higher educational attainment, the data suggest that the participants were educated and able to understand and provide insightful responses on how CI contributes to development, which was the main focus of the study. The findings further showed a strong correlation between education and use of ICTs. This correlation is consistent with numerous reports regarding ICT and development. For instance, in the educational domain, studies conducted by Oyerinde and Bankole (2019; 2021) demonstrated that there is a positive relationship between the utilisation of ICT infrastructure and educational attainment, adult literacy rates, and human development. This correlation highlights the importance of increasing ICT infrastructure to improve educational outcomes, as suggested in studies by Kumar et al. (2023), Ahmad and Sheikh (2021), and Kelzang et al. (2023), especially in rural areas (Gnanamkonda et al., 2019).

Table 4: Respondents' participation according to duration of work in the district

n=206

Duration of work	no.	%
< 5 years	66	32.0
5-10 years	91	44.2
11-15 years	27	13.1
16-20 years	14	6.8
21-25 years	5	2.4
More than 25 years	3	1.5

 Source: Field data (2022)

According to the data presented in Table 4 above, the majority, 140 (68.0%), of the respondents had spent more than 5 years working in the district. This suggests a good lived experience and knowledge about issues happening in the district notwithstanding the issues

pertaining to CI and their contribution to development. The findings also partly suggest that their work in the district was financially yielding thus their long tenure there.

Contribution of Community Informatics to the Development of Kaliro district

The contribution of CI to development was determined across the social, economic, cultural, and political lines of development. These findings are reported respectively in Tables 5, 6, 7 and 8 below.

Social development

Table 5: Contribution of Community Informatics to social development

n=206

Duration of work	no.	%
Quick information flow	114	55.3
Knowledge sharing	159	77.2
Social connection & networking	123	59.7
Others	33	16.5

 Source: Field data (2022)

The study registered a complete percentage (206, 100%) of responses highlighting how CI had contributed to social development. As indicated in Table 5 above, 159 (77.2%) of the respondents reported that the CI had contributed to knowledge sharing, followed by 123 (59.7%) who noted their contribution to social connection and networking, and 114 (55.3%) who acknowledged their contribution towards easy and quick information flow. Additionally, a notable number of respondents, 33 (16.5%) saw CI as a tool for social inclusion, bridging the information gap and promoting literacy through advocacy campaigns. The findings are presented thematically below and discussed in detail.

Knowledge sharing

A total of 159 respondents, accounting for 77.2% of the sample population, acknowledged that the CI initiatives in Kaliro district play a significant role in knowledge sharing. Majority, 77.2% of the respondents acknowledged that the CI in Kaliro district had contributed to knowledge sharing. In emphasis of this, Respondent 1 at the RDC's office attested to how CI forms like the Internet and ICT infrastructure were leveraged to aid informed decisions and actions through knowledge sharing from expert colleagues and other knowledge sources. The Internet enabled them to maintain an online presence, sharing knowledge with stakeholders at all levels within and outside the district. The ICT infrastructure enabled them to process, store and disseminate information to stakeholders with ease. In another interview at the DLG, Respondent 2 stated that the internet and ICT infrastructure available at various posts such as RDC's office, DLG administration, health centers, education institutions, and others have significantly improved the processing and dissemination of information. The CI were found to facilitate information sharing

on all critical issues in health, agriculture, education, and business, among others as observed in a similar study by Kumar and Singh (2012) and Songan et al. (2005).

Social connection and networking

In acknowledgement of the notable contributions CI has towards social development, 59.7% of the respondents noted that CI contribute to social connection and networking among members of the different communities, across the education, health, DLG and general community of Kaliro district. Respondent 7 among the technical staff expressed how CI forms like the district web portal and locally-based social media platforms foster social networking and connectivity and ease information and knowledge sharing among the masses in the community. The respondent evidenced this pointing out that:

> "The district web portal has got links to most of the district social media platforms where individuals openly and freely interact on various issues concerning the district."

In a related instance, Respondent 24 emphasised the advantages that telecommunication service centers were providing to the community. The respondent specifically mentioned that these centers were instrumental in resolving telephone network problems. Besides, they frequently intervened by issuing free SIM cards to potential customers, offering discounts on smartphones, and many more. All these efforts made it easier for people to connect and network with others thus bridging the digital divide.

Quick information flow

Study findings further revealed that CI had improved the speed and ease of information flow among connected individuals. This was confirmed by 55.3% of the respondents, including Respondent 5 and 6, who stated that:

> "When information is posted on the district web portal or social platforms like WhatsApp, it is always guaranteed that it will reach many individuals in a short time."

> "It gets easier to encourage people to use Community informatics as alternative channels and platforms for delivering and accessing information regarding matters that require attention besides the use of notice boards at the administrative offices."

In a related report, Respondent 31 among the district staff described how people utilised ICT training centres, internet cafes, and secretarial service centres to process, share, and receive information about district arrangements and developments. This report highlights the significance of CI in promoting information sharing, and bridging the digital divide within and among communities— as according to Gurstein (2013), Songan et al. (2005) and Saad-Sulonen and Horelli (2010). Meanwhile, in other findings, 16.5% of the respondents, as indicated in Table 5, recognised that CI contribute to limiting social exclusion owing to their role in closing the information gap and promoting literacy through advocacy and sensitisation.

Essentially, towards social development, research findings clearly indicate that CI plays a significant role in reducing social exclusion. This is in line with Clement et al.'s (2012) observation that informatics can bridge the digital divide and provide a platform for building social connections and networks, sharing information, and knowledge. The findings are also consistent with Gurstein's (2007) and Saad-Sulonen and Horelli's (2010) view that CI, as an

ICT4D, empowers people and helps them connect socially, facilitating communication among them. The findings are not any different from revelations from by Noor et al. (2020) and Kamuzora (2010) regarding the contributions of CI in strengthening social networks and increasing social capital.

Economic development

Table 6: Contribution of Community informatics to economic development

n=204

Duration of work	no.	%
Efficiency & Effectiveness in service delivery	158	77.5
New CI developments	50	24.5
Income generation	93	45.6
Business & economic awareness	109	53.4
Job creation	95	46.6
Cost saving	101	49.5
Trade - business promotion	85	41.7
Others	2	1.0

 Source: Field data (2022)

The findings presented in Table 6 above, indicate the notable contribution of CI to economic development. Notably, the immense contribution to efficiency and effectiveness in service delivery in the district reported by majority, 158 (77.5%) of the respondents and transition of business awareness as revealed by 109 (53.4%) of the respondents. These and all other reported findings in Table 6 were further presented thematically and discussed as follows:

Efficiency and effectiveness of service delivery

Majority, 77.5% of the respondents reported that CI contributed tremendously to the efficiency and effectiveness of service delivery in the district. Particularly, Respondent 3 among the Heads of units at the district acknowledged that CI forms like information systems implemented at the DLG and in health centres contributed to the effectiveness and efficiency in service at those points. He noted that, the health information systems were aiding the management of health records, data and information about patients and health cases. An observation report confirmed that indeed, patients' records were secure and easy to access with health information systems in place. On the other hand, information systems, such as integrated financial management systems, aided payment of salaries for district workers as well as the keeping of records of payments as they occur.

Business-economic growth and awareness

53.4% of the respondents recognised the CI contribution towards fostering business growth and economic awareness. Notably, Respondent 15 highlighted that, CI forms such as the district web

portal, public websites and social media platforms offer avenues where people in the business world advertise their businesses. In practice, this is what gives people in the business industry the ability to penetrate geographical boundaries, which subsequently bridges rural and unprivileged communities closer to the global economic systems as posited by Kumar and Singh (2012). In a similar case, Respondent 17 highlighted that:

> "Some Community informatics especially the district web portal, provide information on the various available prices and markets of different products and services."

The findings indicate that CI plays a crucial role in promoting business, economic growth, and raising awareness. These revelations align with Jato's (2022) perspective, which recognises that the deployment of Information and Communication Technologies (ICTs) in rural areas facilitates access to new markets, expands business operations, and generates fresh employment prospects.

Cost saving and reduction

Towards economic development, 49.5% of the respondents acknowledged that CI contributed to cost saving and reduction. This suggests that a significant portion of the respondents acknowledged that technology and information systems designed to benefit local communities play a role in reducing costs particularly by aiding better resource management, enhanced communication, and more efficient service delivery. It also suggests that while many respondents saw the cost-saving benefits, there was still a portion who were not be aware or convinced by these benefits. Thus, the findings indicate a need to create awareness on the benefits of CI towards cost-saving and reduction

Job creation

46.6% of the respondents reported that CI contributed to job creation. There were visibly many CI in the district and so the people associated with them. Respondent 22 cited examples such as, Information and Communication Officer as well as the ICT officer who are designated to maintain the district web portal and fix technical issues. In addition, Respondent 4 pointed out other job positions directly involved in CI work. He reported that:

> "Various people are working in CI centres in the health sector, education sector, general community work as administrators, managers, ICT technicians, and ICT trainers."

It is worth noting this significant impact of CI on job creation. This aligns with the findings of a recent study by Jato (2022), which established that the deployment of ICTs in rural areas leads to increased access to new markets, expanded business operations, and generates fresh employment opportunities.

Income generation

In related reports, 45.6% of the respondents recognised that CI contribute significantly to income generation in the district. Respondent 12 pointed out that the people dealing in hardware, software, internet service, ICT appliances and those offering ICT training and skilling. According to the respondent, these were in business because they had what it took to sustain the CI and generate revenue for themselves.

Respondent 10 and 13 respectively acknowledged that; the majority of the CI realised in the community generate income for their owners. In emphasis of this, Respondent 13 noted that:

> "Just like many informatics in the community, the district web portal generates some revenue from the business adverts it runs to have peoples' businesses promoted."

New CI developments

24.5% of the respondents cited the role of CI in bringing about new CI developments in the district. The presence of various forms of informatics in some areas of the district as reportedly triggered the establishment of many other similar CI in other areas. Respondent 29 among the district staff cited examples such as Secretarial service centres, Computer/phone service centres and ICT training centres which were indeed evidently on the rise and offering services in the town centres of the district.

In other findings, 1.0% of the respondents noted that CI promoted government programs on economic transformation. A point in case, Respondent 14 among the technical staff reported that, CI such as web portals, social media channels, ICT infrastructure and the internet were being leveraged to promote government programs on economic transformation. According to the respondent, the aforementioned CI are channels for information sharing on such arrangements. Respondents mentioned the following examples: *"Emyooga", "Parish development model", "Bona Ba'gagawale", "Elderly fund"* among others. As such, CI also partly addressed the problem of poverty as posited by Kumar and Singh (2012), Yonazi (2012), and Ziaie (2013). The aforementioned arrangements were effective at the community level and were supervised by community leaders, who acted as intermediaries between the masses and the government. These leaders often utilized CI tools, such as social media channels and community radios, to facilitate interactive engagements with the masses and amplified their pleas to stakeholders, particularly, concerning government approach to addressing concerns related to the socio-economic well-being of masses.

The entirety of the findings reported on CI contribution to economic development above suggest that CI plays a crucial role in enhancing rural communities fundamentally by leveraging Information and ICTs to empower and enable community socio-economic processes. The findings are consistent with studies by Noor et al. (2020) and Kamuzora (2010) that underscored contributions of CI to strengthening social capital and fostering local economic development. Additionally, the results on the contribution of CI to social and economic development combined evidently speak to Yangang and Hu's (2021) view on the utilisation of ICTs in rural community that, it reshapes governance models to prioritise rural residents and interactive dialogues, leading to improved community engagement and development.

Cultural development

Table 7: Contribution of Community informatics to cultural development

n=195

Duration of work	no.	%
Cultural export & promotion	110	56.4
Reinforced cultural freedom	64	32.8
Promoted tourism in the area	19	9.7
Promoted cultural awareness	156	80.0
Others	25	12.7

Source: Field data (2022)

The findings in Table 7 above show the contribution of CI to cultural development. Most significantly their contribution to promoting cultural awareness among individuals of the community and cultural heritage as reported respectively by the majority, 156 (80.0%) and 110 (56.4%) of the respondents. These findings and other findings in Table 7 above are further presented thematically and discussed below.

Cultural awareness

Towards cultural development, the majority, 80.0% of respondents mentioned that CI promoted cultural awareness among the masses. Respondent 26 pointed out that, CI forms, like the Internet and ICT infrastructure had become reliable channels for sharing information concerning district's cultural background, upcoming and ongoing cultural arrangements in the district. This created awareness among people in and outside the district and in turn induces tourism in the area as people will want to discover more new things about the area.

Cultural promotion and export

56.4% of respondents believed that CI is essential in promoting and exporting culture. An observation report revealed that, as the internet connects people from all over the world, people from Kaliro district also benefit from it and are connected globally and that they use various tools like Wi-Fi hotspots, internet, district web portal, social media platforms, and more, to promote their culture locally and globally.

Cultural freedom

32.8% of the respondents acknowledged the CI contribution towards reinforcing cultural freedom. Respondent 6 among the DLG Heads of units mentioned specifically how they used the DLG ICT infrastructure and the Internet at the district to share information and facts related to the culture of people. This included sharing details on cultural leaders, cultural events, cultural beliefs, and practices, among other related topics.

Tourism promotion

9.7% of the respondents reported that CI contributes to the promotion of tourism in the area. The respondents pointed out that the internet and social platforms like WhatsApp make it easier for people to share information about the district. For example, information about *'Bulamoogi'* and the *'Balamoogi'* people, their culture, culture and tourism centres like Lake Nakuwa, Royal palaces and Chiefdoms among others. The study noted that information related to culture is shared across the various online channels with the hope that people would show interest in exploring more and visit the area physically as tourists.

This finding suggests that the role of CI in tourism is critical. It shows how the integration of ICTs in rural areas can be yielding to the tourism sector and impactful to cultural and economic development of the rural communities (Garrod et al., 2006). The publication of maps, guides, and trails packaging rural experiences can influence interest of potential tourists and attract them to explore the cultural heritage and traditions of rural communities. In other findings, 12.7% of the respondents acknowledged that CI provide opportunities for individuals to express their cultural values, understand their cultural identity through dialogues, networking and knowledge sharing.

This study, similar to one conducted by Noor et al. (2020), found that Community Informatics initiatives can strengthen social networks and increase social capital in rural areas. In terms of cultural context, the study showed that rural communities can use ICTs to enhance their cultural identity, preserve heritage, and promote cultural activities that contribute to community cohesion and well-being for future generations.

Political development

Table 8: Contribution of Community Informatics to political development

n=206

Duration of work	no.	%
Promotion of human rights	41	20.0
Promotion of Gov't programs	125	61.0
Provision of Gov't information	144	70.2
Civic education	88	42.9
Fostering political stability	73	35.6
Follow up on political development	133	64.9
Others	6	30.0

Source: Field data (2022)

Table 8 showed the significant contribution of CI towards political development across a number of aspects. These findings as presented in Table 8 were further presented under the different themes and discussed below.

Provision of government information

The majority (70.2%) of the respondents recognised the CI contribution towards the provision of government information. They specifically noted how they played a big role in availing people with information concerning government programs such as elections of leaders, education programs, vaccination programs, socio-economic transformation, health awareness, infrastructure developments, agricultural programs among others.

Follow-up political developments

64.9% of the respondents acknowledged that CI make it easier for leaders and people to follow-up on political developments in their communities. The study found that people follow up on information regarding political developments in their communities as it comes through various ICTs, such as the district web portals and social media platforms enabled by internet. In acknowledgement of the contribution of RDC's, Internet and ICT infrastructure are some of the CI in the district, Respondent 1 in the RDC's office revealed that the information often comes through as intelligence, alerting the RDC and other concerned authorities in the district about the chaos or insurgencies that are happening or are likely to happen in the district. Reportedly, this enables the RDC and concerned authorities to plan on how to curb such insurgencies.

Promotion of government programs

Regarding the promotion of government programs, 61.0% of the respondents revealed that the identified CI were promoting government programs on economic transformation. They cited examples such as: *'Emyooga', 'Parish development model', 'Bona Ba'gagawale', and 'elderly funds'*; agricultural programs such as the *National Agriculture Advisory Services (NAADS) program;* political programs such as, *national elections for president, area members of parliament and district leaders*; health programs such as *Covid-19 mass vaccination, anti-malaria campaigns*, among others.

Respondent 25 cited health information systems such as the Epivac system that manages vaccination information nationally. This study established that the information system was fundamental in providing and handling information on Covid-19, its signs and symptoms, implications and guidelines on how to avoid the disease. Similarly, web portals and social networks that disseminated this information contributed significantly towards the promotion of government programs.

Civic education

42.9% of the respondents said that CI had fostered civic education. Reportedly, CI such as DLG ICT infrastructure, Internet, web portals made it easy to process and disseminate information to let people understand the functions of government in society and their rights and responsibilities as citizens. The players in government leveraged the CI to educate citizens about their constitutional rights, responsibilities, and obligations— allowing them to enjoy the entire range of advantages that every citizen of a country should have.

Political stability

A significant 35.6% of the respondents acknowledged that CI foster political stability, primarily by facilitating the management and control of political chaos and insurgencies within the districts to bring about order and stability. This is possible with social networking and information sharing enabled by the CI such as the internet and local social media platforms like; WhatsApp, Facebook, Telegram among others.

Human rights

Towards promotion of human rights, 20.0% of the respondents recognised the contribution of web portals, and social networks towards building and bringing about competence, democratic culture, and satisfying the needs and interests of the masses in communities that Tanibu (2021) termed as "civic education." These platforms provide a space where information related to such concerns can be shared, empowering citizens and equipping them to participate in democratic processes.

Respondent 7 among the technical staff at the district cited the right of access to information and fronted the web portal as a tool that has been used to freely provide information to educate people about their human rights and the implications of human rights violations. The respondent also noted in an example that these CI initiatives were used to process and disseminate information that promoted awareness of peoples' rights, advocate for people's rights and condemns any forms of human rights violation in homesteads and communities. Another respondent, *Respondent 18* among the district administrators, revealed that administrators used the district web portal, Internet, DLG ICT infrastructure and other relevant informatics at their disclosure to promote human rights education and teach the culture of peace and reconciliation among citizens.

In other findings, 2.9% of the respondents mentioned that the implementation of CI such as the RDC Internet and ICT infrastructure, the Kaliro district web portal by government, had earned political actors influence and relevance to their electorate in the district, considering their efforts in lobbying for such initiatives on behalf of their people. These findings suggest that community informatics, through the strategic use of ICTs, has the potential to significantly impact on political development. By leveraging ICT tools and implementing supportive policy frameworks, rural communities can harness the transformative power of technology to drive political development by addressing key areas of concern such as governance, human rights, civic education, political stability, government information, political developments, government programs and more as highlighted in a study by Githinji (2022a).

Generally, the study findings show that the impact of CI to community development is far reaching. Viewed from Kleine's (2010) Choice Framework, there is clear evidence that communities in Kaliro district have access to material resources, such as ICT tools and internet infrastructure, which are fundamental in the dissemination of information on social, economic, cultural and political matters. This fosters a more informed and cohesive community capable of engaging with authorities and influencing governance outcomes. The findings also suggest that the structures, especially in the district's administration and leadership are functional and supportive of the adoption of CI in the district, resulting in greater inclusivity and technological

advancement. The findings further suggest that CI play a role in reshaping identity and empowering both individuals and the community as a whole. This is evident in their impact on promoting citizens' advocacy for human rights, involvement in political causes, civic education, and active participation in governance and policy discussions, thereby contributing to a more informed community. This increased agency is further complemented by the increased participation, as ICTs provide new opportunities for engagement with governance processes, allowing communities to contribute to decision-making and policy discussions.

Conclusion

The results of this study suggest that ICT uptake in Kaliro district is high. This is significant and warrants attention for several reasons. The results suggest that the digital divide is being bridged in an area that might otherwise be overlooked due to its geographical location and economic status. This milestone is fundamental as it expands the choices available to individuals in Kaliro and enhances their capabilities to participate in the digital economy, by leveraging the available material resources such as ICT, and internet to access to useful information. The results further indicate the empowerment of local communities, as CI affords individuals the ability to engage with broader markets, voice concerns on social platforms, and mobilize collective action for community socio-economic advancement. This empowerment demonstrates an increase in individual and collective responsibility.

These results are also noteworthy because they challenge existing arguments that rural areas are tech-resistant and lag in their embrace of technological advancements. It underscores the community's willingness to adapt and integrate with technological progress. It also partly reflects effective policy implementation aimed at improving ICT infrastructure—such as internet connectivity—which is often a precursor to driving technology adoption. Generally, the study suggests that Community Informatics has the potential to drive rural community development. It highlights its capability to facilitate the development of rural districts into more connected and informed communities, capable of self-governance and self-sustenance. The study also recognizes CI as a valuable tool for addressing socio-economic challenges in rural areas. Its integration into daily life highlights the utility of technology, not just as a tool for individual benefit but as a collective means for societal elevation within developing and marginalized regions.

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