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Forms of Community Informatics in Rural Communities (A Case of Kaliro District)

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Abstract

The field of community informatics (CI) is broadly concerned with the study, design and application of Information and Communication Technologies (ICTs) in communities. It is about identifyingcommunity needs and figuring out how technology can be leveraged to help meet those needs. It recognizes the importance of ICTs in shaping the lives of people in communities and communities shaping the future of ICTs.

This study identified the forms of community informatics in Kaliro district using participative case study design with mixed methods research approach. To that end, data from questionnaires issued to 173 CI users across the district and interviews held with 33 district workers were analysed and the results presented in form of tables and themes for interpretation and discussion.

Data obtained from the study revealed that Kaliro district had various forms of CI in the education sector, health sector, DLG (District Local Government) administration, and general community of the district. The study recommended implementation of more forms of CI in the deeper areas of the district to suitably address common concerns of uneven CI distribution and contribute towards closing the information gap between the information “haves” and “have nots”, sensitisation of masses in communities on matters pertaining to CI and formulation of inclusive CI policies to regulate the implementation, management, maintenance and sustainability of CI in communities.

Keywords: Community informatics, ICT4Development, ICTs, Community development, Kaliro district

Introduction

Community informatics is concerned with the integration of information and ICTs in communities to enable and empower individuals and community processes so as to bring about collective development in the community. This is achieved by leveraging information and ICTs to meet community needs, simplify day-to-day tasks, close digital divides, among other benefits. As a practical field, it largely entails use of information and ICTs in community development efforts, that is, enabling and empowering community processes in a way to achieve their social, economic, cultural and political development goals (Gurstein, 2011).

Community informatics is a new concept in theory but deemed old in practice. The concept was coined by Michael Gurstein, a prominent scholar in the field, and popularized by his book, titled "Community Informatics: Enabling Communities with Information and Communications Technologies" (Gurstein,

1999). Gurstein (2003) categorized CI into two perspectives: the first perspective looks at CI as the application of ICTs to enable community processes and the achievement of community goals. This perspective is considered the practical perspective as it regards CI (in their different forms) as activators of community development that support and enable communities to achieve their defined goals of development that is to say; social, economic, cultural, and political goals (Gurstein, 2013; Rhinesmith, 2019). Conversely, the second perspective looks at CI as a new terminology that describes the academic discipline and practice of systematically approaching information systems from a community perspective (Gurstein, 2003).

Purpose of the Study

The purpose of this study was to identify the forms of community informatics in Kaliro district.

Literature Review

Forms of Community Informatics

Community informatics are of various forms and can be categorised under three major forms; that is, social informatics, technical informatics, and organizational informatics (Kling, 2007; Kling & Star, 1998; Kling, 1993).Social informatics involves leveraging data and information to better understand the social dynamics of a community, such as the relationships between the different community organizations, and using that knowledge to design programs and services that will improve the quality of life for the people in the community. The various forms of social informatics focus on improving the quality of life for the people in a community using technology (Kling, 2007). Examples include most web-based community informatics like; webinars, online groups and communities, online training platforms, online forums, social media, blogs, wikis, online databases, online applications, social networking sites, social gaming, social news sites, virtual worlds, online mentoring, online education, online teaching, peer-to-peer learning, online conferences and events, online surveys, online quizzes and tests and many others (Kling, 2007).

Technical informatics involves the use of technology to design, build, and maintain the physical infrastructure of a community to enable resources and information sharing (Kling, 2007). Examples include; data analytics, web development, web design, mobile applications, software development, computer repair, IT consulting, and many others. Community members can use technical informatics services, such as online mapping services, to improve the way they navigate their community.

Organisation informatics involves the use of information, the processes involved and the factors that influence this use. Examples include; collaboration platforms, online communities, online marketplaces, among others (Kling & Star, 1998; Kling, 1993).

Similarly, CI also include all innovations that empower communities with information and communication technologies(Day, 2011). For example; community information centres, telecentres and community IT centres, multipurpose community telecentres, community multimedia centres, and community learning centres (United Nations Educational, Scientific and Cultural Organization,2007; Kamarudin, Bolong, Osman, &Mahamed, 2019).

In Uganda and perhaps other developing countries, the list of CI includes: District web portals; RDC internet and ICT infrastructure, ICT laboratories in secondary schools, ICTs in Health facilities, Internet

cafes, Broadcasting sites, Public payphones, Postal telecenters, Internet points of presence (POP)and others that keep emerging with the advancement in technology (Uganda Communications Commission, 2014a, 2014c). These collectively benefit the people in the respective areas where they are established. The district web portals for example; provide information about the district overview, health, agriculture, education, government programs and policies, tourism, culture of people among others (Uganda Communications Commission, 2014a, 2014b, 2014c; De Cindio & Ripamonti, 2010). The RDC internet and ICT Infrastructure are established to enhance the capacity of the RDC in overseeing and monitoring public sector programmes and projects in the district as well as being able to effectively interlink with his/her peers and the President's office to which he/she reports (Uganda Communications Commission, 2014c). The uniqueness about the various forms of CI is the fact that they recognise the ideology of "community" where social relations and human interrelations are key in achieving community goals.

Methods

Research Design

This study used a participative case study design to guide research processes. It was preferred because it offers a rich method for investigating a single case using participative methods; and replicates outcomes across similar cases (Widdowson, 2011; Kabir, 2016).

Research Approach

The study also used a mixed-methods methodological research approach to carry out the investigations. "Mixed-methods" is an emergent methodology of research that advances the systematic integration of quantitative and qualitative data within a single investigation (Wisdom & Creswell, 2013).They were preferred because they are more flexible, adaptable to several study designs and collect rich and comprehensive data (Davis, 2021).

Study Area

The geographical area of study was Kaliro district, a district in Eastern Uganda. Data was collected from the district's Sub-counties (SCs)of Bukamba, Nansololo, Kisinda, Kasokwe, Bumanya, Budomero, Gadumile, Namugongo, and Buyinda and Town councils (TCs) of Nawaikoke, Kaliro, and Bulumba. The choice for Kaliro district as the area of study was premised on the fact that it was conveniently accessible to the researchers, and that its demographics collectively represent the majority of similar cases (rural communities) with community informatics.

Study Group

The study group comprised of 206 CI stakeholders in the case study area, which included 173 CI users selected randomly and 33 District workers (Kaliro Resident District Commissioner, 5 Technical staff, 4 Administrators, 5 Heads of units, and 18 Staff in different units) selected purposively.

Data Collection Tools

This study used an interview guide, questionnaire and observation guide as tools for data collection.

The interview guide for this study was of a semi-structured type, that is to say, made of semi-structured questions and was used to collect in-depth qualitative data regarding the types or forms of community informatics in Kaliro district from key respondents (district workers).The researchers also issued

questionnaires to CI users in the general community to obtain their views and experiences regarding the types or forms of community informatics in Kaliro district. On the other hand, the observation guide was of a structured type and covered key areas for observation. These included; the various forms of CI available in the community, user activity at the CI centers, activity by management and technical staff at the CI centers.

Data Collection and Analysis

The study was conducted between February 2021 and February 2022. The data obtained in the study was analyzed using SPSS version 20.0 (Statistical Package for data analysis) and presented in form of tables and themes, interpreted and discussed accordingly.

Results and Discussions

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

Table 1: Distribution of respondents' participation according to Subcounty or Town council

N=206

Sub-county or Town council	n	%
Budomero SC	17	8.3
Buhinda SC	15	7.3
Bukamba SC	16	7.8
Bumanya SC	17	8.3
Gadumile SC	10	4.9
Kaliro TC	44	21.4
Kasokwe SC	17	8.3
Kisinda SC	12	5.8
Namugongo SC	17	8.3
Namwiwa TC	15	7.3
Nansololo SC	16	7.8
Nawaikoke TC	10	4.9

Source: Field data (2022)

As observed in Table 1above, the highest rate of participation,44 (21.4%),was registred inKaliro TC and the lowest, 10 (4.9%), in Nawaikoke TC and Gadumile SC.The high participation in Kaliro TC can be linked to its strategic status in the district as the centre of district administration and most of the community informatics under investigation. Additionally, the researchers also purposely targeted moreparticipants in Kaliro TC because, being the centre of business in the district,it had the highest number of key individuals with a better comprehension of the CI concept under study as compared to other SCs and TCs.

Table 2: Distribution of respondents' participation according to age

N=206

Age group	n	%
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)

Table 2, showed that, 97 (47.1%), of the respondents were between the ages of 31 and 40 years where as the least, 16 (7.8%) of the respondents were above 50 years. A total of 138 (67.0%) of the respondents belonged to the merged age group of 21-40 years. It can be said therefore, that majority, 138 (67.0%) of the respondents were in their youthful stages. This high participation can be linked to the belief that youths all over the world are fascinated by technological advancements and eager to embrace the mas opposed to their counterparts, the adults (over 40 years).

Table 3: Distribution of respondents' participation according to highest level of academic qualification attained

N=206

Academic qualification	n	%
Bachelor's degree	35	17.0
Certificate	60	29.1
Diploma	90	43.7
Postgraduate	21	10.2

Source: Field data (2022)

Table 3 revealed that the biggest percentage of respondents, 90 (43.7%), had a diploma, and the least, 21 (10.2%) had a postgraduate qualification. Based on these results, it can be said that the participants were literate enough.

Table 4: Distribution of respondents' participation according to qualifications versus their Town council or Subcounty of designation.

	Level of academic qualification			
Subcounty/ Town council	**Bachelor's degree**	**Certificate**	**Diploma**	**Postgraduate**
Budomero SC	2	1	14	0
Buhinda SC	3	4	8	0
Bukamba SC	1	8	7	0
Bumanya SC	2	5	10	0
Gadumile SC	2	5	3	0
Kaliro TC	8	6	10	20
Kasokwe SC	0	12	5	0
Kisinda SC	4	5	3	0
Namugongo SC	2	6	9	0
Namwiwa TC	6	2	6	1
Nansololo SC	2	2	12	0
Nawaikoke TC	3	4	3	0

Total	**35**	**60**	**90**	**21**

Source: Field data (2022)

Table 4 above revealed that Kaliro TC had the highest percentage of postgraduate holders, 20 (95.2%) and Bachelor's degree holders, 8 (22.9%) than any other TC or SC. This can be dueto the fact that Kaliro TC is the centre of administration in the district withthe majority of key public and private entity offices where appointmentsnecessitate a person withgood and competitive academic qualifications such as a degree or postgraduate.

Budomero SC had the largest percentage of diploma holders, with 14 (15.6%), followed by Nansololo SC with 12 (13.3%). Kasokwe SC had the highest percentage of certificate holders, with 12 (20.0%), followed by Bukamba SC with 8 (40.0%). In general sense, theTCs had more academically qualified participants than SCs. This is the default setting of any society because the literate will always seek to dwell in places where service delivery is better and better opportunities bleed. Places such as towns, trading centres, municipalities and cities.

Table 5: Distribution of respondents' participation according to duration of work in the district

N=206

Duration of work	**n**	**%**
11-15 years	27	13.1
16-20 years	14	6.8
21-25 years	5	2.4
5-10 years	91	44.2
More than 25 years	3	1.5
less than 5 years	66	32.0

Source: Field data (2022)

The findings in Table 5 showed that the highest, 91 (44.2%) of the respondents had spent 5-10 years in the district. The least, 3 (1.5%) of them had spent more than 25 years. A total of 140 (68.0%) of the respondents had actually spent more than 5 years in the district. This suggests that the biggest number of the respondents had a good lived experience and knowledge concerning issues in the district notwithstanding the issues pertaining to CI under investigation.

Table 6: Distribution of Respondents' understanding of the concept of community informatics

N=206

Understanding of Community Informatics	**n**	**%**
Yes	50	75.7
No	156	24.3
Total	206	100.0

Source: Field data (2022)

Table 6 above demonstratedthat majority of the respondents, 156 (75.7%) had never heard about the CI concept under investigation. On the other hand, only 50 (24.3%) of respondents had heard of the concept.

Below are some of the excerpts depicting the respondents' understanding of the CI concept as given by CI users in questionnaires and district workers in interviews

"Application of ICTs for information purposes in the community"

"Design and development of ICTs and how they benefit communities"

"ICTs that give people information in the community"

"Reaching out data and information to the community using computers"

"The study of designs and development of information technology for the good of people, organizations and society"

"Resources for communication with the community"

"Development of ICT for the good of the community"

Many of the qualitative remarks were found to resonate with Gurstein's (2011) definition of community informatics. According to Gurstein (2011), CIrefers to the use of information and ICTs in community development efforts that is to enable and empower community processes in a way to achieve the social, economic, cultural and political goals.

The statements were also not any different from Carroll, Shih, and Kropczynski (2015) and Averweg and Leaning's (2011)understanding of CI. Carroll, Shih, and Kropczynski (2015) defined it as the integration of communities with information sciences and technologieswhereas, Averweg and Leaning (2011) defined it as an academic field of study that seeks to examine how information and communication technologies (ICTs) can be deployed to the benefit of communities.

Table 7: Response rate of participants reportingcommunity informatics in various sectors of Kaliro district

N = 206

Sector	**n**	**%**
Education	189	91.7
DLG Administration	204	99.0
Health	197	95.6
General Community	206	100.0

Source: Field data (2022)

This study categorised community informatics in Kaliro district into four broad categories; CI in the education sector, CI at the District Local Government (DLG) administration, CI in the health sector and CI in the general or general community.Up to 189 (91.7%) of the respondents reported various forms of CI in the Education sector, 204 (99.0%) of the respondents listedCI at the District Local Government (DLG), 197 (95.6%)disclosed the CI used in the health sector where as 206 (100.0%) of the respondentsreported the CI in the general community.

Table 7: Distribution of responses in relation to the different forms of community informatics in education sector of Kaliro district.

N = 189

Community informatics in the Education sector	n	%
ICT labs	177	93.7
Websites	21	11.1
ICT enabled teaching & learning	129	68.3
Biometric technologies	67	35.4
Internet	106	56.1
Others	2	1.0

Source: Field data (2022)

The responses in Table 7 confirmed ICT labs, websites, ICT enabled teaching and learning, Biometric technologies, the Internet as the prevalent forms of CI in the education sector of Kaliro district. Only 2 (1.0%) of the respondents revealed other forms of CI such as Wi-Fi hotspots, and payphones present in some education institutions.These CI are presented and discussed thematically as follows:

i) ICT laboratories

ICT laboratories or what majority, 177 (93.7%) of the respondents referred to as computer laboratories were rooms equipped with computers (mostly desktops) and used to facilitate and support students training in computer studiesand ICT. It was observed that apart from desktop computers which were common in most of the learning institutions with computer labs, some learning institutions like Budini Secondary School, and Kaliro Vocational Training Institute had other ICT infrastructure such as printers, projectors, digital scanners, routers, internet, network hubs among others which they used to facilitate teaching and learning processes.

In confirmation of the availability of computer labs in learning institutions, Respondent 3 reported that, "Some schools, particularly government-aided secondary schools, as well as a few private secondary schools and technical institutes, have computer labs."Amongst the many, the most commonly reported were Kaliro High School, Namugongo Seed School-Kaliro, Budini Secondary School, Kanambatiko Secondary School, and Kaliro Technical Institute.

ii) Internet

106 (56.1%) of the respondents reported that teachers and students from a few learning institutions such as Budini Secondary School, Kaliro National Teachers College, Kaliro Vocational School and Uganda Martyrs School of Nursing and Midwifery- Kaliro, used internet to access vital information to support teaching and learning processes.

For example, Respondent 24 acknowledged that, "Some schools in the district have internet access, but it is limited and not regular." It became a necessary resource during the Covid-19 lockdown, but it was only available in a few schools, like Kaliro High School, Kaliro Namugongo Seed School, and Budini Secondary School."The respondents mentioned that some schools met the internet subscription costs for their staff whereas majority did not. This meant that each staff had to incur subscription costs by themselves to have access to internet. The commonest internet service providers used in the learning institutions were Airtel and MTN.

iii) ICT enabled teaching and learning

129 (68.3%) of the respondents confirmed the observation report that some learning institutions such as Nawaikoke College, Kanambatiko Secondary School, Valley Hill Mixed School, Kaliro Vocational Training Institute, Kaliro National Teachers College and Uganda Martyrs School of Nursing and Midwifery, Kaliro used ICTs to support teaching and learning processes.

Respondent 9 revealed that, "Teachers at Budini Secondary School, Kaliro National Teachers College, and Kaliro Vocational Training Institute, use ICTs such as smartphones, personal computers, and projectors to teach and demonstrate to learners in during class sessions." The study established that ICT enabled teaching and learning as a form of CI became more common and useful during the Covid-19 pandemic lockdowns when some learning institutions resorted to virtual technologies like Zoom to facilitate teaching and learning processes.

iv) Websites

Reporting in agreement with 21 (11.1%) of the respondents who reported websites as forms of CI in some learning institutions, the researcher also observed that indeed some learning institutions like Kaliro National Teachers College and Uganda Martyrs School of Nursing and Midwifery-Kaliro had websites and used them to communicate what happens in the school; publish information to update parents, learners and stakeholders about the school, its services, programs and activities.

Similarly, the study found out that, some learning institutions that did not have websites at least had social media platforms mostly Facebook from where they published information about their location, services, events and activities, among others for their target audience to view.

In confirmation of the reported details about websites, the researcher visited and observed the Kaliro National Teachers College website (https://kaliro.ac.ug/), Uganda Martyrs School of Nursing and Midwifery, Kaliro website (https://umsnm-kaliro.ac.ug/), Kaliro Vocational Training Institute website (https://www.kalirotechnicallnstitute.ac.ug/) and Budini Secondary School Facebook page (https://www.facebook.com/St-Gonzaga-Budini-Secondary-School-316913238480748/) and found out that they provided relevant information to visitors pertaining to contact information, ongoing activities, school programs and made it possible for users to interact with the authorities through the chat facility.

v) Biometric technologies

Like the 67 (35.4%) of the respondents who mentioned Biometric technologies, the researcher observed the same in government aided schools such as Bujejje Primary School, Buyinda Primary School, Gadumire Primary School among others that had biometric devices.

The Biometric technologies were used to monitor teacher and pupil attendance for improved learning outcomes. Respondent 11, for example pointed out that, "Biometric devices are in every government-aided school and are used to track teachers' attendance to reduce absenteeism among teachers."

vi) Others

In other findings, 2 (1.0%) of the respondents reported other forms of CI such as Wi-Fi hotspots, and payphones.

Respondents who cited Wi-Fi hotspots revealed that, the hotspots enabled individuals with valid passwords to connect to the Wi-Fiin their leaning institutions and were able to surf different online resources. A respondent mentioned that Wi-Fi hotspots were not a common thing in many schools but

could be located in a few learning centres such asKaliro Vocational Training Institute, Kaliro National Teachers College and Uganda Martyrs School of Nursing and Midwifery, Kaliro.

For the case of Payphones, respondents mentioned that these were used to facilitate tele-communication especially between learners in boarding school and their parents or guardians back home. Many respondents including Respondent 4, 8, 16 and 28 expressed concerns that public payphones were phasing out of communities and are really hard to find. For the case of schools, they noted that presently, they could only be found in a few schools such as Budini Secondary School.

In general sense, the findings showed that Kaliro district had various forms of CI though established in a few schools and learning centres. These were basically ICT laboratories, ICT-enabled teaching and learning, the internet, Biometric technologies, Websites, Wi-Fi hotspots, and Payphones. Interestingly, majority of these were not any different from CI forms reported by Uganda Communications Commission (2014a, 2014c). The UCC 2014 report cited ICT laboratories in secondary schools, ICT-enabled teaching and learning, the internet, web portals, and payphones as common CI established in schools and learning centres (Uganda Communications Commission, 2014a, 2014c).

The findings also revealed that a few schools and learning centres in Kaliro district had some social informatics in form of websites and internet. According to Kling (2007), such are categorised as social informatics because they are a source of information, support, and connection for the community.

Table 8: Distribution of responses in relation to the different forms of community informatics at the District Local Government administration

N = 204

Community informatics at the DLG Administration	**n**	**%**
Internet	146	71.6
District information systems	125	61.3
District web portal	171	83.8
DLG ICT infrastructure	154	75.5
RDC ICT infrastructure	165	80.9
Others	1	0.5

Source: Field data (2022)

Respondents reported that Kaliro DLG Administration has;District information systems, the Internet, District web portal, DLG ICT infrastructure, and RDC ICT infrastructure. These were the major forms of community informatics at the DLG Administration. Each of these were reported by over two thirds of the total respondents. Only 1 (0.5%) of the respondentsreported about other CI forms like personal laptops, modems and MiFi used by some individuals at the DLG. Further details about these CI are presented and discussed below:

i) District web portal

The researcher visited and navigatedvarious features of Kaliro district web portal available at https://www.kaliro.go.ug/. The portal was reported as one of the CI available in Kaliro district by majority, 171 (83.8%) of the respondents. The observation, survey and interview reports revealed that the portal was used majorly to communicate information about Kaliro district including content on

politics, leadership, district management and administration, government programs, demographics, among others to the people even beyond Kaliro district.

Further inquiries established that the web portal was maintained by the district's Information and Communication Officer.

ii) RDC ICT infrastructure

The RDC ICT infrastructure was observed among the CI forms in Kaliro district, comprised of simple computer workstations, laptops, and printers. This observation was attested to by 165 (80.9%) of the respondents who also cited the RDC ICT infrastructure as part of the CI forms in Kaliro district.

The study further established that, the CI makes it possible for the RDC to communicate and make reports directly to the supervising authority, the Office of the President. Similarly, Respondent 21 mentioned that, "…the RDC relies on the ICT infrastructure to receive and process information..."

iii) District Local Government ICT infrastructure

Critical observations across the different DLG administrative offices established that Kaliro DLG had a wide ICT infrastructure mainly comprised of computer workstations, laptops, printers, photocopiers, digital scanners, computer boardroom, and network servers. The same DLG ICT infrastructure was pointed out by 154 (75.5%) of the respondents as one of the major CI forms used in execution of administration work at the DLG.

It was observed that, the DLG ICT infrastructure was not only at the DLG headquarters, but also at the town clerks', parish chiefs' and sub-county chiefs' administrative offices. There was though a notable difference in the distribution of the ICT infrastructure across administrative offices. Respondent 13 noted that components were not uniformly distributed for instance, network servers, and the computer boardrooms were only at the DLG headquarters. The respondent noted that some administrative offices hardly had even a computer workstation.

iv) The internet

The internet,as reported by 146 (71.6%) of the respondents was reportedly vital in fostering knowledge and information sharing, and social connectivity among staff at the district. The respondents mentioned that once in a while, the district met the costs of internet subscription costs for their staff. This meant that for majority of the times, each staff had to incur costs by themselves to have internet access. The commonest internet service providers were Airtel and MTN.

v) District information systems

125 (61.3%) of the respondents reported district information systems as part of the CI used in DLG administration work. Particularly, Respondent 3, 4, and 19 cited the Integrated Financial Management System used to effect and track payments of public servants at the district; the Integrated Personnel and Payroll System, used to effect payments for pensionable public servants; and the Planning and Budgeting System, used in planning, budgeting, and auditing functions at the district.

Essentially, the existence of district web portal, district information systems and the RDC ICT and Internet infrastructure as forms of CI at Kaliro DLG confirms to the reports by the RCDF and UCC that mentioned of how the collaborative efforts between UCC, RCDF, NITA (U) and line ministries had facilitated the development of functional and customised district web portals to facilitate information

dissemination (De Cindio and Ripamonti, 2010), empowered the RDC offices with ICT and Internet, and facilitated e-governance by connecting DLGs to government information systems such as the prominent Integrated Financial Management System used to effect payments for public servants (Uganda Communications Commission, 2014a, 2014b, 2014c).

Table 9: Distribution of responses in relation to the different forms of community informatics in the health sector

N = 197

Community informatics in the health sector	n	%
Internet	159	80.7
Health information systems	134	68.0
Biometric technologies	160	81.2
ICT health infrastructure	192	97.5
Others	2	1.0

Source: Field data (2022)

The findings in Table 9 indicated that over two thirds of the respondents reported Health information systems, Biometric devices, ICT health infrastructure, and the Internet as the prevalent CI used in Kaliro district health sector. Only, 2 (1.0%) of the respondents reported other forms of CI such as office telecommunication technologies used to ease communications among health workers.A detailed presentation and discussion of the responses is given as follows:

i) ICT health infrastructure

The researchers' field observation report identified desktop computers, laptops, printers, photocopiers, digital temperature guns, digital life monitoring systems, and digital weight and scale balances, as the major informatics comprising the district's ICT health infrastructure and were used by health workers to offer health services to the community.

These findings were also confirmed by 192 (97.5%) of the respondents who also reported similar informatics comprising the ICT infrastructure in the health sector especially in the model health centres such as Bumanya HC IV, Budomero HC II, Nawaikoke HC III, and Namwiwa HC III. These had facilitated good health service delivery and simplified workflows in the HCs.Respondent 8 noted thatalmost all health centreshad informatics.

ii) Biometric technologies

Biometric technologies were reported by 160 (81.2%) of the respondents as a form of CI commonly used in the government HCs. These were distributed by government and were used to monitor the attendance track record of health workers in HCs where they are used.

Respondent 8 elaborated that, they (Biometric devices) " …record and track the attendance of health workers at the designated health centres in order to combat the absenteeism tendency among health workers." These findings emphasised that biometric technologies are prominent forms of CI not only in the education sector, but also in health sector.

iii) Health information systems

159 (80.7%) of the respondents who mentioned Health information systems noted that the systems were vital in ensuring that health information is effectively managed as it is received and generated at the HCs.

For example, Respondent 31 pointed out that their HC IVs had computerised health information systems that capture and store patient medical records. The respondent elaborated that; they used the Epivac system to collect vaccination information from people in the district who were vaccinated. The study established that, Epivac system made it easier for individuals to check their vaccination status and generate certified Covid-19 certificates from anywhere using the system.

iv) The internet

The internet was cited by 134 (68.0%) of the respondents as one of the CI forms in the health sector. However, Respondent 19, 22, 28 and 30 clarified that this was not available in all health centres. Respondent 30 explained that, they were only sure of its availability in Bumanya HC IV. With the internet, respondents mentioned that, Health workers could make consultations online and share digital summaries of patient health instantly.

In brief, the district had Health information systems, the Internet, Biometric technologies, and ICT infrastructure as the common CI forms in the health sector. These findings were concurrent with the reports by Uganda Communications Commission (2014a, 2014c) regarding the CI established in district health centres across the country.

Table 10: Distribution of responses in relation to the different forms of community informatics in the General community

N = 206

Community informatics in the General community	n	%
Multimedia libraries	140	68.0
Secretarial service centres	125	60.7
Wi-Fi hotspots	88	42.7
E-financial service centres	70	34.0
Computer/phone service centres	66	32.0
ICT training centres	47	22.8
Internet cafes	44	21.4
Telecom network services	30	14.7
Others	2	1.0

Source: Field data (2022)

When findings in Table 10 are critically analysed, it can be established that over half of the respondents recognisedthe presence ofmultimedia libraries and secretarial service centres as forms of CI in the general community of Kaliro district. Others reported the presence of Wi-Fi hotspots, E-financial service centres, computer/phone service centres, ICT training centres, Internet cafes, telecom network services. The least, 30 (14.7%) of the respondents reported other forms of CI like telecommunication masks that transfer frequency signals for radios and televisions, stationed and mobile integrated sound systems used in marketing and broadcast among others.The context below presents and discussesathematic overview of the CI reportedly present in the general community of Kaliro district.

i) Multimedia libraries

Multimedia libraries were visibly present in all trading centres of SCs and TCs of Kaliro district. Over 140 (68.0%) respondents attested to this observation and mentioned that multimedia libraries were one of the CI available in their communities.

The study established that the multimedia libraries, they sold out audio and video content like music and movies to people in the community who approached them. Respondent 31 reported that some provided secretarial services as an extension service in order to maximise profits.

ii) Secretarial service centres

There were a few random Secretarial service centres visible in the district's trading centres. Similar reports were made by 125 (60.7%) respondents who mentioned that Secretarial service centres were visibly available in various localities of the district town/trading centres and offered a wide range of secretarial services to community members.

The study established that the centres offered common services such as typesetting, photocopying, printing, sale of office and school stationary, scanning, internet access, printing, binding, laminating among others.

iii) Wi-Fi hotspots

88 (42.7%) of the respondents reported the availability Wi-Fi hotspots in some few selected areas of the district community like Kaliro resort hotel located in Kaliro TC.The Wi-Fi hotspots were points of internet connection and were common in places like Kaliro resort hotel in the town council, and others in Namwiwa, Bumanya, and Nawaikoke.

iv) E-financial service centres

The community had e-financial centres but were sparse and located in a few areas. Observation reports ascertained that they were located in a few trading centres of TCs such as Kaliro TC the centre of the district's business. Nonetheless, 70 (34.0%) of the respondents still reported of their availability in the district.

The commonestones were agent banking kiosks in town centres where people went to conduct financial transactions, seek financial advice, pay bills, apply for loans, or update their customer information. There were few bank branch networks, and apart from Platinum credit bank located near the Post office in Kaliro TC, the study did not learn of any other.

v) Computer/phone service centres

Amongst other forms of CI in Kaliro district, 66 (32.0%) of the respondents cited computer/phone service centres. At the computer and phone service centres; computers, and mobile phones were repaired, software sold and updated. Respondent 17 pointed out that, "Some of the computer and phone service centres buy and sell new and used computers, phones, and other spare parts to maximise profits."

vi) ICT training centres

47 (22.8%) of the respondents reported ICT training centres in the district. Notably, there were not many visible ICT training centres in the district but a few such as "Hands-on Computer Centre" in Kaliro TC along Kaliro-Iganga road. People were seen visiting the centre severally not only for ICT-related services, but also to be trained in ICT skills.

vii) Internet cafes

44 (21.4%) of the respondents cited Internet cafes as one of the CI forms in the general community.However, field observations showed that these were not common everywhere. Respondent 4 reported that they had few internet cafes in the district. The renown one was one near Kaliro market in Kaliro TC. At the café, people mostly youths, frequently sought for internet services to be able to process things online, download contents or work out remotely. The internet cafes also offered printing, photocopying, scanning, and typesetting services among others.

viii) Telecom network services centres

During field observations, the researcher observed the presence of telecom network service centres(in the district's town centres). In Kaliro TC for example, there was Kaliro Airtel service centre next to the town clerk's office, as well as several MTN network service centres along the Kaliro-Iganga road and Kaliro town taxi park. People with issues and inquiries regarding their sim cards, mobile phones or network service visited these centres to have their issues solved.

ix) Others

In other findings, the least, 30 (14.7%) of the respondents reported other forms of CI like telecommunication masks that transfer frequency signals for radios and televisions; stationed and mobile sound systems used in business marketing and broadcast. The mobile sound systems were common in trading centres and were used by small scale businesses to market their goods and services. If not used in real time to promote and market the products and/or services of the business, the sound systems were used to consistently play a pre-recorded audio sound intended for the same.

The finding above confirmed the reports by the RCDF and UCC that highlighted the extent to which the collaborative efforts between UCC, RCDF, NITA (U), line ministries and other ICT4D implementing partners had gone with establishing Internet cafes, Broadcasting sites, Public payphones, Postal telecenters, Internet points of presence (POP) among others to facilitate information sharing and empower people (Gurstein 2013). The reports mentioned similar CI forms which were scattered across the many rural districts of the country including Kaliro district.

The findings also concur with the United Nations Educational, Scientific and Cultural Organisation (2007) view of CI that recognises community information centres, telecentres and community IT centres, multipurpose community telecentres, community multimedia centres, and community learning centres as some of CI establishments. Similarly, Kamarudin, et al. (2019) further recognised telecentres as CI among ICT4D.

Conclusions

The study identified the different forms of community informatics in the education sector, health sector, DLG administration, and the general community of Kaliro district. In the education sector, major CI were; ICT laboratories, internet, ICT-enabled teaching and learning, biometric technologies, and websites. In the health sector, major CI were; Health Information Systems, health ICT infrastructure, internet, and biometric technologies. At the different levels of DLG administration, major CI were; RDC ICT infrastructure, internet, DLG ICT infrastructure, district web portal, and information systems whereas in the general community of the district, major CI were; internet cafes, multimedia libraries,

telecom network service centres, secretarial service centres, e-financial service centres, ICT training centres, Wi-Fi hotspots, and computer/phone service centres.

A comparison of findings from this study with other studies or reports established that reports by the United Nations Educational, Scientific and Cultural Organization (2007) and Uganda Communications Commission (2014c) presented similar forms of community informatics as established in this study. The United Nations Educational, Scientific and Cultural Organization (2007) for example lists amongst other informatics; community information centres, telecentres and community IT centres, multipurpose community telecentres, community multimedia centres, and community learning centres where as Uganda Communications Commission (2014c) lists district web portals; RDC internet and ICT infrastructure, ICT laboratories in secondary schools, health ICT facilities, internet cafes, broadcasting sites, public payphones, postal telecenters, internet POP among others. All these forms of community informatics are not any different from those established by this study across the educational sector, DLG administration, health sector and general community of Kaliro district.The findings also clearly bring out Kling's viewand categorisation of community informatics as social informatics, technical informatics, and organizational informatics (Kling, 2007; Kling and Star, 1998; Kling, 1993). For example; websites, ICT enabled teaching and learning, and the district webportal fit as social informatics. The internet, on the contrary, is more of an enabler. It readily enables social informatics activities/services such as webinars, online forums, online training, social media sites, peer-to-peer learning, among others much as it does with technical and organisation informatics.

Recommendations

Government in liaison with the concerned (potential)ICT4D implementing partners should implement more forms of CI in the district to benefit locals in deeper areas of the district. This strategy will suitably address any concerns of uneven CI distribution and contribute towards closing the information gap between the information "haves" and "have nots." The established CI will introduce new activities, new services and applications into rural areas and contribute towards enhancing development.

Among the CI that need to be established, E-financial service centres should be a priority for the fact that there is a dearth of corporate E-financial service centres such as banks in the district. Apart from Platinum credit bank, the district only has stop centres for agent banking, mobile money and Airtel money kiosks which are never fully effective. The study thus recommends that financial institutions should extend their branch network to the areas in the district where trade and business are on the rise.

Similarly, it was inferred by the majority of the respondents that only a few schools in the education sector leverage internet and ICT-enabled teaching and learning. Therefore, the adoption and implementation of more of these in other schools can be encouraged to support learning and teaching processes of learners and teachers respectively. Subsequently, the approach will register milestones toward the development of the education sector.

As the CI are deployed, masses in communities also need to be sensitised on matters pertaining to CI. They should be educated about CI and their benefits and encouraged to take advantage of them. In addition, the sensitisation should be done bearing in mind of the needs of the people in the community to ensure that they are catered for.

Policy makers in the CI field should formulate inclusive CI policies to regulate the implementation, management, maintenance and sustainability of CI in communities. This should be done with consultation of all key stakeholders and in consideration of the community needs.

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