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Delivery, Support, and Influence of ICT Infrastructure Towards Digital Empowerment: A Proposed Stakeholders' Collaborative Framework

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Abstract
Aim: This study aimed to identify the university's ICT infrastructure's delivery status and to explore the stakeholders' influence and support in upgrading its ICT infrastructure and design a framework to sustain digital empowerment.
Methodology: The study's methodology was mixed methods research design. Purposive sampling technique was used to select 25 unit heads to answer to an online survey instrument developed by Misra et al., (2014) to gather a quantitative data regarding the university's ICT infrastructure's delivery status. Two focus group discussions were also used to gather qualitative data. A total of 4 selected unit heads from the University participated in the first FGD to validate the survey's results, while a total of 3 representatives from the local government unit (LGU), non-governmental organizations (NGOs), and private sector participated in the second FGD regarding stakeholders' influence and support in upgrading the university's ICT infrastructure.
Results: Based on the findings, there were insufficient ICT facilities at the university's delivery level. Moreover, different stakeholders were influenced to assist the university in the development of their ICT infrastructure because of the impact or benefits that these stakeholders can achieve, such as improved hiring processes, technology transfer, and a positive relationship between stakeholders and the University. In this regard, these parties were willing to provide various resources to help strengthen the ICT infrastructure, including financial assistance, donations, and free ICT-related seminars and training for faculty, staff, and students.
Conclusion: Strong involvement of different stakeholders is highly needed to enhance the capability of delivering the ICT infrastructure in the University. Technology transfer, technical assistance, enrolment to employment, and attaining each organizational goal were some factors which influenced these sectors to assist the university in the development of ICT infrastructure towards digital empowerment.

Keywords: digital empowerment, education, ICT infrastructure, stakeholders

INTRODUCTION

Digitalization has evolved rapidly, creating both challenges and opportunities. Currently, the implementation of several tasks and functions in the fields of education, business, management, administration, and the like requires digital technology. According to Phansalkar (2021), access to the digital world is the first step toward digital empowerment. It encompasses the ability to participate confidently in the digital environment, and it achieves its aim when citizens can deliberately, proactively, and creatively use and build on existing information. In this context, the digital transformation required an established Information and Communication Technology (ICT) infrastructure. Tariq (2019) added that ICT also has radically changed the practice and procedures of all forms of endeavors within the business, society, governance, and education. The more established the ICT infrastructure is, the more competent and influential the people in their society are. In connection with this, researchers, academicians, and industry professionals have proved that ICT provides opportunities for all educational participants to excel in their chosen field. Education has become recognized as a socially-oriented activity and a means of empowering society. In the digital age, ICT has transformed educational society into a knowledge and information society which results to transform the economy into a knowledge economy supporting nations to create wealth by exploring knowledge (Tariq, 2019). This allows learners to keep up with the demand of the 21st century. Today, educational institutions are embracing digital transformation by adopting and integrating ICTs into their teaching and learning to produce graduates with competitive skills in Information Technology (IT). ICT improves the students' learning, assists students in learning new skills, encourages social mobility, and assists people in competing in a global economy. Which according to Hrehová and Teplická (2020), education – particularly global and ICT skills improves people's chances of getting work, which leads to a better lifestyle, power, and status. Thus, it has a multiplier impact on the educational system; academic institutions should

invest more in improving the ICT infrastructure to cope with the demand of modern society. However, there is a huge variation in the delivery and quality of ICT infrastructure in educational institutions. High costs of getting, installing, operating, maintaining, and replacing ICT systems; use of unlicensed software; outdated hardware and software systems; and lack of technical help for system maintenance are the key issues (Balasubramanian et al., 2009). REX University is a public university located in the province of Cavite. The university is mandated "to provide excellent, equitable and relevant educational opportunities in the arts, sciences, and technology through quality instruction, and responsive research and development activities. And shall produce professional, skilled, and morally upright individuals for global competitiveness". Its number of enrollees continuously has increased, and a total of 2780 students were currently enrolled in the various programs offered by the university, in addition to 94 faculty and staff. Because of the continuously increasing number of enrollees to produce high quality of education and to support the university's daily activities additional improvements and acquisition of ICT infrastructure were needed. However, due limited budget and laborious process of assessment, financial, and procurement planning, purchase requisition and purchase order the progress and improvement of the ICT infrastructure of the university became challenging. Although the University was doing its best to deliver sufficient ICT infrastructure despite the tedious process of acquisition and limited budget, there seemed to be a consequent decline in delivering and improving the ICT infrastructure of the University.

Objectives

This study aimed to identify the university's ICT infrastructure's delivery status and to explore the stakeholders' influence and support in upgrading its ICT infrastructure and design a framework to sustain digital empowerment.

The following questions were specifically addressed in this study:

1. What is the status of the delivery of the Information and Communication Technology infrastructure of the University in terms of software, hardware, system application, database, network, people, and process?
2. What form of the support that can be provided by the LGU, NGO and private sector to assist the University in terms of ICT infrastructure, services, and funding?
3. What are the factors that influencing LGU, NGO, and private sector to assist the University in terms of ICT infrastructure, services, and funding?
4. What are the strategies,process and framework that the LGU, NGO, private sector and the University can adopt to sustain digital empowerment?

METHODOLOGY

Research Design

A mixed-methods sequential- explanatory research design was utilized as the methodology of this study. This combines quantitative and qualitative data and uses a variety of methodologies to answer research questions in an appropriate and ethical manner (Creswell, 2015). Influenced by pragmatic theory, this approach allowed a deeper understanding of the different stakeholders to support the digital empowerment of the University. This tends to view truth as a function of practices people engage in. This allowed researchers to better identify the aspects that various stakeholders can offer to support the University's present ICT infrastructure status. The study was conducted at REX University located in the province of Cavite. The participants specifically included the unit heads of the University, the chair of the LGU's Department of Information Technology, a representative of the NGO, and an HR staff from the private sector. In addition, Actor-network Theory (ANT) (figure 1) was the theoretical framework of the study. In early 1980s Michel Callon, Madeleine Akrich, Bruno Latour and John Law, ANT was established in the fields of sociology, anthropology, and science and technology studies, but it has since been adopted by other academics, including information systems. This theory contains not merely people, but objects and organization.

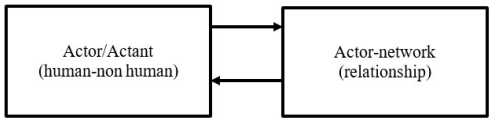

Figure 1: Actor-network Theory

Initially, the theory depicts the relationship of the actant and the actor-network. In general ANT conceptualizes social interactions in network. There is no differences between the human and non humans (actants) of a technology system. The central focus of ANT research is on the process of translation, in which individuals align their own interests with those of others. These actors can be an authority that either influence and use others or have no motivation and will be under the control of other actors.

Sample and Sampling Technique

Non-probability sampling was used to select the participants for the survey. In addition, a characteristic of non-probability sampling techniques

is that samples are selected based on the subjective judgment of the researcher. This is due to the qualities that the participants possess which can provide the needed information either by knowledge or experience. In this case, all participants had a commonality that they have about the delivery, utilization, and improvement of ICT resources. Their knowledge and understanding on the said issues allowed them to participate well in the discussion to achieve higher quality data. Purposive sampling, was used to identify and select the information-rich cases for the most proper utilization of available resources (Patton, 2002). This involves the selection of identified individuals or groups of individuals that are proficient and well-informed with a phenomenon of interest (Cresswell & Clark, 2011). This was specifically applied in selecting the participants who responded to the survey. To capture a wide range of perspectives about digital empowerment, the same sampling technique was used in selecting the participants for the two Focus Group discussions (FGD). It included a total of four participants composed of the Management Information System officer (MISO), computer laboratory coordinator, campus secretary, and a chair from the University. Three participants from the different stakeholders of the University were also included, specifically, the chair of the LGU's Department of Information Technology, a representative of the NGO, and an HR staff of the private sector. These participants had different attributes such as settings, job descriptions, ages, and experiences in their respective employment. This technique is also known as heterogeneous sampling and is used to capture a wide range of perspectives. It helped the researchers, to gain greater insights from all angles.

Instrumentation

In quantitative research, an adopted survey instrument from the work of Misra et al. (2014) was used to evaluate the status of the delivery of the ICT infrastructure of the University. The survey instrument had three parts. Section A gathered the general information of the participants. Section B had 17 items (1-17) intended to elicit information about the ICT infrastructure/facilities utilized/not utilized in the University. The items were structured on a two-point rating scale with response options and boundary limits. In addition, for the item indicators, a mean score equal to or greater than 1.50 (>=1.50) was accepted as utilized, while a mean score equal to or less than 1.49 (<=1.49) was accepted as not utilized . While, section C has 17 items (18-34) that gathered information about the extent of ICT application in the University. In addition, items 18-34 were structured on a five-point with response options (table 1).

Table 1. Response categories with points and boundary limit

Response option	Points	Boundary limit
Always Applied	5	4.50-5.00
Often times Applied	4	3.50-4.49
Sometimes	3	2.50-3.49
Rarely	2	1.50-2.49
Never	1	0.50-1.49

Moreover, to substantiate and validate the results of the survey, a qualitative research was was conducted using a mini FGD with the MISO, budget officer/campus secretary, computer laboratory coordinator, and chair representative. This method gave the researchers in-depth information about the delivery status of the ICT infrastructure in the university. In addition another mini FGD with representatives from LGU, NGO, and private sector was also conducted to gather in-depth information about the influence and support that they can provide to the University in terms of ICT delivery. According to Morgan (1997), FGD is useful in generating a rich understanding of participants' experiences and beliefs. The researchers used the typically focused group procedures by Krueger (1994) and Morgan and Krueger (1998). These procedures included question development, group composition and recruitment, interview protocol and logistics, and data analysis.

Ethical Consideration

An informed consent letter was given to each of the participants. The purpose of the study was also explained to them. Information that they provided were kept confidential and their identities were not revealed as this study was guided by the Data Privacy Act of 2012 – "to protect the fundamental human right of privacy, of communication while ensuring free flow of information to promote innovation and growth.". Pseudonyms were used to ensure their anonymity as well as the link between them and the information they provided.

Data Gathering Procedure

A quantitative data gathering using an adopted survey instrument that was given to the 25-unit heads of the university online was used to address the research question number 1. In addition, to validate the result of the survey, a qualitative data gathering using a mini FGD was used which allowed the researchers to gather in-depth information (for qualitative data) from the selected unit heads of the University regrding the deliveriry status of the ICT infrastructure in the University. Moreover, another FGD was used to address research questions numbers 3, 4 and 5. This method allowed the researchers to gather detailed information from the selected stakeholders of the University. An informed consent letters were given to the participants which they

signed electronically. The participants were selected based on the commonality that they had about the delivery, utilization, and improvement of ICT resources. Their common knowledge and understanding about ICT allowed them to participate meaningfully in the discussion, which thus led to gather higher quality data. In addition, interview protocols and logistics were also observed. The researchers used an online focused group to facilitate the discussion using the recommended guidelines for introducing the group discussion to the participants that included: (1) welcome, (2) overview of the topic (3) ground rules, and (4) first question. For the first pattern, one of the researchers introduced himself as the moderator of the group discussion. This was followed by the second pattern wherein the other researcher discussed the overview of the study including its objectives and the reason why they were chosen. Moreover, They discussed the rules during the group discussion. First, they informed them that our session would be recorded. They were also told that there were no right or wrong answers; the first-name would be utilized; they could actively talk to each other; and the session would only last for 45 minutes to 1 hour. Then, it was followed by the introductory question. The FGDs was conducted through online media, as requested by the participants to follow the current health protocols. The researchers followed the reminders of Bloor et al. (2001) when facilitating group discussions: The moderator should keep the discussion focused without leading it; prevent one member from dominating the discussion (for example, by emphasizing early on the importance of hearing a variety of viewpoints); ensure that all participants have an equal opportunity to contribute; and allow for a fair discussion of opposing viewpoints.

Data Analysis

The study gathered both quantitative and qualitative data. For quantitative, a descriptive statistical technique involving frequency, mean and standard diviation were used to identify the ICT infrastructure delivery status in the university. While for the qualitative data, the researchers used Braun and Clarke's six-phase for thematic analysis involving transcript of interviews. Moreover, recorded and transcribed qualitative data were reviewed, validated and process with the help of MAXQDA 2020 software. In addition, data analysis mapping (table 2) was used to understand the interconnectedness of the events and to be able to identify the relationship between the SOP, objective, data, intrument and analysis to ensure the validity and reliability of the data.

Table 2. Data analysis mapping

SOP	OBJECTIVE	DATA	INSTRUMENT	ANALYSIS
1) What is the status of the delivery of the Information and Communication Technology infrastructure of the university in terms of: a) Software b) Hardware c) System application; d) Database; e) Network; f) People; and g) Process?	1) To identify the status of the delivery of the Information and Communication Technology infrastructure of the university in terms of: a) Software, b) Hardware, c) System application, d) Database, e) Network, f) People, and g) Process.	Inventory of the ICT infrastructure of the university Result of the survey Result of focus group discussion	survey FGD interview	Thematic
2) What form of support can be provided by the LGU, NGO and private sector to assist the university in terms of:? a) ICT infrastructure; b) Services; and c) funding?	2) Identify the support that can be provided by the LGU, NGO and private sector to assist the university in terms of: a) ICT infrastructure, b) Services, and c) Funding.	Result of focus group discussion	FGD interview	Thematic
3) What are the factors influencing LGU, NGO and private sector to assist the university in terms of: a) ICT infrastructure; b) Services; and c) funding?	3) Identify the factors that influencing LGU, NGO, and private sector to assist the university in terms of: a) ICT infrastructure, b) Services, and c) Funding.	Result of focus group discussion	FGD interview	Thematic
4) What are the strategies, processes, and frameworks that the LGU, NGO, private sector and university can adopt to sustain digital empowerment?	4) To design strategies, processes, and a framework that the LGU, NGO, private sector and university can adopt to sustain digital empowerment	Result of focus group discussion	FGD interview	Thematic

RESULT AND DISCUSSION

Relative to the identified research problem, the purpose of this study was to identify the status of the delivery of the Information and Communication Technology (ICT) infrastructure of REX University; to identify the support that can be provided by the Local Government Unit (LGU), Non-Government Organization (NGO), and private sector to assist the University; to identify the factors that are influencing LGU, NGO, and private sector in assisting the University in terms of ICT infrastructure, services, and funding; and to identify the strategies and processes, and a framework that LGU, NGO, private sector, and the University can adopt to sustain digital empowerment through collaboration. The positive impact of ICT on teaching and learning is possible if the right environment and conditions are in place, such as suitable facilities, training, and support (Jiya, 2019).

The status of the delivery of the ICT infrastructure of the University

A quantitative data shows that in terms of the university's ICT infrastructure/facilities/services utilization, Local Area Network (LAN), Campus Area Network (CAN), Wide Area Network (WAN), Cyber Café, Intranet, Radio/television broadcast and Interactive Whiteboard are not utilized by the unit heads of the University. (table 3)

Table 3. ICT infrastructure/facilities/service utilization in the university

No	Indicator	Utilized	Not Utilized	Mean	Remark
1	Computers with printers	25	0	2.00	Utilized
2	Peripherals: scanner, webcam digital camera	25	0	2.00	Utilized
3	Local Area Network	8	17	1.32	Not Utilized
4	Campus Area Network	7	18	1.28	Not Utilized
5	Wide Area Network	0	25	1.00	Not Utilized
6	Internet facilities/cyber cafe	0	25	1.00	Not Utilized
7	Email Services	25	0	2.00	Utilized
8	World Wide Web	25	0	2.00	Utilized
9	Intranet	4	21	1.48	Not Utilized
10	Website	25	0	2.00	Utilized
11	E-Library	17	8	1.68	Utilized
12	Online/E-learning course delivery	21	4	1.84	Utilized
13	Teleconferencing (videoconferencing)	25	0	2.00	Utilized
14	Telephone services (mobile/fixed)	23	2	1.92	Utilized
15	Radio/Television broadcast lecture delivery	3	22	1.12	Not Utilized
16	Projectors	23	2	1.92	Utilized
17	Interactive whiteboard	5	20	1.20	Not Utilized

Furthermore, in terms of the level of ICT application in the University it was determined that also, indicators LAN, CAN, WAN, Cyber Cafe, Intranet, Radio/television broadcast, and Interactive whiteboard are at the lowest level of utlilization which implies that these ICT infractures, facitlities and services were rarely or never been used.(Table 4).

Table 4. Extent/level of ICT application in the University

No	Indicator	1	2	3	4	5	Mean	SD	Remarks
18	Computers + printer networked, or standalone for processing information	0	0	0	9	16	4.64	0.50	Always
19	Peripheral such as scanners, webcam, digital camera	0	2	7	9	7	3.84	0.94	Often
20	Use of LAN for interconnecting all computers within a department/center	17	0	4	0	4	1.96	1.42	Rarely
21	Use of Campus area network interconnecting LANs in the entire university	17	0	5	0	3	1.88	1.42	Rarely
22	Use of wide area network (WAN) interconnecting the university to other institution or linking various campuses	25	0	0	0	0	1.00	0.00	Never
23	Use of Internet facilities/cybercafé in the university	25	0	0	0	0	1.00	0.00	Never
24	E-mail services on the internet or intranet	0	0	2	6	17	4.60	0.65	Always
25	Use of Intranet; LAN, CAN connected to the internet for private internet access by the university	21	0	1	1	2	1.52	1.26	Rarely
26	Use of world wide web (WWW) to obtain information on the internet	0	0	0	0	25	5.00	0.00	Always
27	Use of University website for information and online access to the university	0	0	21	4	0	3.16	0.37	Sometimes
28	E-library for online access to the university library resources	0	0	24	0	1	3.08	0.40	Sometimes
29	Use of online/eLearning service in the University	0	1	11	13	0	3.48	0.59	Sometimes
30	Use of teleconferencing for interactive communication for lectures, seminars, meetings, etc.	0	0	1	8	16	4.60	0.87	Always
31	Use of telephone (fixed, mobile) service for communication in the university	0	8	11	2	4	3.08	1.04	Sometimes
32	Recorded radio/television broadcast lecture delivery	2	3	19	1	0	2.76	0.66	Sometimes
33	Recorded radio/television broadcast lecture delivery	2	13	10	0	0	2.32	0.63	Rarely
34	Interactive whiteboard in place of chalk board for lecture and presentations	20	0	4	1	0	1.44	0.92	Never

Legend: Always (5) Oftentimes (4) Sometimes (3) Rarely (2) Never (1)

To substantiate the results from the survey, a qualitative data was used. The researchers asked the MISO, the Computer laboratory staff, campus budget officer and chair of the University to describe the condition of the ICT infrastructure of the University. Based on the analysis, the themes which emerged under research question 1 shows in table 4.

Table 4: Themes under delivery status of the Information and Communication Technology (ICT) in the University

Themes	Participants	Verbal transcription
Availability of Hardware and Software	Beng	The common computer in the office we have two (2) one for me and one for the general use "They have their own laptops, almost all of them. Almost everyone has their own laptop, and they only need the computer in the department for internet because the laptop has no internet connection unless they have their own... mobile stick. I do not know what do you call it but essentially, there are no internet connections for the individual laptops for the faculty... provided by the campus, there is none."
	Anthony	"To be honest, we do not have [a] state-of-the-art facility with regard to ICT infrastructure on our campus [un]like other institutions. It is null in term[s] of ICT, both hardware and software. We only have basic resources I believe as regards ICT...networking, software. But as regards ICT, it is very limited in terms of ICT infrastructure"
	Dalisay	"We have an insufficient number of computer units for our 2,000 students. We tend to set batches or partners/groups for every laboratory activity, can you imagine that? This is really hard for the students and instructors"
		"We also lack networking devices. To be honest, we have crimping tools and cable network, tester, but we do not have routers and switches"
		If you look into the computer laboratories and available equipment for [the] students, it is not enough that we have I think, 2,000 students and year by year, the computers in laboratories are decreasing because most are already outdated, not working do not have license".
		"We divide [the responsibilities] to sustain the ICT of the campus. We need more personnel for maintenance. As I remember, as required by the Commission on Higher Education, for every laboratory, there should be 40 to 50 computer"
	Mikay	"My files went missing due to the current condition of the computers – old and do not have license"
Internet connectivity/network	Dalisay	"The laboratories do not have internet connections except for the laboratory room on the 3rd floor. The rest has no internet connection"
	Mikay	"It is hard. There are times that there is a very slow internet connection or it is not available so we tend to use our personal internet data"
		"So, as for the condition of our ICT infrastructure, as stated by our MIS, we do not have that state-of-the-art ICT infrastructure. In terms of internet connection, we have one but sometimes, we cannot avoid it from slowing down that causes problems with the interconnection of the offices"
purchasing and financial process	Mikay	"Purchasing the needed hardware for repairing usually takes a long time"
	Dalisay	"Requests take five years. After five years of waiting, it will be rejected then another request will be made. How can we improve with this process?"
	Anthony	"We are sometimes expecting bidders who do not come as scheduled or delayed bidding process. This needs to be rescheduled which requires you to go to the main campus again to continue the process. Then, in the end, the process will not be successful for reasons that I usually do not know. There are very delayed deliveries. Due to the delay, we cannot be sure if the specifications in the requests are still the trend by the time these arrive yet we cannot complain about this"
	Anthony	"In the library, there is only limited access because they cannot accommodate all of the students [at the same time]. Of course, there is a need for more personnel in maintaining the computers as we currently only have one [technical staff]"
ICT maintenance and repair	Mikay	"I am aware of financial planning, allotment of budget, I understand that part. We cannot get the exact numbers of what we requested due to the limited budget that we need to divide to all programs"
	Dalisay	"In my experience, it is very stressful especially when reports are made one after another .If we can complete that 50, then there will be 250 computes, but who will maintain those? We cannot fully maintain these. This is one of our disappointments; we do not have enough personnel aside from the lack of equipment"

According to the MISO and Computer laboratory staff, the University did not have LAN, CAN, WAN, Cyber café, radios/television broadcast. The Intranet services, on the other hand, were only intended for the selected administrators due to technical limitations. Moreover, the University had only one Interactive whiteboard intended only for priority courses such as multimedia, computer graphics and speech communication which means that not all unit heads were able to use it. In addition, all participants described the status of the ICT infrastructure in the University, common problems such as, limited ICT peripherals, outdated hardware

and software, decreasing number of ICT infrastructure due to hardware failures, unlicensed software and lack of ICT personnel were identified.

In general Given all the narrations of the participants, it was evident that the University failed to comply with the given requirements due to number of reasons and factors. Thus, in relation to ICT hardware and software, system application, database, personnel including the tedious purchasing process and limited budget the University indeed had limited and insufficient ICT resources and it could be further inferred that the current situation of the university may hinder in the delivery of quality instructions. Due to these challenges, the University had difficulty in providing the students with unique educational offerings at all levels, specifically, in their ICT skills development. In this situation, there is a potential to decrease the educators' enthusiasm of incorporating ICT into their teaching and learning. (Bingimlas, 2009).

Support that can be provided by the LGU, NGO, and private sectors to assist the University

Although there is no universal definition for ICT, according to Pratt (2019) "ICT, or information and communications technology (or technologies), is the infrastructure and components that enable modern computing". In addition, across various countries, the usage of ICT has become a significant aspect of educational curricula (Day et al., 2000). Relatively, Dougherty et al. (2002) recognized ICT adoption across the curriculum has the potential to improve learning and productivity. In connection, the support of the different stakeholders in enhancing the ICT infrastructure of the University plays an important role. Research question number 2 inquired "what form of support can be provided by the LGU, NGO and private sector in terms of ICT infrastructure, funding, and services". Referring to the gathered qualitative data from the interview with the different stakeholders of the University, the participants were able to identify the support that they can provide to the ICT infrastructure, services, and funding to assist the University. Table 5 shows the themes emerged under the support that can be provided by the LGU, NGO, and private sectors to assist the University Additional ICT Infrastructure.

Table 5. Themes under support that can be provided by the LGU, NGO, and private sectors to assist the University

Themes	Participants	Verbal transcription
Additional ICT Infrastructure	Raynan	"Mobile computer center can also be procured that can be used to community service projects. Future projects will focus on contributions in ICT infra development of the university"
	Leogine	"LGU can provide free trainings to the faculty and students and donate additional hardware and software to the university"
Providing Additional Services	Leogine	"You reached out and asked me to help you with the internet connection of the campus, so I called PLDT"
	Raynan	"We can provide additional personnel to help you in your extension services"
	Lorgine	"Being one of their linkages in the area, I think, knowledge. Especially, in the technical aspect since we can help them be exposed in real world applications and problems as well as experience and vice versa. we in our company, we can offer additional trainings as regards to different software, we can invite your ICT faculty or even the admin members to see our facilities with regard to the ICT's since most of your graduates po are our employees in our company, we can address the you know I think the actual experiences that your students and faculty members can you know experience in terms of technologies, hardware, software. something like that po"
Support for funding	Raynan	"NGO will continuously provide funding for the ICT extension programs of the campus; and can provide funding in various projects such as ICT infra development. Our organization can offer funding in the improvement of computer networks and internet connectivity of the campus and emphasized "collaboration as regards budgeting, donating etc. will have a good impact"

Additional ICT Infrastructure. Different stakeholders could play an important part in the development of the University. Their continued support to the University could provide excellent chances to improve the University's ICT infrastructure. In addition, this will improve the delivery status of ICT infrastructure of the University. the University's stakeholders were able to discuss what form of support they can provide to assist the University. In general, these stakeholders ca be able to support the university by purchasing additional computer peripherals and donating ICT hardware and software. These forms of support from the NGO, LGU and private sector will be of great assistance to the University, which currently lacks appropriate ICT infrastructure.

Providing additional services. Stakeholders also indicated various types of help that the institution can receive in terms of services. Based on transcripts, the additional personnel to support extension services, faculty and students' trainings, immersion and employment emerged.

Support for funding. Since, the University is a public institution, one of the obstacles in improving and developing its ICT infrastructure was the lack of funding. Stakeholders described their assistance in terms of funding in providing additional financing for ICT extension programs and other projects, as well as support for computer network and internet connectivity improvements and additional ICT facilities. The involvement of all stakeholders plays an important role; with everyone's help, the University will be able to improve and provide enough ICT

infrastructure to their students. This finding was also in line with the idea that the public-private partnership is a feasible method for improving educational innovations (David, 2002). This indicates that the digital empowerment will be achieved if the University has adequate ICT infrastructure, including technical supports that can maintain the ICT resources. In connection, schools must ensure that all students have equitable access to ICT devices for learning (UNESCO's International Institute for Educational Planning, 2019). With the mentioned support to be offered by the LGU, NGO, and private sectors, it has made a clear picture on how eager and very willing these organizations and sectors were to support the University and to provide its needs.

Factors influencing LGU, NGO, and private sectors to assist the university

According to Seale (2006), some stakeholders tend to rely on others to take the lead in influencing change in accessibility and digital inclusion practices. In addition, in the development of the ICT infrastructure in the University commitment of the stakeholders are vital. In connection, stakeholders are important because they can take on leadership roles or provide ideas, thoughts, and viewpoints (Warsi, 2018). From the interview, under research question 3, the theme of stakeholder's motivation developed (table 6).

Table 6. Theme under Factors influencing LGU, NGO, and private sectors to assist the university

Themes	Participants	Verbal transcription
Research and Extension services	Leogine	"one of these is the ICT infrastructure development which can cater not only the students of the university but also the stakeholders of extension projects"
		"More on research on government processes para yun ang unang ifocus ng mga professors, ng mga studyante kasi sa ngayon dahil sa pandemic, kita mo naman online, so dyan siguro dapat magkaroon ng shift, dimension with regards to research and studies and thesis para matulungan yung Local Government Unit"
		"As we all know, we are also into community services. So, if the university has these extension services or community services, it will be an opportunity for us to be able to collaborate with them". "The hiring process will be easy ... Something to do with enrollment to employment collaboration"
Job opportunities/skills development	Lorgine	"We can give you immersion, then you know ... they can actual experience ... your students and faculty members can experience in terms of technologies, hardware, software"
	Leogine	"We as local government can provide some free trainings. Also, we can donate some hardware and software ... as far as I know may mga parang projects na talagang pinopondohan ng Local Chief Executive in terms of IT naman"
Quality education	Leogine	"if we will support them [University], the community will benefit, Also, Ma'am, with our social responsibility, I believe that if we have a strong educational background, there will also be a strong community especially in the ICT"
	Raynan	"our organization can offer funding in the improvement of computer networks and internet connectivity of the University". He further added, "we as NGO can provide funding in various projects such as ICT infra development"

Accordingly, the participants shared their opinions regarding the impact or benefits that they will gain wherein these benefits were observed to influence them in supporting and improving the delivery of ICT infrastructure in the University.

Leogine emphasized that the University should focus on ICT research and extension including transaction processing systems to help the Local Government Unit. Secondly, Raynan, representative of the NGO, pointed out that collaboration with the University is an opportunity for their organization. Lastly, Lorgine highlighted that the hiring process in their organization will be easy.

In terms of ICT infrastructure, the participants described the benefits their organization will gain in assisting the university. These benefits influenced these participants to continuously support the delivery of ICT infrastructure in the university. Participant from the LGU emphasized that since the university is located near the LGU, assisting the university in the delivery of ICT infrastructure will benefit the community.

Relative to services, the participants described those collaborative practices which will create a good impact in the relationship of the university and the stakeholders. They will further improve the services that the university and the stakeholders can provide to the community. Moreover, the stakeholders highlighted that they could provide free trainings for the ICT skill development of the faculty and students at the University which will further lead to the creation of 'enrollment to employment' projects. Relative to the project, it was noted that the hiring processes will be easy because the graduates of the university will be highly equipped in the utilization of ICT technologies. Lastly, the stakeholders pointed out that additional funding can be given to support the ICT projects or ICT initiatives of the University to sustain its quality education.

According to Lorgine, "*We can give you immersion, then you know … they can actual experience … your students and faculty members can experience in terms of technologies, hardware, software*" With the statement, these training services will enhance the skills of the faculty and students in the utilization of ICT technologies. She also mentioned that some of the graduates from University are currently employed in their company. That is, she wanted to establish collaboration with employment process because they will be benefitted from it. She mentioned, "*The hiring process will be easy … Something to do with enrollment to employment collaboration*". Likewise, she emphasized that if both organizations [university and their company] continue working together, they can be able to provide IT programs in terms of livelihood and job experiences which can further enhance the quality of education in the university and eventually help the community. Furthermore, Raynan emphasized that the professors and students should focus on research regarding government processes to be able to help the Local Government Unit. In connection to the delivery and utilization of the ICT

infrastructures, the participants were able to describe their experiences more particularly when collaborating with the University. They acknowledged that the University had limited budget for ICT improvement. Hence, to assist the University in addressing their financial concerns, the participants exemplified their willingness to extend help and support. According to Raynan, the University can help them to meet their organizational goal through extension services, specifically, by providing additional funds in ICT infrastructure development. Meanwhile, Lorgine indicated that their company was willing to extend help by conducting free trainings to the faculty and students.

In the discussion with the stakeholders, it was highlighted that they were aware of the infrastructure concerns of the University and that they were willing to assist in its limitation in ICT infrastructure development. According to Jiya (2019), engaging a variety of stakeholders helps to obtain information and foster varied ideas on how to tackle specific societal problems and how to act to alleviate them. Specifically, the help to be given included acquiring of additional hardware, software, and equipment including mobile computers, and improving internet connectivity which will allow to strengthen the collaboration of the University and the stakeholders through research and extension. It was suggested that the government should enlist the help of the corporate sector and international contributors to donate ICT equipment (Titus, 2020).

To summarize, these stakeholders were influenced to assist the University in the ICT infrastructure delivery because the University was helping them to achieve their goals as well as because they would be helping the University to deliver quality education, specifically in ICT, to strengthen the community towards digital empowerment.

Strategies, Processes, and Frameworks that the LGU, NGO, Private Sector, and the University can adopt to Sustain Digital Empowerment

Improving the University's ICT infrastructure was frequently backed by a variety of grants and programs, thus securing such assistance was critical. The best argument in favor of delivering ICT infrastructure in the University was the stakeholders' commitment and support including strategies, process, and frameworks.

Based on the gathered data, it was evident that the University had a problem in delivering ICT infrastructure. Moreover, this section attempts to address the research question 4 in which the theme strategies emerged

Lorgine emphasized, "*If both university and our company continue working together, we can also provide as many IT programs as possible that can help the community in terms of livelihood, job experience and other things*"

What Leogine stated that "*nationalization of partnership, memorandum of agreements with LGU, resolution supporting the state university then industry partnership*" was agreed upon by Raynan saying, "*Formalizing the partnership thru MOA and maintaining good communication between the two organizations…. Transparency in utilizing funds is also one of the factors in strengthening our partnership"*

This section is divided into three parts: first is the strategies needed in the delivery of ICT infrastructure by strengthening the relationship between the university and the stakeholders through collaboration; second is the process of additional procurement of ICT infrastructure and other resources coming from the stakeholders; and the third is the design of a framework that would sustain digital empowerment that will be both beneficial to the University and to the stakeholders.

Strategies. It is important for a university to embody digital empowerment, to intensify ICT initiatives, and to ensure quality of education and delivery of knowledge to the 21st century learners that will be relevant to both the university and the community. Thus, a continuous and strong collaboration between the university and the stakeholders should be established. Based on the interview, to strategically support the delivery of the ICT infrastructure, it is essential that there is a strong background in ICT so that communities will be confident and encouraged to participate in all the projects offered by the University. Figure 2 shows the strategies that can be adopted by the University and stakeholders to sustain digital empowerment. The central idea is the collaboration among the University, LGU, NGO and private sector. These entities should work together to achieve a goal towards digital empowerment. The central idea had three key strategies: The Policy alignment, Research and Extension, and Partnership that need to be executed to achieve shared outcome.

Policy alignment. The University needs to articulate its quality policy, vision, mission goals and objectives to encourage the stakeholders to be actively involved in its ICT programs and activities. Moreover, the University should allow the stakeholders to participate in developing ICT-based policy, according to Ruben Vanderlinde, Johan van Braak, Sara Dexter (2012). Vision development, budgetary policy, infrastructural policy, continuous professional development policy, and curriculum policy are some of the policy domains that make up ICT policy.

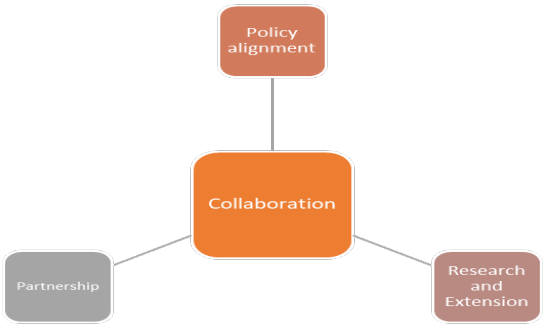

Figure 2. Strategies that can be adopted by the University and the stakeholders

Research and Extension. ICT research and extension activities should be collaboratively conducted by the University and stakeholders in the development of technology programs through technology transfer and technology consultancy. This will generate ICT resources needed by the University in the implementation of the programs. In return, programs and projects, inventions that the university will develop, and design will be transferred to the stakeholders. Moreover, sharing ideas, expertise and knowledge through technology consultancy are also included.

Partnership. According to Shubber (2008), beneficial partnerships can be mutually built by the HEIs that tap into each party's expertise and experience by Sharing ICT resources and best practices such as immersion and job placement activities. Furthermore, dialogue in formulating scalable funding mechanism from the stakeholders to support ICT infrastructure delivery in the university is recommended.

Process. It was clearly stated that the University had been experiencing a problem in terms of the procurement of ICT infrastructures and resources. As mentioned, issues such as disapproval of purchase request, budget allocation, and failure in the bidding process make the overall acquisition process slow. Thus, it was highly recommended to tap the support of the stakeholders to generate additional funds as an alternative support in ICT infrastructure delivery in the University.

Participants agreed that having a strong and sustainable collaboration with the University will have a strong impact to the community. With enough and sufficient resources and support, activities will be easily facilitated and conducted, and all the parties involved will gain confidence and will be encouraged to conduct more projects and produce more output.

Framework. Based on the gathered data, it was evident that there were problems regarding ICT infrastructure delivery in the University, specifically, in the acquisition process and financial availability. Hence, a sustainable collaboration with the LGU, NGO and private sector could play a vital role towards digital development. In connection to this, Figure 3 shows the proposed Stakeholders Collaborative Framework (SCF) that can be adopted by the University and the stakeholders in the delivery, support, and influence ICT infrastructure towards digital empowerment.

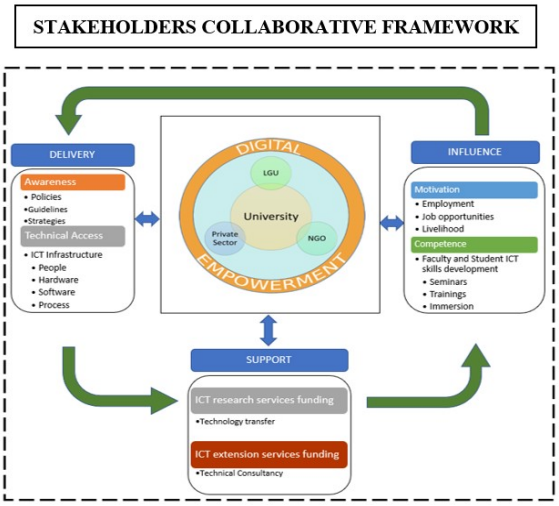

Figure 3. Proposed Stakeholders Collaborative Framework (SCF)

Collaborative efforts should be established by the University, LGU, NGO and private sector to address the problem of the University in ICT infrastructure delivery towards digital empowerment which is the central idea of the framework. SCF has three major pre-requisites, the Delivery, Support, and Influence.

Delivery. The Awareness and Technical Access subcomponents of this pre-requisite are both required. Under Awareness, the institution must identify quality policies, guidelines, and strategies to encourage stakeholders to participate actively in the University's ICT Infrastructure status, programs, and activities. While under Technical Access, the current ICT infrastructure is being improved through ICT-based policies.

Support. The acquisition and financial aspects had been identified as the main problems in delivering ICT infrastructure in the University. As suggested, through the collaboration of government and private sector to donate ICT equipment (Titus,2020), the limitations in the University's ICT funds and finance will be addressed. This pre-requisite is important to establish and implement actions indicated in the Delivery phase. Through the financial assistance of the stakeholders in the ICT research and extension programs of the University, this support will be able

to address its limitation in the delivery of ICT infrastructure. Moreover, the outcomes of the research and extension programs in the form of technology transfer and technical consultancy will increase the generation of ICT resources needed by the University in the implementation of the programs. In addition, through ICT research and extension activities, external finance and potential linkages will be attracted to help the University in investing in their ICT infrastructure.

Influence. This pre-requisite has two components, the Motivation and Competence. Motivation is a process that initiates, guides, and maintains goal-orientation behaviors. This prerequisite does not just stimulate behaviors as it also involves the factors that dictate and maintain our goal-oriented actions. Thus, the result of motivation is that people will have reasons to do things that they do based on their behaviors. There are many factors to consider and reasons why people are getting motivated either in employment, job opportunities and livelihood programs. Competence involves the involvement of people in trainings, workshops, and any activities that would increase their level of knowledge and capabilities specifically in ICT skills development. These factors influence the stakeholders to establish collaboration in the delivery of ICT infrastructure.
The integration of these major pre-requisites will help build strong partnership among the University and its stakeholders. This will be able to sustain the delivery of ICT infrastructure of the University leading to digital empowered community.

CONCLUSION

As stated, the university's mission is to produce globally competitive and morally upright individuals. Improving the ICT infrastructure is one of the priorities. This is to provide excellent, equitable educational opportunities through quality instruction. However, due to limited resources and budget, these issues delay the improvement of ICT infrastructure towards digital empowerment as this is relevant to changes. The study was based on the philosophical assumption that having a strong and established ICT infrastructure together with the support of the different stakeholders will lead to digital empowerment. In connection, the study draws in the pragmatism paradigm. According to Onwuegbuzie et al. (2009), a combination of subjective and objective techniques can arrive at reality in various or multiple ways.

Assumptions. This study was influenced by the philosophical view of pragmatism. According to Morgan (2014), pragmatism asks the researcher to focus on the two different approaches to inquiry. These are objectivity (positivist) and subjectivity (constructively) since the pragmatic paradigm has emerged as one of the underlying philosophical frameworks for some advocates of mixed methods research (Morgan, 2007; Teddlie & Tashakkori, 2009). Below are the related assumptions used in the pragmatism paradigm on the ontological and epistemological view.

Ontology. Based on the ICT infrastructure inventory and the continuously increasing number of enrollees with a limited budget, it was assumed that improving the ICT infrastructure of the University leading to digital empowerment was not enough. Hence, the study aimed to identify whether the status of the ICT infrastructure was aligned with the minimum standard of laboratory facilities and equipment based on the CHED memorandum order and the form of support that can be provided by the LGU, NGO and private sector. It also aimed to identify the stakeholders' influence to assist the University in terms of improving the ICT infrastructure. A quantitative approach was needed to assess the delivery status of ICT infrastructure in the University while a qualitative approach was needed to encourage stakeholders to describe their experiences, ideas, and opinion in delivering and influencing ICT infrastructure. From this ontological perspective, the focus of the study was not only the delivery and improvement of the ICT infrastructure in the university itself but also the relationship between the university and other stakeholders in terms of delivering, influencing and supporting digital empowerment in the university.

Epistemology. Pragmatists believe that knowledge is always based on experience. Each person's knowledge is unique because it is based on their experiences. It is constructed to manage one's existence better and take part in the world (Goldkuhl, 2012). In this study, the knowledge lies within the different stakeholders of the university. Therefore, to assess stakeholder perceptions of digital empowerment, the participants were free to express their own opinions, knowledge, and experiences in delivering, influencing, and supporting digital empowerment in the university. This knowledge was needed to be interpreted to describe the underlying significance of actions and events.

In addition, Findings from the analyzed data that were collected from the different standpoints of the participants were used to obtain the conclusions. In general, the ICT infrastructure condition of the University is insufficient. Some issues raised included lack of technical support, degrading and outdated ICT peripherals, and slow internet connectivity. The proposed Stakeholders Collaboration Framework can help the university to deliver a quality ICT infrastructure which will allow the learners to keep up with the demand of the 21st century skills. It was

evident that a strong relationship with LGU, NGO, and private sector will help the University in improving their ICT infrastructure. Based on the findings, through research collaboration, the stakeholders could encourage the faculty and students in the University to produce ICT researches that will be useful and beneficial to the community, in the form of information systems, transaction processing systems, etc. through technology transfer. In return, the stakeholders will assist the niversity in the acquisition of hardware and software applications that they will be needing to develop these systems. In addition, collaboration through extension services will open opportunities to improve the delivery of ICT infrastructure in the University. Hence, the University can help the stakeholders by conducting extension services to the community and vice versa, and in return, the stakeholders can support the university in providing additional ICT infrastructure to support ICT-related extension services. Lastly, through collaboration, stakeholders can provide free trainings for ICT skills development to enhance their knowledge in connection to the real-world application of ICT. All of these, with the balance of sufficiency, support, and impact, will definitely create significant impact not only for both the University and the stakeholders but also in building a digitally empowered community.

Recommendation

Given the fast-changing nature of ICT development in different institutions aside from the process of delivering ICT, it would be advantageous to examine the capacity of the administrators to build digitally empowered environment in the forms of management and leadership.It is also helpful to include the ICT experiences of the graduates and former professors from the university and their experiences in their current employment to be able to add more data and value in relation to sufficiency and support themes. For the influence theme, a qualitative assessment on the ability and skills of the students and professors in ICT is needed. Lastly, it may be more efficient to include a policy maker to capture the qualitative insights of this kind of study.

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