

Influence of Technology Advancement on the Control of Covid-19 Pandemic

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Abstract:- All over the world, a human being cannot live without beliefs. Since December 2019, the Covid-19 pandemic prevented people from practicing their religion in synagogues to prevent its spread. People used ICT to keep their relationships with their God. This study assessed the use of ICT in RPAG churches during Covid-19 pandemic in the city of Kigali. Both primary and secondary data were used. Primary data were gathered through a questionnaire. Purposive sampling was used to collect data. Data analysis used descriptive statistics and inferential statistics like chi square and correlation. Financial problems, insufficient ICT infrastructure, lack of ICT skills towards Church members, poor conception of ICT policy and ineffective use of ICT in Church administration were identified as main challenges RPAG churches are facing. As solutions, 97% suggest providing support to disadvantaged believers. 98.9% want church leaders to invest in ICT infrastructures. 98% believe that training church members in the use of certain ICT programs should be a good solution. 98.9% of respondents think that setting up ICT policy within the church might be a helpful solution. The researcher recommends the government of Rwanda to encourage faith-based organizations to put much effort in the use of ICT but also churches must invest in ICT and train their followers in the use of technologies.

Keywords:- Technology Advancement, Pandemic, Covid-19 Pandemic.

I. INTRODUCTION

People are unable to live without faith or religion. Religion is a set of beliefs that includes the freedom to worship an unseen, higher force. According to Tutorials point (2021), religion plays a significant role in defining one's cultural identity. Religion is important in creating our connection to the supernatural and building the sense that there is a higher power that regulates our daily life. As a result, the spiritual relationship is formed through the elements of prayer, chants, hymns, and so forth.

Faith-based organizations (FBOs) have full freedom to perform their acts of worship when they are not in violation of laws governing their formation. Except in unusual situations such as war, the Genocide against the Tutsi in April 1994, or other extraordinary events that could risk the lives of civilians, worship has never been interrupted in Rwanda. However, coronavirus disease stopped all services from churches. World Health Organization (WHO) refers to the virus as Covid-19, which has challenged global society on the level of

preparedness to mitigate the effects of the virus on the quality of life of patients affected.

As all countries suffered economically, churches and ministries were seriously facing a big challenge of continuing their main activities (preaching Gospel, praise worship, etc) as gathering and movements outside the home was banned and almost all activities were no longer running.

The Government of Rwanda decided in March 2020 to close the doors of churches and mosques in the country to prevent the spread of the covid-19 pandemic among the Rwandan population. According to Vincent (2020) during lockdown there have been no baptisms, Holy Communion, or confirmation, no weddings or pre-burials service (Vincent, 2020). People who do not attend church service have their own attitudes and most of the time behave badly towards society. They drink too much, they like drugs, they steal from other citizens, and they are violent. In short, they are a source of insecurity in the country. On the other hand, those who attend church service and are born again have good qualities. Pagans change their characters as they confess and repent their sin after they have heard the word of God through preaching and sermons via different means like radio, television, internet, etc because of technology. Information technology (IT) is crucial in our lives because it makes it easier to manage the constantly changing circumstances we face. There are several techniques available in technology to promote development and information exchange. Many scholars showed how IT played a significant role in solving issues of normal life especially in difficult situations like Covid-19.

The church's mission is to bring people of diverse backgrounds and talents together and give them training and opportunity to participate in God's work. Churches help citizens to leave their immoral behavior behind and become good people through salvation. People might unload their spiritual problems at church services, Bible studies, and prayer gatherings, which are popular forms of Christian fellowship.

The study conducted by Tabei et al. (2016) found that spirituality and religious views are believed to be beneficial for maintaining physical and mental health. The rise of Covid-19 which led to global catastrophe has blurred the way Christians communicate with their Creator.

The covid-19 pushed governments to take serious measures including closure of church doors to prevent its spread among people. All churches worldwide faced

extraordinary difficulties conducting their regular activities as a result of the COVID-19 outbreak. Church members were no longer able to socialize with one another and pastors were unable to perform their pastoral duties as a result of the closing of churches and other public spaces. The alternative option was to use technology and switch to online services to maintain fellowship among their followers.

IT infrastructures, digital devices and technical support are essential to pilot online religious services. Church members must be ready to use technology and must have digital literacy skills to respond to calls from their church leaders through technological means. Followers should have sufficient financial capacity to obtain resources such as gadgets, airtime, internet, and so forth, to interact in a timely manner with church leaders.

In addition, Christians should get support in case of issues like hardware malfunction, software failure and so on. It is against this background that this study investigated Influence of Technology Advancement on The Control of Pandemic by Churches of RPAG during lockdown restriction due to Covid-19 pandemic.

➤ *Hypotheses*

H0: ICT infrastructures do not have a significant influence on the control of the covid-19 pandemic.

H1: ICT infrastructures have a significant influence on the control of the covid-19 pandemic.

H0: Digital device does not have a significant influence on the control of the covid-19 pandemic.

H1: Digital device has a significant influence on the control of the covid-19 pandemic.

II. LITERATURE REVIEW

The infrastructure and components that enable modern computing are referred to as ICT, or Technologies. Despite the very fact that there is no single universal definition of ICT, it's widely understood to encompass all devices, networking components, applications, and systems that allow individuals and businesses to interact within the digital world (K.Pratt, 2019).

A. *Pandemic*

A pandemic is the global spread of a newly discovered illness. The respiratory viral illnesses with the highest chance of becoming a pandemic include those brought on by the novel influenza virus and the coronavirus covid-19 (Healthdirect, 2022).

B. *Covid-19 pandemic*

A novel coronavirus named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2; formerly known as 2019-nCoV), which was originally discovered during an outbreak of respiratory sickness cases in Wuhan City, Hubei Province, China, is known as coronavirus disease 2019 (Cennimo, 2022).

C. *Technology in spreading the Gospel*

In the New Testament, technology was employed to spread the gospel a long time ago (Obi-Ani, Anikwenze, and Isiani, 2020). According to Wise (2014) as cited in Animante et al., (2021), the ink and scroll that the apostle Paul and others used to spread the gospel were believed to be innovative technologies at the time. Martin Luther employed advanced technology of the time, the printing press, to produce and distribute the "Luther Bible" during the Protestant Reformation (Animante , Darko-Adjei , & Akussah, 2021, p. 2). In a technologically advanced environment, pastors, evangelists, gospel teachers, and missionaries have used social media platforms to proclaim the gospel." (White & Niemandt, 2015).

According to Kasule (2013) as cited in Animante et al., (2021) in the life of the church and the dissemination of the gospel, social media is extremely essential. Social media has the virtue of being rapid. It is non-restrictive, non-hierarchical, and non-pretentious to use social media to spread the gospel said Adebowale, (2020) as cited in Animante et al., (2021). Some churches have started using ICT. Ghanaian churches, particularly charismatic groups, have made extensive use of social media channels to carry out their church operations (White, Tella & Ampofo, 2016 as cited in Animante et al., 2021, p.3).

D. *Technology and pandemic*

The extent to which people's use of the internet has changed, as well as their feelings of how useful technology has been to them, are revealed by the findings of a new Pew Research Center study of American adults conducted April 12–18, 2021. According to the survey, most respondents (90%) feel that the internet has been at least somewhat important to them personally during the pandemic. Many Americans (81%) also claim to have engaged in video calls with others at some point since the start of the outbreak (Prince, 2022).

E. *ICT and churches*

Kumar (1995) emphasized the scope of the information technology (IT) revolution, claiming that no area on the world will remain unaffected (Kumar & Kar, 1995).

According to Ukodie (2004), Information and communication technology has shown itself and has been recognized as the motor of the twenty-first century and beyond (Ukodi, 2004). The extraordinary advancements in information and communication technologies are having a significant impact on all aspects of human life (Brakel, & Chisenga , 2003). Technology has aided the spread of Christianity throughout history. According to Pautler (2010), Gutenberg invented the printing press in 1436, which revolutionized Bible distribution (Pautler, 2010). The use of ICT in churches is crucial as it helps them communicate and be communicated (DIARY, 2016).

F. ICT in churches during Covid-19 pandemic

WHO (2020) recommended religious leaders and faith-based communities to employ ICT during the COVID-19 pandemic in their article "Practical considerations and recommendations for religious leaders and faith-based communities in the context of Covid-19. They urged religious leaders to recall that they are crucial community role models for promoting WHO's anti-covid-19 principles and showing how communities may still stay connected by doing faith activities remotely/virtually. Team, 2020).

Dare (2020) believed that Church leaders had to enhance their technology in order to reach members. Churches are turning to internet services as regular face-to-face contact is limited for many congregations because of the pandemic (Dare, 2020). According to Miller (2020), Pastor Dave Minton of Capital Christian Centre said, "We're going to keep preaching the gospel because it's needed now more than ever". They're presenting daily Facebook devotionals, offering kids' teachings, and encouraging people to start their own home church through a livestreaming session. More individuals are connecting online than ever before, according to Rice. "Prior to COVID-19, we averaged about 1,200 online viewers a week. We're currently running at about 20,000 to 25,000 viewers a week," she said (Miller, 2020).

G. Conceptual framework

This conceptual framework shows how the ICT infrastructures, digital devices and technical support are related to the control of the pandemic by churches in the city of Kigali.

Technology advancement (iv) Control of Covid-19 pandemic (dv)

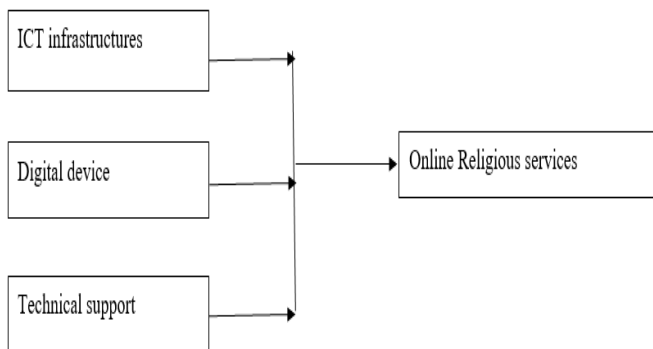


Fig 1: Conceptual framework (Source: Researcher's drawing)

III. RESEARCH METHODOLOGY

Correlational Research Design was used to find out the relationship between variables. Experimental research design helped to investigate the interaction between independent and dependent variables (DV&IV), to figure out a cause-and-effect relationship. The following table shows the target population.

Table1: Composition of the target population

S/N	Church	Number of	Proportion%
1	Gatsata	1000	24
2	Kimihurura	850	21
3	Nyamirambo	1000	24
4	Rwarutabura	500	12
5	Mageragere	300	7
6	Kanombe	500	12
Total		4150	100

The purposive sampling which is classified under non-probability sampling techniques were adopted based on members who were able to read/write, understand the context of Technology, and services offered in the church. The sample size was 365 but was reduced to 200 Christians, due to time and financial resources constraints.

Primary Data were collected in the form of survey using questionnaires, chosen due to their high response rate. Data analysis was done using Scientific Package for Social Sciences (SPSS). Regarding ethical considerations, a letter from UOK was given to the legal representative of RPAG to get access to churches under their leadership. The questionnaire was distributed only to those who are willing to provide information voluntarily and participants were assured of confidentiality and privacy to any information they give.

IV. FINDINGS

Out of 200 questionnaires distributed, 187 questionnaires were collected with a response rate of 93.5%. The distribution of respondents following age group and sex is shown on the figure 2 below.

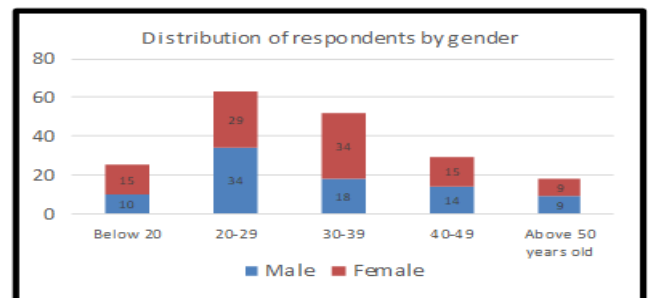


Fig 2: Distribution by gender and Age group

Women make up 55% of the population against 45% for men. Most respondents are between 20 and 29 years old. Another age group that comes in second place is made up of respondents between the ages of 30 and 39 being 28%.

❖ Data analysis for objectives

For assessing objectives, the researcher did tests using different models. Inferential statistics were used for making Hypothesis testing and finding relationship between variables.

A. Correlation Analysis Technique

The researcher tested the correlation to investigate an association between variables using nonparametric correlation and the output is shown in the following table.

Table 2: Correlations

		ICT_INFRASTRAS TR	DIGITAL_ DEVICE	TECHNICAL_ SUPPORT	COVID_C ONTROL	controlling_ variable	
Spear man's rho	ICT_INFRASTRAS TR	Correlation Coefficient	1.000	.616**	.396**	.527**	.030
		Sig. (2-tailed)	.	.000	.000	.000	.685
		N	187	187	187	187	187
	DIGITAL_DEVICE	Correlation Coefficient	.616**	1.000	.645**	.789**	-.003
		Sig. (2-tailed)	.000	.	.000	.000	.971
		N	187	187	187	187	187
TECHNICAL_SUPPORT		Correlation Coefficient	.396**	.645**	1.000	.800**	.052
		Sig. (2-tailed)	.000	.000	.	.000	.480
		N	187	187	187	187	187
COVID_CONTROL		Correlation Coefficient	.527**	.789**	.800**	1.000	-.086
		Sig. (2-tailed)	.000	.000	.000	.	.244
		N	187	187	187	187	187
controlling_variable		Correlation Coefficient	.030	-.003	.052	-.086	1.000
		Sig. (2-tailed)	.685	.971	.480	.244	.
		N	187	187	187	187	187

** . Correlation is significant at the 0.01 level (2-tailed).

Source: Primary Data

Objective1: To examine how ICT infrastructures affect churches on the control of the covid-19 pandemic. ICT_INFRASTRAS TR (IV) posted a relationship of 0.527(52.7%) into COVID_CONTROL (DV) with positive significant of a value of 0.000 since it's less than 0.05

Objective 2: To investigate the effect of digital device on churches in controlling covid-19 pandemic DIGITAL_DEVICE (IV) posted a relationship of .789 (78.9%) into COVID_CONTROL (DV) with positive significant of a value of 0.000 since it's less than 0.05

Objective 3 To find out how technical support affects churches in controlling covid-19 pandemic. TECHNICAL_SUPPORT (IV) posted a relationship of .800 (80%) into COVID_CONTROL (DV) with positive significant of a value of 0.000 since it's less than 0.05.

The researcher analyzed variables to see if they can be reduced into few components or factors which explain the relationship among variables. To achieve this, the researcher did factor analysis or principal component analysis.

The Kaiser-Meyer-Olkin (KMO) test was used to assess the sampling quality of data that will be used in factor analysis. Test result for KMO was .733 and it is a good sign for Factor Analysis process. The anti-image matrices that depend on the decomposition of the two variances to decide whether or not specific variables should be included in the factor analysis was used. By doing so, the variance component of one variable that can be explained by the other variables (image) is associated with the unexplainable variance component (anti image). The anti-image is the part of the variable that cannot be predicted. If the values of the anti-image matrix come out to be low, the variables are right to include in the factor analysis.

Table 3: Anti-image Matrices

		ICT_INFRASTRAS TR	DIGITAL_ DEVICE	TECHNICAL_ SUPPORT	COVID_C ONTROL	Controlling_ variable
Anti-image Covariance	ICT_INFRASTRAS TR	.572	-.158	-.011	-.012	-.079
	DIGITAL_DEVICE	-.158	.274	.011	-.133	-.010
	TECHNICAL_SUPPORT	-.011	.011	.332	-.161	-.103
	COVID_CONTROL	-.012	-.133	-.161	.192	.081
	Controlling_variable	-.079	-.010	-.103	.081	.946
Anti-image Correlation	ICT_INFRASTRAS TR	.846 ^a	-.399	-.026	-.035	-.107
	DIGITAL_DEVICE	-.399	.754 ^a	.036	-.581	-.020
	TECHNICAL_SUPPORT	-.026	.036	.747 ^a	-.638	-.184
	COVID_CONTROL	-.035	-.581	-.638	.677 ^a	.190
	Controlling_variable	-.107	-.020	-.184	.190	.136 ^a

a. Measures of Sampling Adequacy (MSA)

Source: Primary Data

B. Factor Analysis Technique

For objective one, results indicate that the diagonal of the anti-image correlation matrix as per KMO of the sampling adequacy for ICT_INFRASTR as a variable had (.846) which was done by a technique known as MSA. Based on the fact that a factor analysis can be performed on raw data if the KMO is greater than .60, in this case, the anti-image correlation values for .846 (ICT_INFRASTR) hence it is above the threshold indicating its loading was strong.

For objective two, results indicate that the diagonal of the anti-image correlation matrix as per KMO of the sampling adequacy for DIGITAL_DEVICE as a variable had (.754) which was done by a technique known as MSA. Based on the fact that a factor analysis can be performed on raw data if the KMO is greater than .60, in this case, the anti-image correlation values for .754 (DIGITAL_DEVICE) hence it is above the threshold indicating its loading was strong.

For objective three results indicate that the diagonal of the anti-image correlation matrix as per KMO of the sampling adequacy for TECHNICAL_SUPPORT as a variable had (.638) which was done by a technique known as MSA. Based on the fact that a factor analysis can be performed on raw data if the KMO is greater than .60, in this case, the anti-image correlation values for .638 (TECHNICAL_SUPPORT) hence it is above the threshold indicating its loading was strong.

C. Determining the factor values and rotation

The magnitude of factor loadings was calculated after identifying the number of factors and their extraction (correlations between the variables being tested and the factors). The example data's factor loadings are depicted in the following figure.

Fig 3: Component Matrix

	Component	
	1	2
COVID_CONTROL	.931	
DIGITAL_DEVICE	.910	
TECHNICAL_SUPPORT	.855	
ICT_INFRASTR	.755	
Controlling_variable		.995

Extraction Method: Principal Component Analysis.
a. 2 components extracted.

Unrotated factor loadings **Source: Primary Data**

➤ **Factor 1**

After rotation results for COVID_CONTROL showed a strong factor loading of (.931), this signifies that that factor has a strong loading in respect to its Contributors (IV), this was achieved by Principal Component Analysis (PCA) technique, hence this study confirms that it relates well with other variables.

➤ **Factor 2**

Finding on Digital Device gave a strong factor loading of (.910), this signifies that the factor has a strong loading in respect towards the DV as shown by PCA technique, hence this study confirms that it relates well with other variables.

➤ **Factor 3**

Finding on TECHNICAL_SUPPORT gave a strong factor loading of (.855), this signifies that the factor has a strong loading in respect towards the DV as shown by Principal Component Analysis technique, hence this study confirms that it relates well with other variables.

➤ **Factor 4**

COVID_CONTROL indicated a strong factor loading of (.931), this signifies that that factor has a strong loading in respect to its Contributor (IV), this was achieved by PCA technique, hence this study confirms that it relates well with other variables.

➤ **Factor 5**

Controlling_variable indicated a strong factor loading of (.955), this signifies that that factor has a strong loading in respect to its Contributor (IV), this was achieved by PCA technique, hence this study confirms that it relates well with other variables.

D. Chi-square test of independence

The chi-square test helps to compare actual outcomes with predictions. Chi-square test was performed, and output is shown in the following table.

Table 5: Test Statistics

	ICT_INFRASTR	DIGITAL_DEVICE	TECHNICAL_SUPPORT	COVID_CONTROL	Controlling_variable
Chi-Square	133.053 ^a	341.824 ^b	79.187 ^c	208.005 ^d	243.749 ^e
df	17	21	12	25	9
Asymp. Sig.	.000	.000	.000	.000	.000

Chi-square goodness of fit test

Source: Primary Data

➤ *Objective 1: ICT_INFRASTRATR*

The result in the above table shows that ICT_INFRASTRATR had Chi= 133.053, p-value is .0000 which is less than .05. This means that p-value is statistically significant, and the researcher rejected the null hypothesis Ho1.

➤ *Objective 2: DIGITAL_DEVICE*

The result in the above table indicates that DIGITAL_DEVICE had Chi= 341.824, p-value is .0000 which is less than .05. This means that p-value is statistically significant, and the researcher rejected the null hypothesis Ho2.

➤ *Objective 3: TECHNICAL_SUPPORT*

The result in the above table indicates that TECHNICAL_SUPPORT had Chi= 79.187, p-value is .0000 which is less than .05. This means that p-value is statistically significant, and the researcher rejected the null hypothesis Ho3.

V. CONCLUSION AND RECOMMENDATIONS

➤ *Conclusion*

The rise of COVID-19 which led to global catastrophe has blurred the way Christians communicate with their God through God servants. Some of Church leaders used technology advancement to keep regular communication with their followers as a result of the closure of church doors in order to mitigate the spread of covid-19 among population.

The findings of the study showed that ICT infrastructure, digital device and technical support play an important role in conducting online religious services.

However, followers face a number of issues to benefit from online services like financial ability, IT skills and others. This study revealed that church administrations have a long way to go to invest in IT and prepare their congregants through IT training but also to help them financially to obtain digital devices for the success of online religious services.

➤ *Recommendations*

The government of Rwanda should encourage faith-based organizations to put much effort in training their followers in the use of information technology.

RPAG must put in place a clear policy governing the use of ICT in local churches as some of them use ICT while others don't.

Local churches must put in place an ICT policy that governs the use of ICT in church administration and all daily church operations, set up a fundraising strategy among church members to get all the necessary computer equipment and organize regular IT training among church members.

➤ *Areas for further research*

The sample size of 200 Christians in RPAG is very small compared to the composition of church members of RPAG churches. The researcher could not extend the scope of the study due to constraints of time, finance and human

resources. This opens doors to other deep studies for students and researchers to evaluate to which extent churches use ICT and analyze the difficulties and challenges they face, especially those of which operate in rural area.

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