An Empirical Analysis on Optimizing Video Conferencing Tools for Virtual Collaborations: Perspectives of Researchers in Nigerian Library Schools

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Abstract
The study explored researchers' perspectives on optimizing video conferencing tools (VCTs) for virtual collaborations. The study was limited to lecturers in Nigerian library schools, and the findings are expected to apply to other researchers as well. Respondents were gathered from several library schools across Nigeria's six geographical zones. Among the library schools are the University of Ilorin, the University of Ibadan, the University of Nigeria, Ahmadu Bello University, the University of Maiduguri, and the University of Calabar. A mixed-method approach was used to gather information from ninety-eight respondents. The total enumeration sampling technique was adopted, using a questionnaire distributed via Google Form. According to the findings of this study, researchers in Nigerian library schools are increasingly using VCT tools for virtual collaborations. Findings from the study show that 97.6% of respondents express their perception of VCTs to be very engaging and highly pleasant, according to the findings. The findings also show researchers prefer virtual collaboration with VCTs compared to physical collaborations. The study findings also show that 95.1% of the respondents agreed that virtual collaborations with VCT are far more convenient and cost-effective than physical collaborations. The study's findings also found that technical difficulties, network concerns, a lack of ICT understanding, technophobia, the expense of data subscription, and a lack of training are important barriers to using VCT for virtual collaborations. Based on these findings, the study concluded that VCT is better suited for virtual collaboration than physical collaborations, particularly during the Covid-19 era and civil turmoil in the country. Therefore the study recommends that technical difficulties associated with the use of VCTs could be tackled via written instructions presented to the users before the collaboration session.

Keywords: Covid-19, Video Conferencing Tools, Virtual Collaboration, Researchers, Library School, Nigeria.

Introduction

The Covid-19 pandemic has altered many aspects of human life, including education. Instructors and learners cannot meet in the classroom anymore to share knowledge. It is due to the threat of Covid-19. This condition requires academics to employ media that

aids in the teaching and learning process. Covid-19 may not disrupt or interfere with school programmes. It should function normally, however, due to the reasons stated above, academics seek alternative mediums to impart knowledge to students and share knowledge among themselves. Since the pandemic's outbreak in March-September 2020, the Nigerian Centre for Disease Control (NCDC), National Universities Commission, and Covid-19 task force prohibited the physical academic events in Nigerian institutions. Ifijeh and Yusuf (2020) emphasized that many institutions have chosen to move their activities to the virtual realm, leveraging on ICTs, especially video conferencing tools (VCTs) such as Microsoft Team, Skype, Google Meet, Zoom and so on.

With reference to various conferences and seminars held worldwide in academia and other sectors such as medicine, finance, agriculture, government parastatals e.t.c. All aspects of life are now entirely dependent on virtual collaboration via VCTs. Knowing well that majority of institutions in Nigeria derive their Internally Generated Revenue (IGR) primarily from tuition fees, the universities were forced to transit to virtual learning. Despite the constraints of Covid-19, academics and students were encouraged to use VCTs to deliver academic events such as graduations seminars and research projects. It was a tremendous accomplishment for the institution to fulfil its duties using the strength of virtual collaborations. Furthermore, there is a significant increase in the benefits that researchers can derive from the use of VCTs for virtual collaborations. Lobe, Morgan and Hoffman (2019) opined that the convenience and the cost-effectiveness of face-to-face interaction cannot be compared to the virtual collaborations, especially when the research work is to be presented before the audience across a large geographical spread with the understanding that virtual methods can be complemented and replicate, and improved upon the traditional method.

Statement of the Problem

Several studies have investigated the use of ICTs for establishing virtual collaborations for example (Mercieca, 2021, Lo lacono, Symonds, & Brown, 2016; Vinagre, 2016) but only a few have focused on the use of VCTs for virtual collaboration in the context of Nigerian Library School. Furthermore, while most academics in Nigeria are aware of various ICTs, they are not fully aware of their great potential as a powerful tool for virtual collaboration, which could lead to under-recognition and under-utilization of the tools. Furthermore, the number of studies on the use of VCTs as a tool for virtual collaboration is still very low in Nigeria, necessitating additional research into an empirical analysis on optimizing video conferencing tools (VCTs) for virtual collaboration.

Objectives of the Study

The study investigated researchers' perceptions on optimizing VCTs for virtual collaborations by

1. investigating the perception of researchers on optimizing VCTs for virtual collaborations in Nigerian library schools;
2. examining the acceptability and feasibility of optimizing VCTs for virtual collaborations in Nigerian library schools;
3. investigating the impact of optimizing VCTs for virtual collaborations in Nigerian library schools; and
4. identifying the challenges associated with optimizing VCTs for virtual collaborations in Nigerian library schools.

Literature Review

There is limited literature on the use of VCTs for virtual collaborations among researchers in Nigeria library schools, therefore scholarly articles on other related areas would be considered relevant to the study.

Perception of Researchers of Optimizing VCTs for Virtual Collaborations

Technology advancements are often ranked as one of the most important driving forces for academic development. Technology-driven comes in various forms and it may mean harnessing mobile capabilities to improve data acquisition accuracy; using advanced big-data analytics to spot hidden statistical patterns; employing virtual capacity techniques to retool information search, collection, organization, and knowledge dissemination, to name just a few. The bottom line is that the advanced technologies are now leveraged across many domains to continue to deliver impact in the academic domain (Stojan, Haas, Thammasitboon, Lander, Evans, Pawlik & Daniel, 2022). Recently, virtual collaborations have exploded resulting in increasing numbers of people using VCTs for professional and academic purposes. This phenomenon has obliged library and information science researchers to reconsider and investigate the use of VCTs such as Skype, Microsoft Team, Go to Meeting, Webex by Cisco, Google Meet, Adobe Connect, Teamviewer Meeting, TrueConf, Slack, and UberConference, particularly for research and academic purposes (Lata & Sonkar, 2020).

With such a changing world as a result of the Covid-19 pandemic, millions of people are turning to the use of various online programs for virtual collaboration. According to Ryn and Sandaran (2020), VCTs have made staying involved faster, easier, and more enjoyable than ever before. It enables individuals to be visible and audible to others, as well as establish and maintain connections with others by sharing information contents among the connection's group members. These are web-based services that enable groups of professionals to build a semi-public profile within a confined system, articulate a list of other users with whom they have a connection, and read and traverse their list of connections as well as those produced by others within the system (Dhar, Bose & Khan, 2021). This application is mostly used for professional and academic purposes, such as online classrooms, distance learning, and scholarly presentations. The Current global occurrence in which organisations are witnessing an economic downturn orchestrated by the Covid-19 outbreak has prompted many institutions to aggressively pursue cost-cutting measures such as slating most meetings and academic activities via the internet.

In Nigeria, the use of the internet is rapidly increasing day in and out. According to the statistics of December 2013, in Nigeria, 67 million of the population are internet users, out of which 6.6 million are VCT users (Internet World Stats, 2014). VCTs are becoming more popular among people of all ages (Cerezo, Ramirez, O'Shaughnessy, Sanchez, Mattis & Ross, 2021). Researchers and professionals are particularly active internet users, 70 per cent of whom use VCTs (Harrigan, Daly, Coussement, Lee, Soutar, & Evers, 2021). Tan, Shahrill, Ali, Daud, and Naing (2017) explained how the Covid-19 era has led to the birth of what is known as the "Virtual Collaboration Era". Furthermore, many researchers spend time online with their colleagues to solve all types of academic issues and share all possible academic problems due to the benefits that come with VCTs, these include; allowing people to communicate and building an online community and facilitating easy and real-time learning. Through virtual collaborations, VCTs have enabled researchers to share professional ideas, increase research productivity and make collaboration easier and more agile.

Archibald, Ambagtsheer, Casey, and Lawless (2019) conducted a study on the perception and experience of researchers and participants using zoom video-conferencing for qualitative data collection. They investigated the use of information and communication technologies in research. The findings show that researchers encountered significant difficulties in establishing call connections with participants. Although the difficulties had no long-term impact on researchers' and participants' satisfaction with the technical quality of the call, as indicated by ratings of sound quality, video quality, and lags in the live feed. Rather, researchers discovered that the extended cooperative problem-solving process involved in the technical challenges sometimes resulted in unforeseen benefits in terms of creating rapport.

Ramsook and Thomas (2019) conducted another study on prospective teachers on zoom as a transformative teaching methodology. The study centred on the perspectives of teachers whose classes were held using Zoom web conferencing. According to the findings, many features, such as creating and managing break-outrooms, which could optimize learning, were not used by instructors. Participants expressed disappointment that they had not reaped the full benefits and experiences from the virtual meetings. This influenced their preference for in-person classes. The findings from the study discovered that survey participants preferred Zoom over Skype by reporting deficiencies in the platform. As many features such as creating and managing break-out rooms that could optimize learning and research, do not come with the platform.

Acceptability and Feasibility of Optimising VCTs for Virtual Collaborations

The adoption of VCTs for virtual research presentations has gained popularity amongst researchers in the field of Library and Information Science (LIS) and other professional backgrounds across the globe (Amin & Sundari, 2020). Perhaps, due to the advancement in the use of ICT technologies and the behaviour of researchers, the effectiveness of delivering virtual research presentations is lethargic (Rui & Stefanone, 2013; Bisht,

Jasola & Bisht, 2020). Regardless of VCTs' acceptability, adapting to the tools requires a certain level of skill, and most users are constrained by a variety of factors in their quest for effective tool use. In a study conducted by Purwanto, Pramono, Asbari, Hyun, Wijayanti and Putri, (2020), some of the challenges include not being familiar with the platforms, limited opportunity for use, low skills, negative attitude, lack of needed facilities and low level of virtual learning readiness of researchers.

Singh, Singh, Abdullah, Moneyam, Ismail, Tek and Singh (2020) emphasized that VCTs are useful tools for virtual collaboration but sometimes they can be intimidating if it has never been used before. Thus a researcher who wishes to make his research presentation online using VCTs should be familiar with the functionalities of the tool. Other concerns raised by the McMaster Research Ethics Board (2020) about Zoom use include the possibility of having uninvited guests as part of a meeting without the knowledge of meeting hosts; recordings made by Zoom can be stored on a publicly accessible cloud without the knowledge of meeting hosts; and non-encryption of information on the Zoom server. Despite these challenges, adopting VCTs for virtual collaborations has numerous advantages over physical collaborations in terms of use and efficiency (Pandey, Ogunmola, Enbeyle, Abdullahi, Pandey & Pramanik, 2021).

According to Puncreobutr (2016) in this new social era, learning and innovation skills are vital. Researchers must seek and accept training and development to enhance academic excellence. Using VCTs for virtual collaborations prepares learners for their future careers (Charbonneau-Gowdy & Cechova, 2020). Nonetheless, Rashid and Asghar (2016) demonstrated the effectiveness of digital technologies in increasing engagement and self-directed learning in their studies; however, they found no significant effect of digital technologies on students' learning performance. While VCTs have altered the dynamics of virtual learning, the debate is whether incorporating VCTs into the virtual collaboration process has a significant impact on teaching and learning quality and/or improves learners' performance and experience. Their study also highlighted the significance of researchers in delivering structured and organised e-learning that can boost learners' motivation, personal competency, and learning satisfaction.

Romadhoni, kiristiastuti, Nurlaela, Sutiadiningsih, Astuti, Pangesthi and Bahar (2020) surveyed the acceptability of various forms of virtual learning by students during the pandemic Covid-19. The study's findings show that there are differences in student acceptance of virtual learning. VCTs have the advantage of incorporating the system into academic services for students, while some virtual platforms have quick and easy network access. According to the findings of the study, the use of various online platforms has an impact on a lecture on new forms of interaction.

Impact of Optimising VCTs for Virtual Collaborations

In recent times, the impact of modern ICT is growing rapidly. It has become an integral part of the educational system, particularly in the educational process. Academic success has been deeply rooted in the use of new innovative ICT, and the new trend is the design of online exposure to virtual activities. Adeyeye, Ojih, Bello, Adesina, Yartey, Ben-

Enukora and Adeyeye (2022) noted that academics and institutes of higher learning have diversified their system of operation operations in recent months through ICT systems such as Google-classroom, Microsoft Team, and Moodle, as well as a combination of traditional, face-to-face lectures and tutoring the VCTs. Most institution of higher learning in Nigeria has hugely invested in these ICT resources and technologies to provide support for researchers and students. The use of VCTs for virtual collaborations is becoming more common, and it is a growing tool that is now being used across all industries around the world. Amid the Covid-19 crisis and the need for social isolation, VCTs have significantly innovated and reshaped how lecturers engage with their students. It has also allowed researchers to maintain a sense of community gathering and promote wellness in a time when isolation has become a normal part of life. VCTs have the potential to be very useful in virtual learning.

Sayem, Taylor, Mcclanachan and Mumtahina (2017) discovered that due to advancements in ICT and the convenience of learning opportunities. Students prefer distance learning over face-to-face learning since it allows them to balance work and family life obligations. The study also concluded that online support tools like Skype, Zoom, Microsoft Team and Google Meet enable students and academics to connect via virtual collaborations from any convenient location, which is an effective use of technology to improve students' engagement and success rates while minimizing the inconvenience of after-hours commitment for academics.

Despite the numerous advantages of employing VCTs, research indicates that there are challenges to their successful deployment and use. Bingimlas (2008) identified two types of impediments to using ICT in teaching and learning: teacher-level barriers and school-level barriers. Teacher-level hurdles include issues such as a lack of confidence in using ICT, a lack of competency, resistance to change, and negative attitudes about ICT use. While concerns such as lack of time, lack of appropriate training, lack of accessibility, and lack of technical assistance are reported to influence school-level ICT utilisation. Fabry and Higgs (1997) believe that a lack of time would make it difficult for instructors to study and prepare ICT resources for their courses, leaving them unable to fully utilise and integrate ICT into their lessons. Botner (2018) noted that the innovative use of VCTs has proven to be a promising tool for increasing social engagement and providing social and academic support for teachers. The results of a programme called the Virtual Senior Centre developed by Self-help Community Services revealed that online interactive classes reduced students' feelings of isolation and disconnection while increasing self-reported health status and feelings of being very connected (Scheitler, 2015).

Challenges Associated with Optimizing VCTs for Virtual Collaborations

Despite the enormous benefit and promising future of ICT in improving virtual teaching and learning by altering how students experience their studies, the nature of teaching, particularly in institutions of higher learning, has not been effectively transformed by VCTs (Henderson, Selwyn & Aston, 2017). Bower, Lee, and Dalgarno (2017) opined

that Virtual collaborations are more effective when there is an efficient interaction between humans and computers, such as combining face0to-face learning and online learning in a collaborative blended and flexible manner. As a result, the rate of discussion on current digital innovation is unprecedented and occurs at a faster rate than in previous decades (Curley & Salmelin, 2017).

Many higher education institutions, particularly in Africa, are struggling to keep up with the rapid pace of digital innovation. With the lack of consistency in VCTs for the teaching and learning process, there is little evidence for the possibility of virtual learning in the education sector (Oke & Fernandes, 2020). In a study conducted by Huang, Backman, and Backman, (2010) on a student's attitude toward virtual learning in second life. The result indicated that dyslexic students experience several challenges associated with virtual learning use, including information overload, imperfect word processing tools, inadequate search functions, and having to relate to more than one system at a time.

Similarly, Meyer and Gent (2016) discovered in their study that, despite the use of smart devices and social media, teaching and learning remained virtually static, particularly in South Africa. Although the use of VCTs to promote virtual learning has been limited to digitization. Many technological breakthroughs lack exclusive and exclusive rights, meaning that their usage by academic institutions is unregulated (Talebian, Mohammadi & Rezvanfar, 2014). On that note, the use of VCT for virtual collaborations is critical. As a result, studying the experience of ICT use in virtual collaborations can help researchers overcome obstacles and become successful technology users. As a result, the primary goal of this study is to examine researchers' perceptions of the use of VCTs for virtual collaborations in Nigerian library schools. Overall, the key issues and challenges identified as significant in using VCTs by researchers in the related study were; limited access to the internet connection, limited technical support, limited time, lack of effective training, cost of data subscription and lack of researcher competency.

Methodology

Design

The study used a descriptive survey design. This method is commonly used in Information system research to collect self-report data from the study participants. A survey may seek information about individuals or the opinion of survey participants. A survey design was chosen for this study because it allows the researcher to reach a large number of respondents (lecturers/researchers) in the universities studied and allows for the generalisation of the study's findings. Population and

Population and Sample

The study's population included researchers from all of Nigeria's Federal Universities across the country's six geopolitical zones. Nigeria currently has 49 federal universities (NUC, 2020). Each of Nigeria's six geopolitical zones was represented by one Federal university, and the library schools at these universities were chosen. This brings the total number of library schools involved in the study to six. The sample was drawn using total enumeration, which included all of the respondents in the study population.

Instrument

The questionnaire used as the data collection instrument was adapted from Amuda and Ajani (2021) and was entitled "Optimizing Zoom Application for Virtual Research Presentation Questionnaire" (OZAVRPQ). The researchers created a questionnaire with items related to the study's four objectives. The questionnaire was divided into two sections. A and B sections Section A required respondents' demographic information while section B features the items. Section B was divided into FOUR parts. Each part concentrated on the study's objectives. Part 1 concentrated on the perception of researchers on optimising VCT for virtual collaboration. Part 2 covered nine items on the acceptability and feasibility of optimizing VCT for virtual collaborations. Part 3 contained 12 items on the impact of optimizing VCTs for virtual collaborations. Lastly, Part 4 contained the one question on the challenges associated with the use of VCT for virtual collaborations.

Validity and Reliability

The questionnaire was given to three experts from three departments (Library and Information Science; Test and Measurement; Statistics) to confirm the face and content validity of the instrument used for data collection. As a result of their observations and suggestions, the items in the instrument were modified such that they could be regarded as valid for use in the study. The questionnaire used for data collection in this study was given to ten academics in the Department of Library Science at the University of Benin in Edo State, Nigeria, to ensure its trustworthiness. Using odd and even numbers of items in the questionnaire, the half split reliability approach was used to divide the response into two halves. After that, the responses were tested using Cronbach's alpha. The thirty-one-item measure had an overall reliability coefficient of 0.821. This was sufficient to confirm that the instrument was suitable for the research.

Administration Procedure

An online survey was created, reviewed by LIS experts and scholars, and piloted with a sample of the target audience before being implemented. Pre-survey e-mail invitations and survey confirmations were sent to approximately 98 per cent of researchers through Google-form from the six library schools chosen for the study. The survey was available on the internet for four weeks for respondents to complete and return their responses. At the end of the four weeks, 82 copies of the questionnaire had been properly filled out and returned. Due to the lockdown and corona-virus outbreak, the study's scope was limited to researchers at the six selected library schools. Due to the Covid-19, which tightly enforced social separation and the nation's security danger, face-to-face administration of the questionnaire and interview was not possible.

Data Analysis

Data was gathered in both quantitative and qualitative formats. The qualitative data was thematically analysed while the quantitative data was analysed using percentage and frequency counts then the results were represented in tables.

Results

Table 1: Response Rate

S/N	Federal Universities	States	Zones	Population	Response Rate
1.	University A	Cross-River	South-South	14	13
2.	University B	Enugu	South-East	14	14
3.	University C	Oyo	South-West	18	18
4.	University D	Kaduna	North-West	20	12
5.	University E	Kwara	North-Central	14	13
6.	University F	Bornu	North-East	18	12
7.	**Total**	**6**	**6**	**98**	**82**

Source: Field Survey (2022)

Objective 1: Researchers' perception of optimizing VCTs for virtual collaborations

The purpose was to investigate researchers' perceptions on optimizing VCTs for virtual collaborations. However, respondents were asked to indicate their level of agreement and disagreement to achieve the goal. Table 2 displayed the outcome.

i. Are you aware that VCTs are used for virtual collaborations?

Respondents were expected to express their position of agreement and disagreement with this statement.

100% of respondents stated that they were acutely aware that VCTs are commonly used for virtual collaborations around the world.

VCTs are utilised for meetings, according to a few respondents. Especially when it comes to educating personnel in collaborative organisations.

Another group of respondents mentioned that VCTs were commonly employed in academics during the Covid-19 pandemic. The technologies are primarily utilised for virtual presentations at seminars, workshops, and, most critically, for holding conference meetings among like-minded scholars.

Few respondents also mentioned that VCTs are utilised to organise meetings among groups of family members to express their ambitions and to stream live events.

ii. Table 2: Perception of Optimising VCTs for Virtual Collaborations

S/N	Perception of the use of VCTs	Agreed	Not Sure	Disagreed
1.	It is simple for me to learn how to use VCTs for virtual research presentations.	52 (53.4%)	16 (19.5%)	14 (17.1%)
2.	When I use VCTs to collaborate with other	53 (64.6%)	20 (24.4%)	9 (10.9%)

	professional colleagues, I feel at ease.			
3.	It is very interesting when VCTs are used to assist other researchers in the delivery of virtual presentations.	53 (64.6%)	19 (23.2%)	10 (12.1%)
4.	I preferred virtual collaboration to physical collaboration.	41 (50%)	15 (18.3%)	26 (31.7%)
5.	Interacting through VCTs validates the academic system's modern level.	52 (63.4%)	16 (19.5%)	14 (17.1%)
6.	It was a pleasure to use VCTs for virtual collaborations.	41 (50%)	3 (3.6%)	38 (46.3%)
7.	It was a positive experience to use VCTs to share knowledge.	53 (64.6%)	20 (24.3%)	9 (10.9%)
8.	Using VCTs helped me improve my ICT skills.	72 (87.8%)	3 (3.6%)	7 (8.5%)
9.	My virtual collaborative performance improves when I use VCTs.	52 (63.4%)	17 (20.7%)	12 (14.6%)
10	It is extremely convenient to use VCTs for virtual presentations.	80 (97.6)	2 (2.4%)	0 (0%)

Source: Field Survey (2022)

The results in table 2 reveal researchers' perceptions of the use of VCTs for virtual collaborations in Nigerian library schools, and it indicates that most of the researchers (97.6 per cent) indicate that using VCTs for virtual research presentation is very convenient; convenience in the sense that they do not need to leave the comfort of their home before research presentation can be done. (64.6 per cent) are comfortable using VCTs to collaborate with other professional colleagues, (87 per cent) believe that using VCTs improves their ICT skills, (64.6 per cent) believe that using VCTs to share knowledge was a positive experience, and (63.4 per cent) believe that using VCTs improves their virtual research presentation performance while While (50 per cent) of respondents disagreed that virtual collaboration was preferable to physical collaboration, (35.2 per cent) also disagreed that using VCTs for virtual collaboration was a good experience. This study, on the other hand, reveals that researchers in Nigerian library schools have mixed feelings regarding the usage of VCTs because some of them were uncomfortable using VCTs for virtual collaborations.

Objective 2: Acceptability and feasibility of optimizing VCTs for virtual collaborations

The purpose of this study was to look into the acceptability and feasibility of using VCTs for virtual collaborations. However, respondents were asked to indicate their level of agreement and disagreement to achieve the goal. Table 3 displayed the outcome.

Table 3: Acceptability and Feasibility of Optimizing VCTs for Virtual Collaborations

S/N	Acceptability and feasibility of the use of VCTs	Agreed	Not Sure	Disagreed
1.	VCTs have been extremely beneficial in the management of virtual collaborations.	78 (95.1%)	4 (4.8%)	0 (0%)
2.	VCTs encourage other professional colleagues to expand their knowledge of ICT.	47 (57.3%)	5 (6.0%)	30 (36.6%)
3.	Most researchers prefer virtual research presentations to physical presentations.	80 (97.6%)	2 (2.4%)	0 (0%)
4.	VCTs substantiate the academic system's modern level.	80 (97.6%)	0 (0%)	2 (2.4%)
5.	VCTs substitute virtual presence for physical presence.	78 (95.1%)	1 (1.2%)	3 (3.7%)
6.	VCTs are commonly used by professionals to share experiences	77 (93..9%)	5 (6.1%)	0 (0%)
7.	Most researchers use VCTs for training and development in addition to research presentation.	66 (80.5%)	12 (14.7%)	4 (4.9%)
8.	VCTs have become an integral part of the educational system.	71(86.6%)	9 (10.9%)	2 (2.4%)
9.	It is extremely convenient to use VCTs for virtual collaboration.	52 (63.4%)	12 (14.7%)	18 (21.9%)

Source: Field Survey (2022)

According to the findings in Table 3, Nigerian researchers' perceptions of the acceptability and feasibility of using VCTs for virtual collaborations are high among researchers in the Nigerian library school, with a response rate of 80 (97.6 per cents).

According to the findings, the majority of respondents felt that VCTs have aided in the delivery of research presentations. The findings also show (63.4 per cent) that VCTs legitimise the academic system's modern level and substitute physical presences with virtual presences. More importantly, the findings of the study reveal that (64.6 per cent of researchers use VCTs to share academic knowledge and experience. This finding shows that (63.4 per cent) agreed that using VCTs improves their virtual collaborative performance. This finding shows that (63.4 per cent) agreed that it is extremely convenient to use VCTs for virtual collaborations.

Objective 3: The impact of optimizing VCTs for virtual collaborations

The objective was to look into the impact of using VCTs for virtual collaborations. However, respondents were asked to express their level of agreement or disagreement to achieve the goal. Table 4 displays the outcome.

Table 4: Impact of Optimizing VCTs for Virtual Collaborations

S/N	Impact of VCT on Virtual Collaborations	Agreed	Not Sure	Disagreed
1.	Using VCT for virtual collaboration is cost-effective	78 (95.1%)	4 (4.8%)	0 (0%)
2.	Using VCTs for virtual collaborations make knowledge sharing become so easy	80 (97.5%)	0 (0%)	2 (2.4%)
3.	Using VCTs for virtual collaboratiostimulate research intrest to teach	56 (68.3%)	14 (17.0%)	12 14.6%)
4.	Using VCTs for virtual collaborations ensure better retention of knowledge	48 (58.%)	4 (4.8%)	30 (36.5%)
5.	I cinsidered using VCTs for virtual collaborations	52 (63.4%)	17 (20.7%)	12 (14.6%)
6.	Using VCTs for virtual collaborations makes learning become more viable	80 (97.5%)	2 (2.4%)	0 (0%)
7.	Using VCTs for virtual collaborations is very expensive	62 (75.6%)	6 (7.3%)	14 (17.0%)
8.	Using VCTs for virtual collaborations improves relevance of research	38 (46.3%)	26 (31.7%)	18 (21.9%)
9.	Using VCTs for virtual collaborations reduces rich to poor digital divide	80 (97.5%)	2 (2.4%)	0 (0%)
10	Using VCTs for virtual collaborations gives voice to	36 (43.1%)	4 (4.8%)	42 (51.2%)

	the voiceless			
11	Using VCTs for virtual collaborations improves social acceptability	78 (95.1%)	4 (4.8%)	0 (0%)
12	Using VCTs for virtual collaboration enhances digital capacity	82 (100)	0 (0%)	0 (0%)

Source: Field Survey (2022)

The results in table 4 reveal the perception of Nigerian researchers on the impact of the usage of VCTs for virtual collaborations by researchers in Nigerian library schools. The findings from the study indicate that most of the researchers with a response rate of (95.1per cent) agreed that using VCTs for virtual collaborations is cost-effectiveness, (97.5per cent) of the respondents agreed that using VCTs for virtual collaborations makes knowledge sharing so easy, (97.5per cent) of the respondents indicate that using VCTs for virtual collaborations makes learning to become more viable and (97.5per cent) of the agreed using VCTs for virtual research presentation reduces rich-poor digital divide. Also, (95.1per cent) of the respondent agreed that using VCTs for virtual collaborations improves social acceptability while (75.6per cent) of the respondents agreed that using VCTs for virtual collaborations is very expensive and (56per cent) of the respondents also disagreed that Using VCTs for virtual collaborations give voice to the voiceless. This result, however, implies that VCTs is enhanced social acceptability, improve digital capacity and are cost-effective compared to face-to-face presentation, particularly when the research work is to be presented outside the geographical location of the presenter.

Objective 4: Challenges associated with optimizing VCTs for virtual collaborations

The goal was to look into the problems involved with using VCTs for virtual collaborations. To achieve the goals, respondents were asked to describe the challenges they face when using VCTs for virtual collaborations. The challenges were divided into seven main categories and analysed using the Friedman test. Table 5 displays the results.

What challenges do you envisage in optimizing VCTs for virtual collaborations?

i.Few respondents have this to say:

Nigerian researchers in LIS schools will have to extra mile to use VCTs for virtual collaborations." The reason for this is that our issues are numerous. The first step is to provide researchers with orientation training. Most academics in Nigeria have a negative attitude toward online involvement; they prefer physical presentations to virtual collaborations. As a result, I believe one of their key issues in adapting to the internet environment... "I would like to term it technophobia."

Few respondents also explained that:

"One of the key obstacles associated with the usage of VCTs for virtual research presentation is that the expense of data subscription is overwhelming," which is compounded by the fact that the university internet connection is poor. Because the

university internet service is so inadequate, many teachers grumble about having to utilise their money to subscribe for better internet access.

Few respondents noted that:

"I view a lack of ICT awareness and a limited power supply as critical challenges related to the use of VCTs". We have been hearing and reading about how many African researchers at library schools are falling behind in their use of modern ICT because faculties do not provide ICT training for researchers. However, power outages have been a serious impediment to the effective use of VCTs for virtual collaborations. When I use VCTs on my laptop, the electricity is frequently interrupted, and the energy backup on most laptops may not last as long.

Another respondent noted that:

Unfortunately, none of our library schools is equipped with a backup energy source, such as a generator or a solar inverter. "How can we sustain the use of VCTs for virtual collaborations in Nigerian library schools if no alternate energy backups are available?"

This result shows that there are major problems involved with the use of VCTs for virtual collaborations, as evidenced by the respondents' reasoning and inferred in Table 5.

ii. **Table 5: Challenges Associated with optimizing VCTs for Virtual Collaborations**

S/N	ITEMS	Frequency	Per cent
1.	Technical Know-how difficulties	14	17.0
2.	Network Issues	14	17.0
3.	Cost of data subscription	16	19.5
4.	Technophobia	12	14.6
5.	Limited power supply	15	18.2
6.	Lack of training	11	13.4
	Total	82	100

Source: Field Survey (2022)

Table 5 outlines the difficulties associated with using VCTs for virtual collaborations in Nigerian library schools. The findings show that there are numerous challenges. They are technical know-how difficulties, cost of data subscription, network issues and lack of training users on how to use VCTs for virtual collaborations.

Discussion of Findings

According to previous studies on VCTs, such as Archibald, et al. (2019), most researchers at Nigerian library schools are aware of the prevalence and importance of VCTs. The study found that participants recognized the importance of VCTs as an excellent and promising tool for virtual collaborations; nonetheless, the platform was not preferred over face-to-face mode. Probably, the researchers' readiness to continue using the face-to-face online presentation in this study reflects either their lack of digital abilities in the usage of VCTs or their prior unfamiliarity with the tools. The findings of this study, which show that virtual collaboration using VCTs is both convenient and cost-effective, are congruent with those of Lobe, Morgan and Hoffman (2020). The findings also show that the VCTs were innovative, pleasant, and extremely satisfying to the participants. Participants also agreed that as compared to face-to-face presentations, VCTs boost social acceptability and digital capacity. This conclusion is consistent with the findings of Lo Iacono et al. (2016), who got a similar reaction in their study. Although participants identified challenges such as the cost of data subscription, technical difficulties, network issues, low ICT knowledge, technical know-how difficulties, and a lack of training on the use of VCTs for virtual collaborations, the cost of data subscription remains the most significant constraint to the use of VCTs. This result is consistent with the researchers' observations during an online presentation of a research project by some graduating library school students that are not addressed by this study. Some students did not finish certain courses because they could not afford to pay for a data subscription, which prevented them from taking exams through VCTs. This is also one of the main reasons why some Nigerian higher education researchers do not attend webinars. Furthermore, this study demonstrates that the benefits of adopting VCTs for virtual collaboration outweighed the drawbacks.

Conclusion

This study took into account researchers' perspectives on optimizing VCTs for virtual collaboration in Nigerian library schools. The study included 98 Nigerian Library School researchers through distributed questionnaires via online forums/platforms. The findings revealed that the majority of respondents are quite aware of the presence and importance of VCTs for virtual research presentation, and their attitude toward the usage of VCTs for virtual collaboration is very positive. y The majority of respondents describe VCTs as very interesting and highly satisfactory platforms for collaborations; they also note that using VCTs is much more convenient and cost-effective than a face-to-face presentation, especially when the research work is to be presented outside of the presenter's geographical location. The study noted technical difficulties, network issues, the cost of data subscription, a lack of ICT understanding, and a lack of training as challenges.

Recommendations

The following are suggested based on the study's findings. Training should be a major strategy for library schools in Nigeria to accommodate the teaching of the use of VCTs for virtual collaborations.

The study indicated that VCTs are a more suitable platform for virtual presentation when compared to face-to-face or physical collaborations. Therefore the government, through the Ministry of Education, should increase funding for academics to subscribe to dependable internet connections to maximise the use of VCTs for virtual collaborations.

It is also suggested that technical difficulties associated with the use of VCTs for virtual collaboration be addressed or reduced by providing written instructions before the presentation session.

Limitations and Future Research Directions

This study looked into researchers' perspectives to optimise VCTs for virtual collaboration in Nigerian library schools. Some limitations are obvious because no research is perfect. The study focused on only six of Nigeria's many library schools across the country's six geopolitical zones. Extending the research to other library schools throughout the country will produce valuable and useful results that can be applied to all library schools in Nigeria.

Second, the study used a self-reported open and closed-ended instrument to collect data, and the sample size was limited to LIS researchers from six library schools where the instrument was administered. As a result, future research should explore doing a comprehensive qualitative study on optimising VCTs for virtual collaboration in Nigeria.

Future research should investigate additional possible areas of interest and gaps mentioned in the study.

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