Video conferencing as a teaching mode in higher educational institutions in Uganda: teacher perception

Magombe Yasin*

Islamic University in Uganda,
Mbale, Uganda
Email: magombe.yasin@iuiu.ac.ug
*Corresponding author

Adam A. Alli

Uganda Technical College Bushenyi,
Bushenyi, Uganda
Email: adam@iuiu.ac.ug

Nambobi Mutwalibi

Islamic University in Uganda,
Kampala Campus,
Kampala, Uganda
Email: hello@nambobi.com

Juma Kasadha

City University of Hong Kong,
Hong Kong, SAR, China
Email: jkasadha2-c@my.cityu.edu.hk

Abstract: Recently, Information Communication Technologies (ICT) have gained significant usage in enabling institutions to continuously deliver education even during the COVID-19 pandemics lockdown. Its significant application in the education sphere has resulted in new capabilities at all levels of educational institutions. In Uganda, the use of video-enabled teaching is increasingly being established in universities especially during the COVID-19 lockdowns. In this study, we examine teachers' perception of the use of video conferencing, as a mode of teaching in higher educational institutions. The findings of this study show that teachers are of the high opinion about Video Conferencing (VC) as a mode of teaching at Higher Education Institution (HEI). In the study, several challenges that included poor ICT infrastructure, slow internet connection and those related to the cost of establishing a reasonable ICT infrastructure that can support VC were revealed. We conclude our study by providing recommendations required to improve infrastructure and to create policies to support online education as a whole and in particular VC as a teaching model that bridges in person, in class and remote learning.

Keywords: higher education institutions; ICT infrastructure; information and communication technology; learning theory; technology acceptance model; video conferencing.

Biographical notes: Magombe Yasin is a PhD candidate of Computer Science and Engineering at Cukurova University (Turkey). He holds his MSc degree in Technical Education (MScTE) from the Islamic University of Technology (Dhaka-Bangladesh) and a Bachelor's degree in Information Technology from the Islamic University in Uganda. He has served as Ag. ICT Head of Department; a System Administrator and a Part-Timer Lecturer of Computer Science at the Islamic University in Uganda. His research interests are in machine learning and e-learning platforms.

Adam A. Alli is a PhD fellow in Computer Science and Engineering at the Islamic University of Technology, Dhaka, Bangladesh. He completed his MSc degree in Computer Science (2008) from the University of Mysore, India and BSc degree in Computer Science (2002) from the Islamic University in Uganda. He also received his Postgraduate Diploma in Management and Teaching at Higher Education (2015) from the Islamic University in Uganda and a Graduate Diploma in ICT Leadership and Knowledge Society (2013) from the Dublin City University through the GeSCI program. He was Dean, Faculty of Science at the Islamic University in Uganda from 2011 to 2016. He is a Lecturer of Computer Science and Engineering at the Islamic University in Uganda; and Uganda Technical College in Bushenyi.

Nambobi Mutwalibi is a Research Assistant at Motion Analysis Research Lab, Islamic University in Uganda. He is also working as the Head of Science and Technology, Labour College of East Africa. He was a Research Assistant in Technical and Vocational Education (TVE) Department at Islamic University of Technology, Bangladesh (IUT, 2018). He holds MBA degree from Nexus International University Formerly Virtual University of Uganda, Muyenga, Kampala and BSc Technical Education degree from Islamic University of Technology, Dhaka, Bangladesh, specialising in Computer Science and Engineering. His research interest include disruptive innovations, JTBD, wargaming strategy, game theory, blue ocean strategy, blended learning, green skills, TVET and ICTs in a developing country.

Juma Kasadha completed his PhD studies in the Department of Media and Communication at City University of Hong Kong and a Former Visiting Researcher in the United Nations University Institute in Macau (UNU-CS). His research interests are on new media technologies and social change with particular emphasis on citizen political engagement; civic and political implications of new media technologies in developing democracies. He received his MA degree in Communication and Media Studies from Cyprus International University (Turkey) and BSc degree in Mass Communication and Post-graduate Diploma degree in Management and Teaching from the Islamic University in Uganda, Uganda.

1   Introduction

Information and Communication Technology (ICT) has become an integral part of education and society especially during the COVID-19 pandemic lockdown situation (Radha et al., 2020). The integration of ICT in education has been fuelled by advancement in communication technology (availability of smart devices, powerful software to create and distribute video-enabled content) and most recently the pandemic situation which required people to stay and work from home. As of today, many online classes are powered by Google classes, MOOCs, Zoom, Skype, Facebook, etc. These platforms host millions of hours of live video classes and tutorials whose purpose is to advance knowledge in different learning environments (primary schools, high schools, colleges and universities). The impact of ICT in furthering education cannot be underestimated.

Studies have shown that ICT has a positive effect on improving the education system in many countries (Berkeshchuk et al., 2020; Fernández-Gutiérrez et al., 2020; Kim and Lee, 2020; Olaore, 2014). In each of the above-mentioned studies, the authors have explored how ICT is extensively used in education by many universities. There exists a myriad of ICT used in universities that make teaching and student learning independent, active and self-paced. This forms the principal idea behind e-learning, e-education, e-teaching, i-education, e-conference, and i-boot camps for education.

In context of this study, E-Learning has mainly two formats. The synchronous online format (live e-learning) and self-paced asynchronous e-learning (Berkeshchuk et al., 2020). All these types of learning styles either use the web, recorded audio or recorded/live video platforms. In particular, Video Conferencing is considered as an alternative means to provide education for satisfying the diverse needs of both teachers and learners during this era (Shamsuddin and Kaur, 2020). Video Conferencing has been accepted as a standard means of conducting meetings and lectures in universities. In evolving countries like Uganda amidst lack of policies and poor infrastructure, some kind of ICT enabled learning using Zoom, Microsoft Teams and Google classes (Correia et al., 2020; Dutta, 2020) have been adopted. In this study therefore, we examine how video conferencing as a mode of teaching has been perceived by teachers at in higher education.

This study explores the teachers' perception about the integration of Video Conferencing as a mode of teaching and learning process in their teaching at higher educational institutions. Moreover, the study was intended to discover challenges for implementing Video Conferencing at higher educational institutions, and enlists support needed for realising Video Conferencing in higher educational institutions specifically in Uganda. This study is guided by the following questions: i) What are the teachers' perception regarding Video Conferencing as a mode of teaching and learning process in higher educational institutions? ii) What are the challenges of Video Conferencing as perceived by the teachers if it's to be implemented in teaching in higher institutions of learning?

1.1 Contribution

The contributions of this study are as follows:

1   Enlisted and discussed details on teachers' opinion on how to integrate Video Conferencing in teaching and learning process in Uganda. This provides sufficient background to studies that may lead to the implementation of Video Conferencing in teaching and learning in higher education in third world countries.

2   Provides curriculum developers an overview of framework, infrastructure, and understanding of what curriculum is required when technology such as video conferencing is adopted in the teaching and learning process.

3   Opened up further areas of research especially in semi-skilled, business and technical education and education for disadvantaged groups.

The rest of the paper is organised as follows; Section 2 is the problem statement, in Section 3, we present the conceptual framework. In Section 4, a survey on related literature is given. In Section 5, we present the survey of related work, methodology is presented in Section 5, Analysis and interpretation is given in Section 6, whereas discussion, limitations, recommendations and the conclusion is presented in Section 7.

2   Problem statement

New education policies in the late 1980s allowed for liberation and privatisation of higher education. The new policies opened opportunities for self-sponsorship schemes that expanded the higher education spectrum hence resulting in the emergency of new universities in the early 2000s and 2010s. As a result, the number of universities increased from 2 in 1988 to over 50 universities in 2020. In addition, the general enrolment increased by 34.1%. Increased student enrolment in different institutions of higher education has resulted in numerous challenges; among which included; the deteriorating quality of education due to increased student teacher ratios, insufficient infrastructure and low lecturer-student ratios. In order to catch up with the expansion of the number of students at high educational institutions, and insufficient infrastructure, information technology adoption is seen to provide alternative solutions to conduct teaching effectively. In 2020, lockdown as a result of the COVID-19 pandemic made it more necessary to adopt information technology to enable students to continue to study from home. One of the ways to continue providing education was through video conferencing facility.

Adopting video conferencing as a mode of teaching can enable students continue to learn during and after the pandemic, decongest classes and enable social distancing as a mechanism of reducing the spread of COVID-19, reduce the cost of obtaining university education and improve the lecturers' ability to deliver knowledge to many students at the same time, anytime anywhere. From that perspective therefore, we investigate the perception of lecturers in adopting video conferencing as a means of teaching in Higher education sector in particular to Ugandan universities.

3   Conceptual framework

In Figure 1, a conceptual framework has been constructed by adopting the Theory of Reasoned Action (TRA) (LaCaille, 2020) and Technology Acceptance Model (TAM) (Sagnier et al., 2020). These two models combined provide a hybrid understanding of adopting video conferencing in teaching at higher education. In the model Figure 1, when teachers are presented with a new technology in teaching, two key factors influence their decision about how and when they will use it in class. These two factors are:

1   *Perceived usefulness*: The degree to which a person believes that using a particular system would enhance his or her job performance. This component of the model can be determined using the scale measured using psychometric measure. This measures if the technology in place can improve quality of work, give greater control over work, accomplish task quickly and can increase effectiveness and efficiency.

2   *Perceived ease-of-use*: The degree to which a person believes that using a particular system would be free from effort. This component of the model can be determined using the scale measured using psychometric measure. These measures if the technology in place can easily be used, learned, and easy to interact with, easy to remember how to accomplish a task among other factors portray ease of use. This model provides the basis upon which the constructs used in this research were built.

Figure 1   Modified technology acceptance model
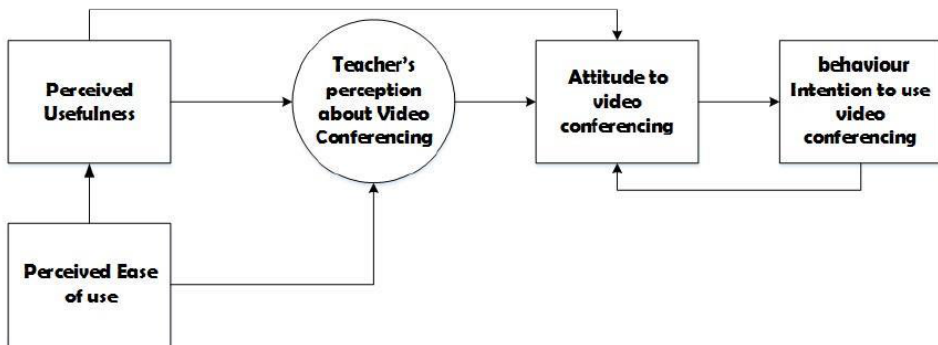
Sources: Hoi (2020), LaCaille (2020), Sagnier et al. (2020)

The above two factors influence the perceptions of teachers towards video conferencing which directly affects teachers' attitude to video conferencing which in turn extends its effect to the behavioural intention to use and vice versa. Moreover, perceived ease of use has a greater impact on perceived usefulness hence attitude is affected in one way or the other. Basically, attitude to use here is concerned with the users' assessment of the cachet of employing video conferencing in teaching at higher institutions of learning. Behavioural intention depends on the prospect of a person using the application (Hoi, 2020).

4 Survey on related literature

4.1 Learning theories and supporting technologies

The way teaching and learning is conducted today is quite different from the earlier days. This is due to the fact that learners no longer interface with one audience they learn from. With the advances in information technology and support for teaching and learning, many audiences have sufficed in the classroom environment. For example, a student in class attends to a teacher, a laptop connected to the internet and a smartphone connected to a social media platform. These audiences have been created by use of technology which allows many more students to be actively thinking about information, making choices, and executing skills than is typical in teacher-led lessons. The use of technology requires that the teacher and students play changing roles to enable learners to grasp the knowledge taught (Al-Qaysi et al., 2021; Salloum et al., 2021). In this case technologies such as multimedia, gaming and video conferencing are preferred to be used by teachers to capture and retain the concentration of students in class (Lapitan et al., 2021). Technology has changed the definition of how learning and teaching are done especially with the coming of smart devices such as phones and tablets, very high-speed internet connectivity, easy to use media production and easy collaboration and interaction (Yang and Kuo, 2020). With advancement of educational technology, theories of teaching must be aligned to support the development of teaching in the new learning environment created by the usage of different upcoming technologies.

4.2 Traditional learning theories

- *Behaviourism*: Learning is viewed as Stimulus-Response analysis, "Conditioning" forms the basic component of learning wherein repetition of a specific behaviour leads to the response, Learning is viewed as a series of expected responses following conditioning, Instruction revolves around a cyclical pattern of teacher-modelling, student-repetition, and teacher reinforcement. In Behaviourism, PowerPoint presentation, multimedia video conferencing Websites are used to achieve learning (Masethe et al., 2017; Murtonen et al., 2017).

- *Cognitivism*: Learning is seen as reflection and cognition, the Mind is considered as a "Black Box", at the same time learning is explained as a recall function of stored information. Instructions are usually used to grabs the attention of learners this helps make sense of the information taught (Childs, 2019; Rücker et al., 2017).

  PowerPoint presentation, Multimedia, Video conferencing, Websites, Gaming and budges are attractive tools used to achieve cognitive learning.

- *Constructivism*: Learning is considered an active and constructive process. Learning in the classroom is evident when students are building knowledge by doing (hands-on learning), Instruction in Constructivist theory looks like guided problem solving, New information is a link to prior knowledge; self-relevant education; making connections to their own experiences on Social media (WhatsApp, Facebook), web 2.0 (wiki, Google apps), Video conferencing (Al-Shammari et al., 2019; Fernando and Marikar, 2017; Xu and Shi, 2018).

4.3   Emerging learning theories

- *Socio-cultural constructivism*: In Socio-cultural Constructivism interaction within the learning environment that creates dialogue and actively shapes the learning environment to bring diversity to the community is encouraged. Participants internalise the information being discussed and learning occurs (Akar and Yildirim, 2009). Mediation tools and tools that bring about strengthening and development of culture pillars and used to facilitate learning. In this theory, Social media platforms such as WhatsApp, Twitter, Facebook are usable in addition to Web 2.0 tools such as Wiki, Google apps, maps, etc. add a lot of value to peripheral learning (Strayer, 2007).

- *Cognitive theory of multimedia learning*: Cognitive Theory of Multimedia Learning, is Learner-cantered with technology being adjusted to fit their needs is encouraged. Learning occurs when presented with the right kind of cognitive processing based on research-based principles (Mahajan et al., 2020). It takes into account the principles of how people learn when an online application is being designed. Tools such as video conferencing and interactive Web sites are essential to achieve learning (Corbett and Spinello, 2020).

- *Connectivism*: Connectivism encourages learning through networking. Knowledge nodes are created where information is accessed and stored. Learning is directly proportional to the number of connections. In connectivism learning may occur outside the individual networks. Tools for networking between hubs are very important tool to facilitate learning. These tools include WhatsApp groups, Facebook groups, Google classrooms, learning boot-camps, workshops and conferences (Corbett and Spinello, 2020; Yousef et al., 2020).

4.4   Trends in educational technology

Earlier in 2000s, technology available for teaching and learning was looked at as an extension of traditional distance learning. During that era, word processors were used for creating content, and email applications were used to distribute the content to the learner. It was the responsibility of the learners to print the content for use. This improved distance learning strategies by cutting on the postal cost and reducing the time it would take the learners to receive learning material (Lee et al., 2020). Recently, the mode of distance education has become more interactive and has opened new ways of teaching and learning.

By 2010s, collaborative environments, online computing supported by massive availability of bandwidth and increase in computing powers (personal computer, tablets, smartphones) saw a rise in new applications for teaching and learning. These included web applications supporting multimedia objects and video, gaming applications and mobile applications supported by advances in smartphone technology (Burbules et al., 2020; Nordin and Bacotang, 2021).

Advances in mobile technologies resulted in massive production of online content for learning hence the birth of MOOC courses. This required some kind of storage hence the birth of the Content delivery system in cloud computing environments. The availability of cloud and sophistication in computer applications for both mobile and computer

systems enabled content creators to come up with new learning solutions that included open content, personalised learning environment, gaming, etc. (Burbules et al., 2020; Kassab et al., 2020)

During this period video content has become more popular as teaching and learning tools. Advancement in computing, Internet of Things, Fog computing Dew Computing gamification of education, Bring Your Own Device (BYOD) is shaping the way learning is happening. Live classes through Facebook and other platforms are becoming popular means of learning. The future is seen to bring learning to the less privileged like the blind, and the Deaf let alone the physically disabled learners. Adaptive learning technology, video conferencing and other upcoming new technologies are likely to alternate solutions for teaching and learning (Al-Emran et al., 2020; Kassab et al., 2020).

Major trending technologies of the time include cloud-based technology in education, Virtual and augmented, reality, and Mobile-style education. With cloud-based technology students will no longer worry about massive storage devices, accidental deletion or loss of files, Essays, content related to projects, projects, assignments are shared more easily and securely stored on the cloud. An example of such a facility is on GitHub and Google drive. Secondly, with an increasing number of affordable Virtual reality equipment and the availability of free app, it is becoming extremely easy to create content that can be used for teaching, and lastly, efforts to connect mobile technology and devices within the classroom allows teachers to provide a fully immersive, integrated learning experience for all learning styles and abilities (Al-Emran et al., 2020; Themelis and Sime, 2020).

Video conferencing provides a wide range of advantages given the fact it stimulates and supports vision, listening components in participative learning. These advantages as in Education technology are: it assists in the delivering of quality teaching and learning, opening up possibilities for collaborative teaching and learning, make best use of resources, provide live support for students at remote sites, give access to expertise not available within the institution, provide students from other institutions and in remote areas with access to specialised teaching and activities. Furthermore, it can provide students with opportunities to work with their peers from other institutions and countries. This supports group work, collaborative and international projects.

Despite the importance and the needs of Video Conferencing, there are problems that need to be resolved. These problems include the quality of instruction, quality of internet, hidden costs, misuse of technology, and the attitudes of instructors, students, and administrators. Each one of these affects the overall quality of distance learning as a product. Moreover, 3D printing, Bring Your Own Device (BYOD), adaptive technology and wearable technology, Internet of Things adds value to video conferencing paradigm (Al-Emran et al., 2020; Themelis and Sime, 2020; Wlodarczyk et al., 2020). Incorporating incoming technologies in video conferencing mode shall enable the scope of learners to expand, including the visually impaired, the deaf among other groups of learners such as disadvantaged and semi-skilled learners

4.5 *Perception models for information technology in education*

Modelling teachers' perception of Information technology and Information systems in education has been investigated over years. A number of models have been suggested these includes but not limited to Theory of Reasoned Action (TRA), Theory of planned behaviour (TPB), Technological Pedagogical Content Knowledge (TPACK), Technology

Acceptance Model (TAM, TAM2), Unified Theory of Acceptance and Use of Technology (UTAUT) (Berkeshchuk et al., 2020; Kim and Lee, 2020). In literature, two important theories that relate closely to understanding perception as behaviour intention has been reviewed. These theories are: Theory of Reasoned Action (TRA) and Technology Acceptance Model (TAM). Theory of Reasoned Action (TRA) is a widely studied model from social psychology which is fretful with the elements of consciously intended behaviour (LaCaille, 2020). According to TRA states that a person performance of a specific behaviour is determined by his/her Behavioural Intention (BI) to perform the behaviour and BI is jointly determined by the person's attitude (A) and Subjective Norm (SN) concerning the behaviour in question.

Similarly, attitudes toward behaviour are influenced by beliefs and evaluations. At the same time subjective norms are influenced by normative belief. Emerging information technology can't improve the teaching and learning effectiveness if it is not accepted and used by potential users (teachers and learners) of the technology. The need to understand why people accept or reject technology is very crucial. The need to investigate acceptance can be achieved when users believe that the technology in question is useful to them in achieving their major routines without a lot of hustling. Their belief in technology affects the attitude in using the technology, thus bringing up some behaviour (satisfaction). This concept has been coined in the technology acceptance model.

TAM is based on two main assumptions: i) Perceived usefulness of video conferencing (PUVC) and ii) Perceived ease of use (PEVC) which are influenced by external variables, the two (perceived usefulness of video conferencing (PUVC) and perceived ease of use of video conferencing (PEVC)) influence attitudes towards technology, similarly perceived usefulness and attitudes towards technology influence behavioural intention to use and finally the behavioural intention to use influences actual use. TAM is not only used for prediction but also for description to help researchers and practitioners detect why a particular system may be unacceptable and pursue appropriate steps (Teo, 2014).

In education, TRA and TAM have been used to evaluate the acceptance of technology in the learning and teaching environment. For example, the belief of a teacher and students about the use of multimedia projects in class for teaching could excite students in learning concepts. This at the same time would encourage students and teachers to participate equally in class hence attendance by students could improve. In this example, the perception of the fact is the belief of use whereas the technology in question is the use of multimedia projects in class. The use in this case can affect behaviour intention that is coming to class and this could in turn cause action that is behaviour change. Moreover, the belief of use of multimedia projector can be obtained from the fact that teachers or students could have heard it from other counterparts from different environment this causes a perception of social acceptability causing an intention to adopt multimedia projector in class (behaviour intention) and later causes the actual behaviour of use of multimedia use in class. This example explains TRA that perception of a fact causes attitude at the same time insinuates intention to act.

On the other hand, TAM is based on the principle that for one to adopt technology he/she first evaluates the usefulness of the technology and the same time the ease of use. In the same vein teachers and students before adopting the use of multimedia projector in class that's behaviour in class, they must clearly be convinced to use it that evaluate

whether it is or not useful. In our multimedia example, the acceptance or rejection of the technology in class determines the attitude to use a multimedia projector in class.

Adaptation to change, culture, education and awareness are factors to consider while evaluating acceptance and use of technology. In order to find out why people resist technology, predict how users will respond to technology and attempt to improve users' response towards technology, Technology Acceptance Model (TAM) is used.

5 Methodology

5.1 Research design

This study employed purposive survey with a researcher-designed questionnaire for data collection. A questionnaire is considered the most appropriate tool for this study because it involves soliciting for respondents' beliefs or behaviour. The tools allow the respondents to easily express their perception without being influenced by the persons conducting the study. In addition, the questionnaires gave them enough time to reflect on their answers.

5.2 Research participants

Data was collected from 43 teaching staff drawn from five universities. The five universities were selected because they give a representative sample of the slightly above 50 universities. The sample universities include one international university established by Organisation of Islamic Cooperation (OIC), one private charted university established by the church and three public universities. Ten teaching staffs consisting of both male and female were purposely selected from each of the five universities respectively and 43 responded.

Summary of the participants is given in the Table 1.

Table 1 Showing distributions and responses of questionnaires

S. No.	Name of the university	Status	No. issued out	No. returned
1	Busitema University	Public	10	10
2	Islamic University in Uganda	International	10	10
3	Muni University	Public	10	8
4	Uganda Christian University	Private	10	8
5	Kyambogo university	Public	10	7
	Total		50	43

The ten sampled individuals per university represented a holistic view of lecturers in that the information given by them is proper representation of the use of video conferencing in the selected university. Of the 50 dispatched questionnaires, we received 43(86%) in the stipulated period of one month. Given the rate, we find the data presented a correct representation of the sample required for this study. The 43 teachers were classified into teaching position (lecturer, assistant lecturer, teaching assistants).

From the 43 responses a total of 34 male teachers returned the questionnaire and nine were female. Of those who returned responses, 67.4% were aged between 25 years and

34 years, 27.9% were of age between 35 years and 44 years and 4.7% were aged between 45 years and 54 years. Of the 43 teaching staff, 27 were lecturers, 8 were assistant lecturers and 8 were teaching assistants.

5.3   The research tools

A self-completion questionnaire was used for the study. Questionnaires are easy to administer, user-friendly, and fast to score. Therefore, it takes a relatively shorter period of time for the respondents and researchers to complete and score. The questionnaire used in this study had six sections that included both open and closed-ended questions. The first section included questions seeking demographic information, the second to fourth sections were designed according to a five-point Likert scale (1 = strongly disagree to 5 = strongly agree). These sections solicited responses about perceived usefulness, ease of use and attitude as behaviour intention towards use of video conferencing in accordance with TAM model and TRA (Kim and Lee, 2020; LaCaille, 2020; Salloum et al., 2021). The fifth and the sixth sections are semi-structured questions seeking responses on challenges and support required for video conferencing implementation.

5.4   Data collection procedure

Data was collected using Google forms. The questionnaire was designed and the link was shared by the researchers directly to respective teaching staff in the aforementioned universities. The invited teaching staff was encouraged to share the link and invite as many staff as within their respective departments. Being an online form, all responses were received in real-time upon the completion of filling by each respondent. The data from the Google form was exported to Software Package for Statistics and Simulation (SPSS). Google forms were used because they provide a number of advantages which include real-time response, easy follow-up.

5.5   Data analysis procedure

Data collected from the questionnaires were tabulated in the form of the frequencies and percentages. Separate tables were drawn for different sections of the questionnaires. Each table was followed by its interpretation. SPSS version 20 software was used to do a quantitative analysis. The Weighted Mean (W.M.) of each component of the conceptual framework (perceived ease of use, perceived usefulness and attitude towards use) was determined and conclusion drawn. In the study weighted mean was consider because the study tool contains component that combined more than one variable whose responses differ in precision. It is therefore desirable to average the weights in the best way possible to give a single measure that is representative of the outcome of each component of the questionnaire. Secondly, we choose W.M due to the fact that each variable takes into account varying weights as assigned by each respondent. The Table 2 shows interpretation of weighted mean whereby Weighted mean $>= 4.5$ implies that the respondents strongly agree and their opinions have superior confidence, whereas Weighted mean $4.5 > W.M >= 3.5$ indicates that respondents agree and their opinions have high confidence, lastly Weighted mean below 3.5, indicates respondents are either

uncertain or disagree and their opinions on the item in question are low and have no confidence in them (Vanbelle, 2016).

Table 2 Showing weighted mean and its interpretation

Weighted mean	Interpretation
WM>=4.5	Strongly Agree (SA)
4.5<WM<=3.5	Agree (SA)
3.5<WM<=2.5	Uncertain(U)
2.5<WM<=1.5	Disagree (SA)
1.5<=WM	Strongly Disagree (SA)

6 Analysis and data interpretation

6.1 Analysis and interpretation of data using weighted mean

6.1.1 Perceived usefulness of video conferencing in teaching and learning at higher educational institutions.

The Table 3 shows the perceived usefulness of video conferencing in teaching and learning at higher education. The title columns represent variables (dimension of Video Conferencing in teaching and learning), weighted mean and std. deviation respectively. The test parameter consists of eight variables which include support for learning progress, collaboration, quality of teaching and learning, and assessment. In addition, variables that test for preservation of teaching material, maximisation of teaching and learning time and teaching platforms have been included. Lastly, a variable to test real-time learning is added.

Table 3 Showing the analysis of perceived usefulness of video conferencing in teaching and learning

Variables	W.M.	Std. Dev.
Supports learning progress	2.80	1.54
Supports collaborative teaching and learning	4.35	0.72
Supports quality teaching and learning	4.00	0.87
supports student assessment	3.35	1.17
Preserves instructional material	3.85	0.95
Maximises teaching and learning time	4.45	0.55
Maximises multiple platforms	4.40	0.81
Provide real-time learning for students on remote	3.76	1.24
Overall weighted mean	3.89	0.79

The average weighted mean, standard deviation of each variable and overall mean was computed and then tested against the interpretation stated in Table 1. The overall weighted mean is 3.89 ± 0.79, this means the opinion of the respondent towards usefulness of video conferencing is high. The value obtained herein indicates that

respondents agree that video conferencing is useful in teaching and that their opinion shows high confidence.

6.1.2 Perceived ease of use of VC in teaching and learning at higher education

The test parameters consist of six variables which include Simplifies sharing of instructional material/content easily, helps in gaining confidence in using video conferencing equipment, facilitates quality teaching in higher education, simplifies progressive introduction of new teaching and learning, requires training and lastly is seen not necessary in teaching.

Result in Table 4 was subject interpretation as Table 3. The overall weighted mean is 3.84 ± 0.97, this indicates that respondents agreed with the notion that using video conferencing in teaching is easy to use. Their opinion is of high confidence. Although their opinions are high, they score is low on if video conferencing is seen necessary in teaching in presence of physical in person, in class learning.

Table 4   Showing the analysis of perceived usefulness of video conferencing in teaching and learning

Variables	W.M.	Std. Dev.
Enables sharing of instructional material	4.24	0.83
Have confidence in use of video conferencing equipment	3.80	0.88
Facilitates quality teaching at HE	4.22	0.79
Teaches well using VC facility	3.80	1.02
Requires training	4.45	0.78
Is seen not necessary in teaching	2.57	1.57
Overall weighted mean	3.84	0.97

6.1.3 Attitude towards behavioural intention to use VC in teaching and learning

The test parameters consist of six variables which include Gives confidence in teaching, more advantageous than traditional teaching and learning, brings more productivity in teaching and learning, Hesitant to use and lastly, Makes teaching uncomfortable.

Table 5   Showing the analysis of the attitude towards behavioural intention to use video conferencing in teaching and learning

Variables	W.M.	Std. Dev.
Hesitate to use VC	2.79	1.21
Teachers are not scared of using VC	4.31	0.66
use of VC makes teaching uncomfortable	2.63	1.19
Brings more productivity in teaching and learning	4.17	0.83
want to learn more about use of VC	4.38	0.63
Makes teaching productive	4.38	0.63
Overall weighted mean	3.70	0.99

The overall weighted mean is 3.70 ± 0.92, this means the data measuring opinion of the respondent attitudes towards use of video conferencing is concentrated along with the

mean value. The value obtained herein indicates that respondents agree that teachers have a positive attitude towards use of video conferencing in teaching and that their opinion is of high confidence. Although their opinions are high, they score is low on hesitant to use video conferencing in teaching. This could be because of lack of infrastructure and knowledge required to deliver lessons using VC.

6.2 Thematic analysis of structured questions

6.2.1 Challenges of integrating video conferencing in teaching and learning

The structured question was analysed by developing themes. The challenges were categorised in four major themes. The themes included challenges internet connectivity, insufficient infrastructure, required skills and training and weakness in delivery instruction using VC (pedagogy). We present the word count summary of challenges in Table 6.

Table 6 Showing a word count summary of challenges

No	Challenges	No. appearance (%)
1	Internet connectivity	59.1
2	Infrastructure	44
3	Skills and training	50
4	Pedagogy	27

The challenges that hinder the use of VC in institutions are Internet facility and connectivity (59.1%), Infrastructure (44%), skill and Training (50%) and pedagogy (27%). The most predominant challenge revealed by the respondents was internet connectivity.

6.2.2 Suggested support required for VC

Solutions fronted by respondents to overcome the above challenges were categorised in five major themes which include internet connectivity, infrastructure, skills and training, funding and sensitisation.

Table 7 above shows that improvement of infrastructure (34%), expansion of internet access and connectivity (22%) to include rural areas, deliberate action to impart skills in use of technology (27%), funding of technology programs at the universities (25%) and sensitisation of teachers to use technology in teaching and learning (13%). This generally means that the most crucial advancement was needed in improving infrastructure.

Table 7 Showing word count of suggested support required for VC

No.	Suggestion to overcoming the challenges	Appearance (%)
1	Internet connectivity	22
2	Infrastructure	34
3	Training	27
4	Funding	25
5	Sensitisation	13

7 Discussion, limitations, recommendations and conclusion

7.1 Discussion on the major findings

The findings of this study reveal that respondents have a high opinion on the use of VC as a mode of teaching and learning at higher educational institutions in Uganda. In particular, the respondents agree that video conferencing is useful in teaching and learning, easy to use and the respondents' attitude towards use of video conferencing in teaching and learning attracted high confidence as indicated by weighted means presented in table 3. This high opinion reflects on the fact that teachers appreciate video conferencing as a mode of teaching. Furthermore, video conferencing can be used to explain a variety of topics in the student domain of learning progressively from simple to complex concepts. This can immediately be followed by quizzes that can be rewarded using marks or badges. Assessment video conferencing material can be done in real-time or offline. The offline function enables students to go back and recap on the concepts that were not grasped during real-time presentation of content. This is an additional value to the traditional setting. This result is consistent with studies in Benitt (2019), Kohnke and Moorhouse (2021) and (Rehn, 2017) in which it was concluded that VC is a helpful instrument that enables teachers gain knowledge, deliver content and gain opportunity for collaboration.

On some occasions video games, puzzles and flashcards are added to video conferencing sessions. This allows learners to recognise concepts that allow the teacher to tap from learners' background knowledge so as to challenge existing ideas. These advance learning. Further slides, charts, and virtual field trips can be embedded to provide rich experience to learners. Students can create videos and post them to the teacher to acquire feedback and assess students learning. With advancement in video conferencing application, content can be embedded in websites, blogs, wikis and online messaging platforms. Thereby increasing the scope video enable teaching as a useful component of teaching and learning. Including all sorts of tools in VC class makes student study from anywhere at any time even during time of disaster. This gives autonomy and independence for both teachers and student. We find this consistent with other studies in Knapp (2018), Piotrowski and Robertson (2017) and (Rassaei, 2017) who identified that VC sessions received positive feedback from students and teachers, improved engagement besides identifying mismatches between learners and teachers that are bridged using VC tools.

Perceived ease of use of video conferencing has strong evidence on student outcome, this is because it affects pedagogy, quality of instruction, classroom climate, classroom management and optimisation of learning. Well prepared video conferencing class allows content creation in real-time as the presenter delivers a lecture. This content can be produced for reuse later by the students. At the same time those who were not available for the lecture during live streaming can have a copy, this kind of sharing provides an important platform for learners to revisit content again and again until mastery is achieved. At the same time quality of instruction is improved because video conferencing provides an audio-visual environment which comes with motivation, clarification, discouragement of cramming, increase of vocabulary, and brings direct experience, hence reinventing new ways of teaching/learning in schools. Similar results are found in Benitt (2019) and Rassaei (2017).

7.2   *Challenges of integrating video conferencing in teaching and learning*

The study also revealed that the major challenges are infrastructure, internet facility and connectivity, skill, training and pedagogy as reflected in Table 6. However, to a lesser extent Lack of institutional support in terms of e-learning policy, funding and planning and lack of administrative support possess substantial challenges too.

- *Facilities/infrastructures*: From the findings, very few universities in Uganda have video conferencing facilities used in teaching and learning. This means that very few teachers in Uganda have access to this technology. In addition, other factors include electricity, telephone connectivity, internet which is restricted to urban areas and thereby influencing the trend of access to technology. Furthermore, access to other equipment such as computers, usage of computer labs by different classes has placed a challenge on usage of infrastructure because the student computer ratio is high. This limits the time for access to the computer by both teachers and students. Owing this lack of exposure, there exists technology access inequality in teachers. Hence many teachers choose to remain in the comfort zones of teaching in the traditional way. The respondents also noted that there is resistance to change, this makes teachers not to appreciate teaching using video conferencing.

- *Internet access/connectivity*: The internet was one of the major challenges cited by the respondents. Most of the lectures or instruction takes place through the internet connection and requires high-speed internet to have video conferencing as a mode in teaching and learning process. Teachers reveal that slow and unreliable internet affects the use of video conferencing during classes. This is seen as a major challenge which has hampered the integration of video conferencing in teaching-learning process. Similarly, video conferencing requires fast and reliable internet, this basically comes with a cost.

- *Skills and training*: Since the access to technology is very low, the level of skills and knowledge of teachers, administrators and students in these areas are insufficient. Thus, the acceptance and value of these technologies in education are unimportant. The findings show the teachers stressed the need for training in order to gain some skills which can help them on how to use the new teaching platform and the students needed to be oriented on how to learn and access learning materials from the new system. The demanded training like any other factor is directly connected to cost. The costs are associated with the purchase, setup and testing, Internet subscription, services and maintenance as well as training. This becomes expensive for those institutions which rely partially or fully on fees collection for sustenance. It was also revealed the technical support is lacking since very few experts who have qualifications in the use and setup of new technologies in teaching and learning.

- *Pedagogy*: The findings revealed that teachers lack teaching skills using technology and those with the basic knowledge due to inaccessibility of computers, their skills tend to degrade or even vanish. Therefore, it is clear that many people are not well familiarised with the use and application of ICTs (VC) in day-to-day activities and hence their knowledge and skills in ICT related work is low. This makes it hard for teachers to effectively integrate such technology in lectures/module development. In addition, the findings revealed that most teacher training curriculum does not include

courses that are aimed at imparting knowledge in new instruction technologies. This causes a fear factor that influence teachers to remain comfortable with the traditional ways of instruction.

The study revealed that apart from the challenges caused by infrastructure, internet facility, skill and pedagogy. In addition, Lack of institutional support in terms of e-learning policy, funding and planning and lack of administrative support pose substantial challenges to a lesser extent.

7.3   Support needed in adopting VC in teaching and learning

The study revealed support is required across different dimensions to support adoption of VC as a mode of teaching and learning. These dimensions include improvement of infrastructure, expansion of internet access and connectivity to include rural areas, deliberate action to impart skills in use of technology, funding of technology programs at the universities and sensitisation of teachers to use technology in teaching.

- *Infrastructures/facilities*: The findings reveal that many institutions of learning lack facilities that support technology (video conferencing). So, to overcome that respondents suggested that hardware and software infrastructures should be put in place in order for video conferencing to be easily integrated in teaching and learning environments. Similarly, internet connectivity and other related issues should be put in place.

- *Training*: Owing this lack of skills, training of all the stakeholders involved in the teaching and learning environment was suggested by the respondents. This equips the teachers, students, administrators with the skills needed in order to smoothly use technology in their day-to-day activities. Respondents suggested this can be done by doing an induction training to impart the stakeholders with the necessary knowledge needed in order to embrace technology. Similarly, extensive training was suggested by the respondents. This can change the pedagogical approaches by the teachers to suit the 21st-century teaching models.

- *Internet/connectivity*: The findings revealed that internet is the biggest challenge in Uganda as its characterised by many factors such as slow, unreliable, expensive and concentrated around urban areas.

7.3.1   Suggested solutions

To handle this challenge the respondents suggested quit a number of factors to be used to encounter this challenge;

- *Increasing the internet bandwidth*: In university, as one respondent suggested, this can be done using either an analogue or digital telephone line across a network within an institution using dedicated cables, radio waves or microwaves in order for video conferencing to be integrated in the teaching and learning environment in universities in Uganda. Further suggestions include an extension of internet connectivity to remote areas and make the internet more accessible, affordable and train users on how to use it.

- *Funding*: As it was revealed in challenges, cost was attached to each of the challenges revealed. Therefore, many respondents suggested that help from the government be a kind of donation or grant to facilitate the integration of technology in the teaching and learning process. This donation can facilitate the purchase of equipment, installation and configuration /setting up. Similarly, the institutions with enough resource should support the integration.

- *Sensitisation*: One challenge revealed that many teachers lacked enough information about the importance of technology in the teaching and learning process. This was due to lack of exposure backed by inaccessibility of technology. On this note therefore, there is need to sensitise the stakeholders in different institutions on the benefits of video conferencing. In doing so, this will help to motivate the teaching staff, students and administrators of various learning institutions. The sensitisation of the stakeholders will change their perception towards the use of VC technology.

7.4 Limitations and implications of the study

First, the number of participants is small, which limits the generalisation of the results of this study. The sample size of 43 teaching staff from five universities is small. Therefore, it's hard to generalise based on this sample size. Similarly, the convenience sampling technique that was used has its limitations. Secondly, this study used a questionnaire which is argued to be inadequate to understand some forms of information such as, changes of emotions, behaviour, feelings, etc. which affect the response.

7.4.1 Areas of further studies

Perception of Video Conferencing at higher institutions in Uganda, focused mainly on university education. From literature Video Conferencing has a very wide scope and potential to improve and duplicate teaching across all levels of education this, therefore, opens up the following areas for further studies one of the areas of further studies include effectiveness of Video Conferencing in retooling teachers. Secondly, studies to explore the possibilities of using Video Conferencing as a mode of vocational education and training is required. We note that business and technical and vocational education is the core of every developing nation. Therefore, finding out how to improve BTVET using online forms of education. The third area of exploration includes online education which can help in extending the skills and knowledge to groups of impaired learners. Lastly, it is becoming more relevant to study online education for secondary, primary and high schools. Learning more about the impact of online tools on how children learn will assist impact knowledge to the school going population, hence drawing roadmaps on integrating online mechanisms in secondary schools in Uganda.

7.5 Conclusion

In conclusion teachers in HEI have a high opinion about the use of VC as a mode of teaching at higher educational institutions in Uganda. However, they encounter many challenges. Infrastructure, internet facility, pedagogy, insufficient funds and inadequate levels of skills in the use of these technologies is the centre of all challenges in the implementation of this great educational endeavour. Improvement of infrastructure,

expansion of internet access and connectivity to include rural areas, deliberate action to impart skills in use of technology, funding of technology programs at the universities and sensitisation of teachers to use technology in teaching are required to advance not only VC but ICT in general. Proper infrastructure development will not only increase the probability of excellent integration of VC in the teaching-learning process but also boost independence of learners in undertaking challenging innovations. In future we hope to study VC and related technologies in business, technical, vocational, education and training institution as a distinct education sector that leads to development of hands-on skills for development of societies.

7.6   Recommendations

Having found that the teachers' opinions are high about Video Conferencing being useful, easy to use and also the attitude towards use being positive. The following recommendations follow suit putting into consideration the suggestions made by the respondents herein.

The first recommendation is to improve the infrastructure. Building and improving the existing infrastructures will increase accessibility to Video Conferencing technology. Secondly, there must be deliberate effort to extend the internet backbone to rural areas so that the universities in the rural areas can tap from the backbone. This will help universities to connect to the Video Conferencing classes anywhere and anytime. Lastly, the government through the ministry of education should equip its universities and other high institutions with enough resources so as to match the standards needed for Video Conferencing. Similarly, the private universities through their funders should adhere to National standards of improving their ICTs so that VC application are easy to adopt. This will help better integration of Video Conferencing in teaching and learning at universities and Higher education institution in all.

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