

The Strategic Drivers Influencing Teachers' Integration of ICT in Teaching and Learning Environment

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How to cite this paper: Japhet E. Lawrence. (2022). The Strategic Drivers Influencing Teachers' Integration of ICT in Teaching and Learning Environment. *The Educational Review, USA*, 6(7), 300-311. DOI: 10.26855/er.2022.07.004

Received: June 5, 2022

Accepted: July 2, 2022

Published: August 1, 2022

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Abstract

There is a growing demand on educational institutions to use Information Communication Technology (ICT) to teach the skills and knowledge students need for the digital age. ICT is becoming increasingly important in our daily lives and in our educational system. The integration of ICT into teaching and learning environment provides more opportunities for teachers and students to work better in a globalised digital age. ICT has the potential to play an increasingly vital role in education be it in classroom, administration and online instruction or other activities. There is tremendous potential for teachers and students to harness the power of ICT to improve the quality of teaching and learning in the classroom. The purpose of this study is to identify the drivers that may influence teachers' decision to integrate ICT in teaching and learning. The study is chosen because of the strategic importance of ICT in education in general and particularly, its immense potential, to transform the ways in which teaching is carried out in the classroom. It provides opportunities for greater flexibility interactivity and accessibility for engaging teaching and learning at the individual, group, and societal levels. There are a lot of studies in the area, but very little empirical research has been conducted to examine this phenomenon from the teachers' perspective. The present study aims to fill this gap by using in-depth case studies, conceptualised within the grounded theory method to develop a model that will explain and enhance the understanding of the drivers influencing teachers' integration of ICT in teaching and learning environment. The diffusion theory will provide the theoretical foundation for this study.

Keywords

Integration, teachers, teaching and learning, ICT, drivers, grounded theory

1. Introduction

Technological innovations are increasingly being used to derive changes intended to deliver significant performance improvement in education (Lawrence, 2018). The explosive growth of Information communication technologies (ICT) has changed modern society and has dramatically reshaped teaching and learning. There is a growing demand on educational institutions to use ICT to teach the skills and knowledge students need for the digital age. The integration of ICT into teaching and learning provides more opportunities for teachers and students to work better in a globalised digital age. There is tremendous potential for teachers and students to harness the power of ICT to improve the quality of teaching and learning in the classroom. The use of ICT to improve and enhance the quality of teaching and learning is essential for successful education in the 21st century (Lawrence & Tar, 2018). ICT covers all technologies used for

the handling and communication of information and their use, specifically in education. For example, desktops, mobile telephony, digital recording equipment, software applications, multimedia resources, information systems, Intranet, Internet, tablet, PCs, e-readers, laptops etc, provide a great deal of opportunities, as well as challenges for education in general, particularly teaching and learning environment.

A report by UNESCO (2004) states that ICT holds promise in providing not only anywhere and anytime access to knowledge, but also equal opportunities for networking and communication that allows knowledge sharing, participation, and lifelong learning. ICT plays a critical role in education; it provides a strong teaching and learning environment for students. ICT can be used to complement existing teaching practices to support the teaching and learning process and it can be very helpful for teachers' in preparing their lessons and delivery. It can be used to improve and enhance student learning and motivation in the classroom. ICT provides opportunities for greater flexibility and accessibility for engaging teaching and learning at the individual, group, and societal levels (UNESCO, 2004).

The integration of ICT in education continues to gain momentum in educational literature (Lawrence, 2018). The growth of ICT has opened a vast arena providing opportunities for the improvement of education, particularly in teaching and learning environment, where teaching and learning can take place anytime and anywhere (Lawrence, 2020). The role of ICT in teaching and learning has been increasingly important amongst educators as a mechanism to improve quality in the classroom, interactivity and facilitate flexibility in learning experiences, anywhere and anytime suitable to individuals (Lawrence & Tar, 2018). Students can choose what they want to learn, when and where to learn; this provides them greater independence a feature of lifelong learning (UNESCO, 2004). Through using ICT, learners can connect and collaborate with other students around the world.

The purpose of this study is to empirically identify the drivers influencing teachers' decision to integrate ICT in teaching and learning environment. The intention is to present evidence from teachers' perspectives. Previous research (Hennessy et al., 2005) has shown that theoretical grounding for understanding and developing clear process of ICT integration has been lacking. The present study aims to fill this gap by using grounded theory to develop a model that will explain and enhance the understanding of the factors that influence teachers' adoption of ICT in teaching and learning environment.

2. Conceptual Framework: Diffusion theory

The diffusion theory (Rogers, 1995; Rogers, 2003) offers theoretical base for examining the drivers influencing teachers' integration of ICT into teaching and learning. It is hoped that the use of the theory will widen the scope of inquiry and pools the lessons learned from research that spans disciplines and methodologies and provides insights that may help to extend the depth and breadth of understanding of the integration of ICT in teaching and learning environment. The study seeks to build on and extend the model and previous research on adoption, integration and implementation, by providing integration model, propositions, and data designed to increase the understanding of the drivers influencing integration of ICT in teaching and learning.

Rogers (1995) diffusion of innovation theory is used to study a variety of innovations and it has been used in hundreds of studies including fields such as education, social sciences, health, agriculture, anthropology, business, and economics. The theory is one of the most popular theories for studying integration of information technologies and understanding how IT innovations spread within and between communities. Rogers (1995) defines innovation as an idea, practice, or object (ICT) that is perceived as new by teachers. Thus, an innovation can be a new idea, such as an innovative approach of teaching, technological innovation like ICT can create uncertainty in the minds of potential teachers (e.g., about its expected consequences on effect of teaching) as well as representing an opportunity for teachers to reduce uncertainty in another sense (its ability to improve teaching and learning). The latter type of potential uncertainty reduction represents the possible efficacy of ICT in solving teachers' felt need or perceived problems. The attributes or characteristics of an innovation as perceived by the members of a social system (teachers) determine its rate of integration.

There is a burgeoning body of work on ICT integration in education (Rogers, 1995; Rogers, 2003; Davis, 1989) which focussed on factors such as relative advantage, complexity and ease of use, that have examined the overall impact of these variables on integration of technological innovation. Technological characteristics influence the diffusion processes of an innovation and are significant factors impacting innovation integration. Rogers (2003) states that characteristic of an innovation as perceived by individual in a social system affect the rate of adoption and integration. He identifies five technological characteristics that may contribute to the adoption or acceptance of an innovation such as relative advantage, compatibility, complexity, observability, and trialability. Stockdill and Morehouse (1992) identify user characteristics, content characteristics, technological considerations, and organizational capacity as factors influencing ICT integration into teaching and learning. Balanskat et al. (2007) further, add teacher-level, school-level and

system-level. While personal characteristics such as educational level, age, gender, experience with computer and attitude towards computers can influence the integration of a technology.

Other studies have shown that teachers' integration of ICT into teaching is also influenced by organizational factors, attitudes towards technology. Lawrence (2019) highlights independent variables such as management commitment and user involvement as influential drivers in the integration of innovations. The relationship between an innovation's characteristics and integration has been examined in several diffusion studies. Albirini (2006) find that computer attributes are significantly correlated to teachers' attitudes towards computer. The study highlights the importance of technological attributes in the integration of ICT in teaching and learning process. Teachers' computer experience relates positively to their computer attitudes, the more experience teachers have with computers, the more likely that they will show positive attitudes towards computers.

3. Research question

This study sets out to identify the drivers influencing teachers' ICT integration in teaching and learning process. The study is cross-sectional in nature and the data for the study was collected over a six-month period. The study aims to build on the work done so far by using grounded theory technique to develop a theory designed to contribute toward a fuller understanding of the drivers influencing ICT integration in teaching and learning. Specifically, the study examines the main questions: What are the major divers influencing teachers' ICT integration in teaching and learning? The analysis and discussion draws on in-depth case studies with a purposive sample of tertiary teachers in Nigerian universities. The question of learning and understanding how these drivers influence integration of ICT that is generated through this study is of interest and concern for academics, universities and policy makers.

4. Research design

The study takes the form of exploratory and descriptive research, focusing on the major drivers influencing teachers' integration of ICT in teaching and learning. Semi-structured interviews were conducted with four teachers regarding their perspectives on the integration of ICT into teaching and learning. The study used qualitative approach to provide an in-depth description, conceptualised within the grounded theory method to explain the drivers influencing ICT integration in teaching and learning process.

4.1 Data collection

4.1.1 Case participants

Six tertiary teachers were approached to participate in the study, four of the six teachers agreed to participate. These four teachers came from four universities, two from northern Nigeria and the other two from the southern part of Nigeria. All teachers were members of staff and all were at the level of lecturer or higher, with one being professor. Letters were emailed to these teachers requesting a one-hour interview. The purpose of the study and the nature of the research were clearly spelled out as were assurance of confidentiality. The participants were asked open-ended questions. The primary details of the teachers that participated in the study are shown in table 1 in no significant order.

Table 1. List of participating teachers

teachers	location of institution	age	Teaching experience	Department
UT	Northern Nigeria	47	16	Political science
UE	Northern Nigeria	52	20	Computer Science
NK	Southern Nigeria	38	7	Nursing & Midwifery
DL	Southern Nigeria	44	10	Arts & Education

Source: (study data)

4.2 Interview

Interviews are arguably the primary data sources where interpretive research is undertaken (Yin, 1994), as it is through interviews that researchers can best access participant's views and interpretations of actions and events (Walsham, 1995). Kaplan and Maxwell (1994) indicate that the primary goal of interview is to elicit the respondent's views and experiences in his or her own words rather than to collect data that are simply a choice among pre-established response categories. Interviews are flexible enough to favour adaptation to each context, organisation also to pursue unexpected paths and cues suggested by the theoretical sensitivity (Glaser & Strauss, 1967) developed by the researcher

throughout the research process.

Semi-structured interviews of one hour were conducted, recorded and transcribed.

This is the main preferred data collection method where teachers can freely discuss their individual situations as to how they integrate ICT in teaching and learning. Questions are open-ended and a relatively unstructured interviewing format was adopted. The teachers were offered interview guide prior to each interview so that they can reflect on their responses. The recursive model of interviewing, whereby the interview proceeds along the lines of a conversation, was used to enable teachers to reflect on their experiences, discuss issues they considered important, and to elicit finely grained insights into their integration of ICT in teaching and learning. The interview transcripts were analysed using grounded theory technique to identify key areas of teachers' integration of ICT in teaching and learning process. The first round of interviews was used to gain a formative understanding of each teacher's perspectives with the research question outlined above being used as a guide, to provide the first body of data. Then subsequent data collection was guided by the theoretical sampling principle of grounded theory as defined by Strauss and Corbin (1998), sampling based on concepts that have proven theoretical relevance to the evolving theory. Teachers were asked to discuss and verify, individually the accuracy of the researcher's representation of their views and the theory emerging from such views.

5. Data analysis

The process of data analysis in qualitative research “involves working with data, organising it, breaking it down, synthesising it, searching for patterns, discovering what is important and what is to be learned, and deciding what you will tell others” (Bogdan & Biklen, 1982). Throughout data collection, data analysis will take place through systematic procedures regarding abstraction and comparison outlined in the grounded theory method (Glaser & Strauss, 1967). The grounded theory approach uses an iterative pathway moving from data collection to emergent theory and back again until theoretical saturation is reached.

The grounded theory coding methods are: open coding, axial coding and selective coding with the understanding that a researcher may alternate between all three forms of analysis depending upon the changing circumstances of the study (Glaser & Strauss, 1967). Coding is “the crucial link between collecting data and developing an emergent theory to explain the data”. Strauss and Corbin (1998) recommend line-by-line open coding that gets researcher off the empirical level by fracturing the data, and then conceptually grouping it into codes that then become the theory, which explains what, is happening in the data. Axial coding involves re-building the data (fractured through open coding) in new ways by establishing relationships between categories and their subcategories. Selective coding is to integrate and refine the categories into a theory, which accounts for the phenomenon being investigated and validates the statements of relationships among concepts, and fills in any categories in need of further refinement. Memo writing is occurring throughout the analytic process whereby memos elaborate processes, assumptions, and actions that are subsumed under codes.

6. Case study analysis

This section discusses the analysis of the teachers that participated in this study. The aim of the case study is to elicit qualitative information and to produce in-depth, holistic study (Yin, 1994), giving the reader sufficient contextual descriptions to allow them to transfer the case studies based on conceptual applicability. The case studies are reported with sufficient detail and precision to allow judgements about transferability and to generate theory which is fully grounded in the data. Glaser and Strauss (1967) define grounded theory as being one which is “readily applicable to and indicated by the data, and is meaningfully relevant to and is able to explain the behaviour under study”.

The study focused on the in-depth understanding of the drivers influencing teachers' decision to integrate ICT in teaching and learning. The material is drawn from four separate field studies carried out within the broad tradition of interpretive case study (Walsham, 1995). The case study involved extensive interviewing of key participants (university teachers), coupled with the use of documentary evidence. The data analysis process involved identifying patterns in the data; these patterns included issues raised repeatedly across interviews, commonly found in ICT usage in teaching and learning activities or opinions, which kept re-appearing. The data was analysed within each case as well as across the cases to detect similarities and compare differences. The initial concepts that emerged in one case context were then contrasted, elaborated, and qualified in the other. Within the first case, the iterative approach of data collection, coding, and analysis was more open-ended, and generative, focusing on the development of concepts, properties, and relations, and following the descriptions of how to generate grounded theory set out by Glaser and Strauss (1967) and Eisenhardt (1989).

The detailed write-up of the cases and all the data generated by interviews and documentation were examined and

coded by focusing on the drivers influencing integration of ICT in teaching and learning. The case data were read and categorised into concepts that were suggested by the data rather than imposed from outside. This is known as open coding (Strauss & Corbin, 1998) and it relies on an analytic technique of identifying possible categories and their properties and dimensions. Once all the data were examined, the concepts were organised by recurring theme. These themes became prime candidates for a set of stable and common categories, which linked a number of associated concepts. This is known as axial coding (Strauss & Corbin, 1998) and it relies on a synthetic technique of making connections between subcategories to construct a more comprehensive scheme. The case data were then re-examined and re-coded using this proposed scheme, the goal being to determine sets of categories and concepts that covered as much of the data as possible.

This iterative examination yielded a set of broad categories and associated concepts that described the salient conditions, events and experiences associated with integration of ICT in the first teacher case. These initial concepts guided the remaining case study, allowing the process of data collection, coding, and analysis to be more targeted. Following the constant comparative analysis method (Glaser & Strauss, 1967), the initial teacher case’s experiences were systematically compared and contrasted with the second teacher case. This analysis also used Miles and Huberman’s (1994) technique for across site pattern comparison and clustering that involves matrix displays to compare key events, triggers, and outcomes, see Table 2. The presence of these categories is indicated by a ‘Yes’ in the table. The results indicated a positive relationship between teacher-level, technological and institutional drivers. In all the cases, teacher-level, technological and institutional drivers (resources) were congruent with the integration decision, except for one teacher that did not indicate a yes for resources.

Table 2. Across case pattern comparison

Core categories	Subcategories	Teachers			
		UT	UE	NK	DL
Teacher-level drivers	Attitude toward ICT	Yes	Yes	Yes	Yes
	Teachers’ ICT knowledge	Yes	Yes	Yes	Yes
	Compatibility	Yes	Yes	Yes	Yes
Technological drivers	Benefit of using ICT	Yes	Yes	Yes	Yes
	Perceived usefulness of ICT	Yes	Yes	Yes	Yes
	Perceived ease of use of ICT	Yes	Yes	Yes	Yes
Institutional-level drivers	Leadership support	Yes	Yes	Yes	Yes
	Resources	Yes	Yes		Yes

Source: (Case study data)

Data from the second teacher case was first sorted into the initial concepts generated by the first teacher data. It soon became clear however, that the initial concepts generated by the first teacher case did not accommodate some of the findings emerging from the second teacher case. Accommodating the second teacher case’s experiences, led to some important elaborations and clarifications in the emerging theoretical framework, and forced a reconsideration of some of the first teacher case’s experiences. The process of comparing and contrasting the teacher case data was repeated for the remaining teacher cases. Redefining the initial concepts to incorporate considerations of the second teacher case’s experiences required returning to the first teacher case data, and re-sorting and re-analysing them to take account of the richer concepts and more complex relations now constituting the framework. This ability to incorporate unique insights during the study is one of the benefits of a grounded theory approach, an example of what Eisenhardt (1989) labels “controlled opportunism”, where “researchers take advantage of the uniqueness of a specific case and the emergence of new themes to improve resultant theory”.

The iteration between data and concepts ended when enough categories and associated concepts had been defined to explain what had been observed at all the teacher cases, and no additional data was found, to develop or add to the set of concepts and categories, a situation Glaser and Strauss (1967) refer to as “theoretical saturation”. The resultant framework is empirically valid as it can account for the unique data of each teacher case, as well as generalise patterns across all the teacher cases (Eisenhardt, 1989). The core categories and subcategories that emerged from the analysis are shown in Table 3. Finally, having analysed interview transcripts from each of the teacher cases, the categories generated provided the basis for constructing a qualitatively rich narrative description of the integration of ICT in teaching and

learning. This account was then fed back to the interviewees, who provided commentary, correction, and elaboration on drafts of the findings and conceptual model.

Table 3. Core categories and subcategories that emerged from the data analysis

Core categories	Subcategories
Teacher-level drivers	Attitude toward ICT
	Teachers' ICT knowledge
Technological drivers	Compatibility
	Benefit of using ICT
	Improve communication
	Global reach of ICT
	Easy access to information
	Perceived usefulness of ICT
Institutional-level drivers	Perceived ease of use of ICT
	Leadership support
	Resources

Source: (Case study data)

7. Discussion of the case study findings

The previous section has analysed the teachers that participated in this study and identified the drivers that influenced integration of ICT. This section presents the case study results, describing the experiences of teachers' ICT integration in the process. The results from the case study were used to develop a theoretical model for conceptualising the organizational issues around the integration of ICT. The results of the multiple case studies will be discussed in terms of the categories that emerged from the grounded theory analysis process. The intention is to identify and give substance to each of the categories. The integration drivers that emerged from the teachers' experiences with ICT are depicted in Figure 1.

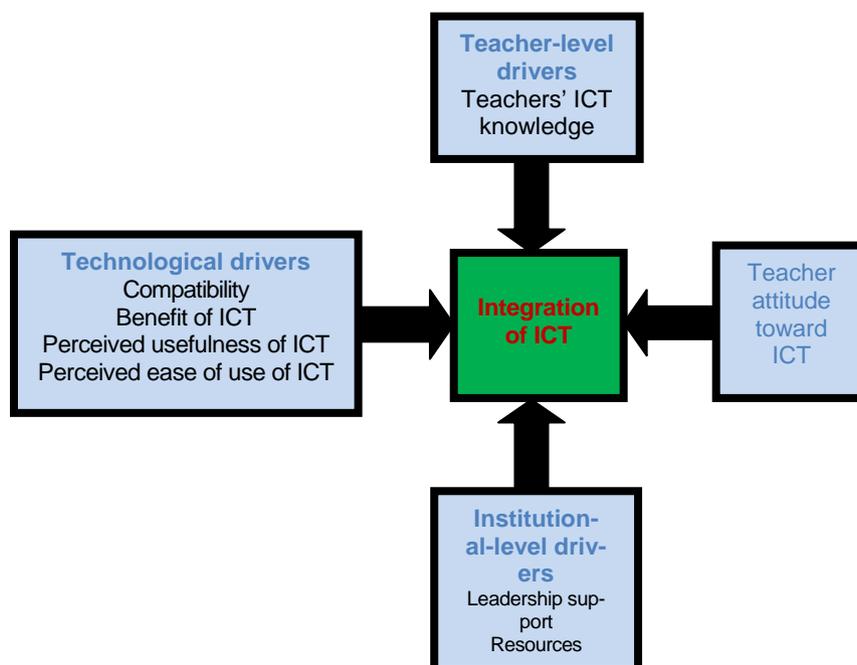


Figure 1. Proposed conceptual Model of ICT Integration.

Figure 1 shows the categories and concepts that emerged as salient from the data analysis, as well as their relationships. This theoretical model is proposed as an initial formulation of the key drivers influencing teachers' decision in integrating ICT in teaching and learning. It attempts to show a 'map of the territory' based on the analysis developed from the case study data. It is "the researcher's first cut at making some explicit theoretical statements" (Miles & Huberman, 1994). The researcher sees the theoretical model as simply the current version of the map of territory being investigated. No claim is made that the drivers and categories presented here are exhaustive. Further studies of ICT integration in other educational setting should add to or modify the idea presented here. The categories constituting the drivers influencing teacher's decision to integrate ICT in teaching and learning are discussed below.

7.1 Integration of ICT

Researchers have identified several indicators of ICT acceptance. The most generally accepted measures of ICT in education appear to be user satisfaction, system usage and frequency of use has been employed as measure of implementation success (Davis, 1989). However, system usage has been the primary indicator of technology acceptance (Davis, 1989). Furthermore, system usage has a notable practical value for managers interested in evaluating the impact of IT. The focus of the study is on the drivers influencing ICT integration in teaching and learning. Therefore, integration of ICT is used as an indicator. It is important to note that ICT related to technology usage in educational sector in its entirety rather than to a specific function.

7.2 Attitude toward ICT

Attitude toward ICT refers to the teachers' general feeling of favourable or unfavourable for the use of ICT in teaching and learning process. The attitudes of teachers towards ICT can influence integration, if teachers have negative attitudes toward ICT, providing them with excellent ICT facilities may not influence them to integrate it into their teaching (Lawrence, 2002). The case result shows that all the teachers that participated in the study have positive attitude towards the use and integration of ICT. It shows that attitude is an important driver in the integration of ICT. The case study findings support others (Lawrence, 2019) which found attitudes of teachers towards technology greatly influence integration of computers into their teaching and learning. Lawrence (2020) indicates that to successfully implement educational technology in school's program depends strongly on the teachers' support and attitudes. It is believed that if teachers perceived technology programs as neither fulfilling their needs nor their students' needs, it is likely that they will not integrate the technology into their teaching and learning. However, if teachers' attitudes are positive toward the use of educational technology then they can easily provide useful insight about the integration of ICT into teaching and learning processes.

7.3 Teacher-level drivers

The integration of ICT is strongly governed by teachers' characteristics such as age, gender, educational experience, knowledge of ICT, and attitude towards ICT can influence integration. A teacher that has skill or knowledge is in a better position to judge the usefulness of ICT in teaching and learning activities. Therefore, an understanding of personal characteristics that influence teachers' integration of ICT into teaching is relevant. The teachers' characteristics driver is described by knowledge of ICT that emerged from the case analysis, which is found to explain the integration of ICT in teaching and learning (Lawrence, 2019; Alshalawi, 2022).

7.3.1 Teachers' ICT knowledge

The case evidence shows that teachers' ICT knowledge is an important concept in understanding the integration of ICT. Teachers use and integrate ICT in teaching and learning activities, if they have the skill or knowledge to judge the effectiveness of the technology and not by its sheer existence in the classroom. The case result shows that all the teachers in the study use PowerPoint in delivering their lectures and two of the teachers use smart whiteboard in their classroom. The case study finding is supported by Lawrence (2018), Tenai (2017), Willermark (2017) that found adopter characteristics such as experience with computer and attitude towards computers can influence the integration of technology in the classroom. Teachers' computer experience relates positively to their attitudes toward ICT usage. The more experience teachers have with computers, the more likely that they will show positive attitudes towards computers. Positive computer attitudes are expected to foster computer integration in the classroom, for successful transformation in educational practice, teachers need to develop positive attitudes toward integration of ICT in teaching and learning activities (Tondeur et al., 2017; Akcil et al., 2021; Lawrence, 2020).

7.4 Technological drivers

Technological drivers represent the perceived characteristics of ICT. The integration of ICT is strongly governed by

how teachers perceive ICT and its capability to leverage it for teaching and learning activities. If teachers perceived that the use of ICT offers relative advantage over other technologies, for example improve teaching and learning quality, it is likely to be integrated into teaching. Technological characteristics influence the diffusion processes of an innovation and are significant drivers impacting innovation integration. Evidence from previous study suggests that technological attributes as perceived by teachers influence the rate of integration (Rogers, 2003). Rogers stresses the need to understand the perceptions of an innovation, as this has strong influence on future prediction of integration of specific innovation. The technological driver is described by five characteristics of ICT that emerged from the case analysis, which is found to be influential in the integration of ICT in teaching and learning. These characteristics are compatibility of ICT, benefits of using ICT, perceived usefulness of ICT and perceived ease of use of ICT in carrying out teaching and learning activities in the classroom.

7.4.1 Compatibility

The compatibility of ICT refers to the degree to which the use of ICT is perceived as being consistent with the existing practices, values, past experiences, and the needs of teachers. The use of ICT not only changes the traditional ways of teaching, but also requires teachers to be more creative in adapting and customizing their own teaching materials and strategies (Lawrence, 2020; Ifinedo & Kankaaranta, 2021). The integration of ICT presents a unique opportunity for teaching and learning to improve and enhance learning activities by providing course materials online where they can be accessed 24 hours a day, seven days a week, this means that learning can occur anytime and anywhere (Lawrence & Tar, 2018). The objectives of most teachers using any technology in teaching and learning are to improve teaching and learning quality and enhance student engagement and productivity (Zhang et al., 2021; Ergado et al., 2022). The use of ICT can help teachers enhance their pedagogical practice and it can also assist students in their learning. ICT can play a role in student skills, motivation, and knowledge and it can be used to present information to students and help them complete learning tasks.

The case result shows that compatibility is a significant factor contributing to the integration of ICT in teaching and learning, the emphasis lies in the fit between the characteristics of the technology and the characteristics of the task. The more an innovation is compatible with the current situation of a potential adopter and its needs, the lesser are the switching costs and uncertainties, the more probable the innovation will be integrated (Lawrence, 2020; Lawrence, 2002). The case findings provide support for diffusion of innovation theory and it is consistent with prior research which has shown that successful innovations occur when the task and the technology are compatible (Rogers, 2003). Innovations that offer advantages, compatibility with existing practices and beliefs, low complexity, potential trialability, and observability will have a more widespread and rapid rate of diffusion. Therefore, if teachers perceive ICT as a beneficial tool, compatible with their current activities, easy to use and have observable outcomes, they will show positive attitudes towards ICT integration.

7.4.2 Benefit of using ICT

Benefit of using ICT in teaching and learning is similar to Rogers' (1995) relative advantage of innovation. ICT benefit deals with the degree of teachers' valuation of the relative advantage that can be derived from the use of ICT in teaching and learning. A higher teachers' recognition of ICT benefits increases the likelihood of the allocation of teachers' time, and technological resources necessary to the integration of ICT in teaching and learning. The case result shows the greater the perceived benefit of ICT, the more rapid its rate of integration is going to be. This is consistent with the findings of other diffusion scholars that have found relative advantage as variable that has been consistently identified as one of the most critical integration drivers (Rogers, 2003). Support for ICT benefits is provided by Lawrence (2020, 2002) states that innovations that offer benefits, compatibility with existing practices and beliefs, low complexity, potential trialability, and observability will have a more widespread and rapid rate of integration. Therefore, if teachers perceive ICT as a beneficial tool over the existing technology, compatible with their social needs and current activities, easy to use and, it can be trialled before use, have observable outcomes, it is likely that teachers will integrate it. The case studies illustrate several types of benefits. Among the teachers, the benefits gained from ICT can only be described as perceived benefits, that is, benefits are based on individual teachers' experiences. The case evidence shows some of the major benefits gained from the use of ICT include improve communication, global reach of ICT and easy access to information. The evidence of these perceived benefits is presented and discussed briefly in turn.

Improve communication: The evidence reveals that teachers most often use ICT as a communication medium to interact with students, colleagues and others around the globe. All the teachers used ICT primarily in this way and they reported that its use had made communication easier, better and faster. The speed of communication and speed of access to information and the documentary record of action of email was regarded as beneficial. The use of ICT enhances students' communication skills, students interact among themselves and with the teachers, both within and outside the

classroom using e-mail and chat rooms, the level of interaction between teachers and students increases. Communications that previously had not been possible have now been achieved with ICT where students from diverse cultures and languages can interact, as well as interact with other scholars. When comparing email communication with other methods; all the teachers agreed that it was a far easier mode of communication, that messages could be composed and sent quickly.

Global reach of ICT: The ICT is a viable means to exchange information with students, colleagues and work collaboratively with other scholars. The use of ICT removes geographic boundaries, allowing teachers to easily access information and to reach for potential project collaborators around the globe. ICT presents a unique opportunity for teaching and learning by improving and enhancing learning activities by providing course materials online where they can be accessed 24 hours a day, seven days a week, which means learning can occur anytime and anywhere. The use of ICT allows teachers to be in contact with students and other academic all over the world, this is particularly important for teachers, who are heavily involved in collaborative projects with scholars who are geographically dispersed. The case result shows that all the teachers viewed ICT as a versatile medium which has general accessibility and vast geographic reach, coupled with the ability to break down geographic barriers. All teachers have experienced some form of new opportunity from using ICT, for example collaborating with other scholars in research projects or accidentally discovering something online which can positively impact their teaching.

Easy access to information: All the teachers that participated in the study use ICT to access information previously unavailable or unknown to them, this includes the ability to search academic databases around the world. The ICT is a very useful research tool to access a variety of information from all over the world and it represents an improved means to access global academic resources. The case study result suggests that the ability to search and access information by teachers and students are some of the benefits of using ICT in teaching and learning. This is evident in terms of speed of access to information and in terms of overcoming time zone restrictions. In general, the enhanced speed of communication is viewed as advantageously as is the speed of access to information.

Based on the evidence from the case study, it could be argued that speed and convenience were one of the reasons for using ICT for communication, especially for teachers that regularly communicate with other colleagues in different time zones. The findings of the case study support evidence produced elsewhere (Lawrence, 2020; Lawrence, 2019; Lawrence, 2002), which suggested that ICT in education is likely to be used as an access facility to global information and as a communication tool for networking, research and development. The availability of global resources like digital libraries where teachers, students and professionals can access and share research material and course material at anytime, anywhere, 24-hours seven days a week.

7.4.3 Perceived usefulness of ICT

Perceived usefulness of ICT is defined as the prospective teachers' subjective probability that using ICT will increase job performance and improve efficiency (Davis, 1989). If ICT is perceived as useful for teachers needs and capable of supporting and improving their teaching tasks, it is more likely to be integrated than if it is not perceived as useful (Lawrence & Tar, 2018). The case result shows that ICT is considered a useful tool for teaching and learning. The use of ICT for communication is especially useful in that it provides an efficient, informal and inexpensive method of communicating with students and colleagues. The case shows that all the teachers reported that the use of ICT has been useful as a research tool and they are able to improve and teach more efficiently. The case result supports what other empirical studies have suggested that teachers are more likely to integrate ICT into teaching and learning activities, if they perceived ICT as a useful tool to perform their teaching tasks (Lawrence, 2002; Davis, 1989).

7.4.4 Perceived ease of use of ICT

Perceived ease of use refers to the degree to which ICT is perceived by teachers as relatively easy to use (Davis, 1989). If ICT is perceived as easy for teachers to carry out their teaching tasks, it is more likely to be integrated than if it is not perceived as easy to use. The technical feasibility of ICT will be resisted if teachers deem it too complicated to use. The perceived ease of use of ICT emerged in the case analysis as one of the categories directly influencing teachers' decision to integrate ICT in teaching and learning. This finding supports Davis (1989) who identifies perceived ease of use as an important determinant of technology usage through perceived usefulness. The case evidence showed that across all teachers, ICT was perceived as easy to use particularly email and searching for information. The increased ease of communication was evident from the teachers that felt that email communication was less formal and much more interactive. Teachers are more inclined to correspond with their students electronically, because the process of communication is much easier. One of the teachers reported "that ICT is a quick and easy means to communicate to students and to collaborate with colleagues".

7.5 Institutional drivers

Institutional drivers are those categories affecting the institutional structure that the institution could adjust or change to suit its changing environment. Two categories that emerged from the analysis include leadership support and resources.

7.5.1 Leadership support

Leadership support refers to the perceived level of broad support offered by the institutional management. Teachers rarely have complete autonomy regarding the integration of ICT in teaching and learning. The management of institution typically controls access to the infrastructure supporting integration, such as allocating resources, offering training programs, applying ICT to support a wider variety of teaching and learning tasks, and encouraging experimentation with ICT and may even control physical access to the hardware and/or software needed to integrate ICT innovation. The active involvement and support of management can provide the appropriate strategic vision and direction. Leadership support creates a more conducive environment for the integration of ICT. The more support given by the leader, the more likely organisational resources would be allocated to the implementation of innovation decisions, which will in turn facilitates the integration and success of an innovation. The case result highlights considerable awareness among teachers concerning the potential of ICT and a general level of enthusiasm for integrating ICT into their teaching practices. The case results show that across all teachers, there is evidence of managerial enthusiasm towards ICT use. It is argued that teachers with full leadership support would most likely consider integrating ICT, while a lack of leadership support has often been cited as a barrier to effective use of technology (Lawrence, 2020). The case result is consistent with previous empirical studies (Lawrence & Tar, 2018), which found leadership support to be important in the integration of innovation. UNESCO (2004) and Lawrence (2002) state that having a champion at all levels in the education system promotes ICT integration in teaching and learning.

7.5.2 Resources

Resources refer to the level of financial and technological resources available in the institution. Much of the reported empirical work on ICT usage assumes that ICT provides value and that teaching and learning would benefit from using it, with little regard for institutional characteristics that might predispose success or lack of success (Lawrence, 2002). Three of the teachers indicate that teachers may realise some benefit from the use of ICT in teaching and learning, but only if they have the necessary resources and management support can ICT be used. The case result shows that institution with adequate financial and technological resources will be better prepared and able to undertake a complex innovation such as ICT, and thus reap the benefits of its use. The integration of ICT depends mainly on the availability and accessibility of ICT resources such as (internet, hardware, software). Teachers that have access to the required infrastructure and technological resources are better equipped to integrate ICT in teaching and learning and consequently are more likely to enjoy higher benefits from the use of ICT. This is consistent with the case study findings, which shows that if teachers cannot access ICT resources, then they will not be able to use them. Therefore, access to resources such as computers, software and hardware are necessary key elements to integration of ICT. The case result supports what other empirical studies (Lawrence & Tar, 2018), which found that access to ICT infrastructure and resources in schools is a necessary condition to the integration of ICT in education. A study by Lawrence (2020) found that access to technological resources is one of the effective ways of teachers' pedagogical use of ICT in teaching and lack of organisational resources as impediment to integration and usage of ICT.

8. Conclusion

The central concern of this study has been in gaining deep insight into the drivers influencing teachers' ICT integration in teaching and learning. The study has identified and discussed the drivers that positively influenced teachers' ICT integration in teaching and learning process. The study has developed an integration of ICT model that considered the teacher-level, technological and institutional-level drivers, which explained the integration of ICT. The author has argued both theoretically and where possible using empirical evidence, why these categories helped to better understand and explain ICT integration in teaching and learning. The study's results provided significant support to past findings in the literature. The study was presented in a descriptive form and chronicles the perceptions and experiences of teachers' integration in teaching and learning. Zeller (1991) suggests that studies with an interpretive perspective don't report out "data", they report "scenes", i.e. accounts of researchers' engagement over time with participants in their surroundings (Zeller, 1991 cited in Miles and Huberman, 1994). In addition, Hammersley (1992) argues that "an account is valid or true if it represents accurately those features of the phenomenon that it is intended to describe, explain or theorise".

The study has presented the current picture of the drivers that influenced teachers' ICT integration in teaching and

learning. It has told story of ICT integration from the perspective of the teachers that participated in the study. The conclusions of the study were based on the analysis of the teachers studied and not on a population. It is not the goal of an interpretive study to make generalisations from the examined teachers, but rather to offer understanding or insights about the integration of ICT in teaching and learning. A rich, thick description of the case allows readers to make decisions regarding transferability of the research (Merriam, 1988). This study has presented considerable progress in explaining the drivers that influenced teachers' ICT integration. The findings provided theoretical and practical insights into the integration and have contributed to the existing body of research on technology usage in education in general and particularly ICT in teaching and learning. The research reported here contributes to what is hoped will be a continually expanding body of empirical evidence that can increase knowledge of ICT integration in education.

9. Further research

The research has drawn conclusions about the drivers of ICT adoption in teaching and learning and has laid a foundation on which further longitudinal studies could be undertaken. The study has identified teacher-level, technological and institutional-level drivers as influential in the integration of ICT in teaching and learning. Additional research could be conducted to determine if other kinds of technological innovations are affected by these drivers. Further empirical study is needed to assess the validity of the theoretical model proposed in this study in order to develop an appreciation of the relative contributions of the model's constructs. As with any other simple model, there is a danger that additional significant drivers have not been included in the model. Longitudinal investigations would allow researchers to measure the explanatory drivers that emerged from the study before the adoption and integration of ICT in teaching and learning and more objectively assess the impact of ICT on the institution. Further research should also examine the impact of the drivers to ICT adoption on the performance of teachers.

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