

Effects of Triability, Relative Advantage, Compatibility, Complexity, and Observability on the Adoption and Use of ICTs in Accra Technical University Library

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Abstract

This study investigates how Rogers' diffusion of innovation features like relative advantage, compatibility, complexity, triability, and observability affect information technologies acceptance and application at the Accra Technical University Library in Ghana. This study will eventually culminate in the development of tailor-made strategies for ICT adoption and use at Accra technical university library in Ghana. The Diffusion of Innovation Theory (DIO) was the theoretical framework that guided the study. The necessary data for this qualitative research was collected using a case study research design with the purposive sampling method. Twenty-two (22) members of staff from the library were interviewed, in addition to the observation of the various sections of the library to collect the pertinent data. The findings revealed that the library has acquired ICT technologies and infrastructure, ICT-based software, ICT-based electronic resources, and ICT-based library services. However, their acceptance and application were greatly influenced by the ICTs attributes as proposed by Rogers.

The paper submits that the library management should focus on the introduction of user-friendly ICT tools to promote acceptance since the speed of adoption and use strongly relates to an innovation's apparent simplicity. The library management should also make sure the ICT tools earmarked for adoption are well-suited with the current systems and triable.

Keywords: *Innovation, Trialability, Complexity, Relative Advantage, Observability, Diffusion*

Introduction

Generally, the twenty-first has been acknowledged as a time driven by the transformation in information, due to the significant advancement in information and communication technologies (ICTs). This effectively modified teaching and learning processes in schools, colleges and universities (Mogwe & Balotlegi, 2020). This has equally enhanced information quality across the different spheres and fields of study (Adebayo, Ahmed, & Adeniran, 2018). This has consequently made the use of ICTs in libraries a constant occurrence, having significant impact on their operations, and modifying nearly all their functions.

These have enabled the creation of inventive service for extensive information exchange due to the enhanced flexibility and customisation of services the use of ICT offers (Adebayo, Ahmed, & Adeniranm 2018).

Anafo, Akpah, and Ofori (2020) posit that the application of innovations such as computers, scanners, RFID, photocopiers, audio-video technology, and Internet service has substantially improved information delivery and accelerated the growth of individuals and nations in Africa. Thus, the critical role of ICTs deployment within libraries of higher institutions of learning in the overall value of education and training has been established. This is particularly evident as more 3opportunities for educational expansion are created in distance and open learning, paving the way for unceasing scholarship (Adebayo, Ahmed, & Adeniran, 2018; Gulavani, 2021). Anafo, Akpah, and Ofori (2020) Anafo, Akpah, and Ofori (2020) argue that before the arrival and incorporation of ICTs into library services, libraries worked in a difficult and unproductive manner. This resulted from individual, unconnected manual completion of library chores carried out without integration. This happened because of the manual execution of library tasks and disconnected activities. Information materials were also kept on shelves, aggravating

problems with inadequate space (Plockey & Pwadura, 2018). Nevertheless, Abubakar (2022) contends that integrating and efficiently using ICT is essential to attending to the widening disproportions in educational opportunities. Ghana has the potential to enhance the training and delivery of education across all levels through the integration of ICT, thereby facilitating significant transformations in the educational landscape. Consequently, ICT use is of great relevance in reaching both personal and organizational goals, specifically in higher institutions of learning. This is mainly so because of its capacity to permit concurrent access for several users, therefore closing the global information gap and creating a more favourable learning environment for students (Adebayo, Ahmed, & Adeniran, 2018).

According to Acheampong (2019), Ghana's ICT development has reached remarkable feats, just as many other African countries. Nonetheless, Acheampong (2019) accepts the limited availability of technology-driven services within academic libraries in Ghana. It has largely focused on traditional library automation (Anafo, Akpah, & Ofori 2019), where manual processes, such as document delivery, are replaced with computerised systems. This reluctance may primarily be due to the inherent hitches that underdeveloped nations encounter in accepting and deploying new innovations (Acheampong, 2019).

A plethora of research studies have emphasised the critical role of ICT resources for the enhancement of academic libraries' user services and operational success (Konlan, 2022; Abubakar, 2022; Sokari et al., 2017; Mafungwa, 2017). Venkatesh et al. (2003) have also echoed the usefulness of ICT in the academic space for improving productivity. However, Kwegyiriba et al. (2021) posit that, despite the incontrovertible evidence on the usefulness and appropriateness of ICTs, the limited use of ICTs in Technical Universities, including the library, has hindered its ability to alter and customise offerings, and discover new ways of managing information. The tardy pace at which the Accra technical university library is deploying ICT impedes its ability to provide remote access to resources, which limits its international presence and reputation. This may be due to the restricted insight into the phenomenon and the absence of context-specific strategies on ICT adoption and utilisation in Ghana. Therefore, a better appreciation of the challenges and the need to create tailored strategies for the adoption and utilization for Ghanaian Technical

University libraries. This will help address the difficulties of using unsuitable models or strategies developed largely for the technologically advanced nations, disregarding the context-specific aspects peculiar to Ghana's technical universities (Ismail & Mokhtar, 2016; Baker, 2011).

Anafo, Akpah & Ofori, 2020; Ibrahim and Issah (2021) argue that the absence of customised ICT adoption and use models and strategies for the Ghanaian context is what libraries of colleges and universities in Ghana are grappling with, despite the imperious need for them. Several issues, according to Baada (2018) and Anafo, Akpah & Ofori (2020), could explain why Ghanaian technical university libraries enjoy limited ICT acceptance: absence of ICT policies, lack of technical expertise, as well as social, cultural, legal, economic, political, and educational issues. However, the researchers are unsure about the reasons for the slow or low ICT adoption and use at this stage of the study. Therefore, the study problem to be examined is ICT adoption and use in technical university libraries in Ghana, the case of Accra technical university library with special focus on the diffusion of innovation theory and the technology, organization, and environmental framework. At the end of the study, the researcher intends to suggest a suitable strategy that will improve ICT adoption and use in the Accra technical university library.

Research objectives were to:

1. explore how Roger's adoption attributes of relative advantage influences ICT adoption and use in Accra Technical University library in Ghana.
2. explore how Roger's adoption attributes of compatibility influences ICT adoption and use in Accra Technical University library in Ghana.
3. explore how Roger's adoption attributes of complexity influences ICT adoption and use in Accra Technical University library in Ghana.
4. explore how Roger's adoption attributes of trialability influences adoption and use of ICT in Accra Technical University library in Ghana.
5. explore how Roger's adoption attributes of and observability influences adoption and use of ICT in Accra Technical University library in Ghana.

Research questions

1. How does Roger's adoption attributes of relative advantage influences ICT adoption and use in Accra Technical University library in Ghana?
2. How does Roger's adoption attributes of compatibility influences ICT adoption and use in Accra Technical University library in Ghana?
3. How does Roger's adoption attributes of complexity influences ICT adoption and use in Accra Technical University library in Ghana?
4. How does Roger's adoption attributes of trialability influences adoption and use of ICT in Accra Technical University library in Ghana?
5. How does Roger's adoption attributes of and observability influences adoption and use of ICT in Accra Technical University library in Ghana?

Literature Review**ICT adoption and use in academic libraries in Ghana**

Balogun (2018) claims that, available research indicates that substantial monetary considerations have been given by the developed countries for the digitisation of information resources. Baada (2018) asserts that, for almost four decades, academic libraries in developed nations have recognised the importance of ICT and have continued to deploy it for most information-related activities. Many libraries have successfully created fully ICT-mediated libraries with constant access to digital materials. Therefore, the utilisation of ICT library activities is a well-known notion (Baada, 2018; Ankrah & Atuase, 2018; Asamoah-Hassan, 2001). Despite this, situations in Africa, especially Ghana, show clear differences when contrasted with those in America and Europe (Baada, 2018).

ICT use in Ghana's libraries began early in the 1980s. However, the body of existing research does not provide an exact narrative on the ICT application of academic libraries in Ghana (Baada, 2018). Abubakar (2022) contends that the progress made in the deployment of ICTs for various jobs within academic libraries in Ghana, although fragmented, is worth acknowledging. This is because, although there are variations in ICT applications in libraries in Ghana, available research findings validate the achievements made, which are comparable to those of the advanced nations (Baada, 2018; Ankrah & Atuase, 2018).

Baada (2018) claims that there have been more uses of ICTs by libraries of Ghanaian institutions for the purposes of automating different aspects of their operations. He notes that, a small number of academic libraries start the computerization process in the early to mid-1980s that enabled the provision of several services like databases, and internet connectivity. It also aided the creation of digital catalogues which resulted in the development of Online Public Access Catalogues, bibliographic databases, and subsequently CD-ROM databases during the 1980s (Ankrah & Atuase, 2018).

According to Ibrahim et al. (2018), the use of ICT in college and university libraries has significantly increased, although this increase has come with difficulties. Rabah (2015) claims that the problems regarding acceptance and usage of ICTs are multifaceted and complex. These have influenced institutions, principally academic libraries, preventing them from reaching significant organizational goals (Akca & Ozer, 2014).

Libraries in Colleges and universities, including those in Ghana, are blamed for their insignificant adoption efforts (Obinyan & Unuabor 2013). People often blame the contemptible ICT deployment on the lack of qualified individuals and the inappropriate use of technology in the local context. There is available evidence to support the claim that ICT adoption has not produced a commensurate utilization (Ameyaw, Banji, & Boateng, 2019). This decline is caused by ignorance about ICT and its appendages, like e-learning websites and other tools supporting student-centered learning (Nyagorme et al. 2017). The capital-intensive character of ICTs is also causing their underuse because of their overprotection and control to extend their lifespans (Apawu, Yidana, & Apeanti 2012).

Studies on the correlation between ICT adoption and utilisation abound in literature (Adjei et al., 2020; Ameyaw, Banji, & Boateng, 2019; Baada, 2018; Plockey & Pwadura, 2018; Dzandu & Dadzie, 2012). Dzandu and Dadzie (2012) in their study found that most participants regularly made use of databases but at different levels and rates. Ameyaw, Banji, and Boateng's (2019) study revealed a substantial number of the students using the ICT tools available in the library, but only a small number of students used the CD-ROMs and scanning services. Similarly, Baada (2018) noted differences in the way study subjects used ICT tools. He blamed the Blame Library's organizational structure and culture for not using ICT as fully as it ought.

Another study by Adjei et al. (2020) revealed that insufficient standards and practices are elements stopping the digital preservation efforts in Ghanaian university libraries.

Attributes of Information Communication Technologies

Ugur and Koc (2015) have put forth five distinct impactful qualities for innovation adoption. According to Rogers (2003), this set of key attributes of relative advantage, complexity, compatibility, trialability, and observability exerts influence on innovation adoption.

Rogers (2003) suggests that how much a person or organization believes a new idea, system, or tool can provide more benefits than what they already have will likely affect their choice to adopt and use it. According to him, the acceptance of invention must lead to improvements in the efficiency and status of the person or organization concerned. Thus, the adoption of ICT in the library must lead to the ability to access information quickly, conveniently, and at a lower cost (Al-Jabri & Sohail, 2012). Teye and Duah (2022) explain that since universities and college libraries need to provide information quickly and accurately to users, they must evaluate innovations like the Online Public Access Catalogue (OPAC) based on how valuable, relevant, useful, and effective they are compared to traditional card catalogues before deciding whether to use them. This is based on the inherent motivation to attain personal satisfaction, value, or goals drives the adoption and utilisation of ICT (Teye & Duah, 2022). Therefore, in assessing the value and reputation of ICTs, issues such as expenditure and social effects are considered.

According to Rogers (2003), the compatibility concept relates to how well an invention fits the existing ideals and conditions. Sahin (2006) argues that the speed of adoption depends largely on how compatible one finds it to be. Compatibility and adoption have a positive link whereby the possibility of invention being adopted is greater when it fits the client's ways of life. Therefore, the compatibility attribute directly affects the rate of adoption, because a key component of innovation is its fit with the value systems of possible adopters (Rogers, 2003). Nevertheless, in other situations, the organization or person trying to acquire and deploy an invention may have to accept other sets of ideals to create agreeable and fitting association. This is especially important in cases when the innovation under consideration deviates from the existing system or cultural values (Al-Jabri & Sohail, 2012).

Complexity is the extent of an invention's originality to which an innovation can be fairly challenging for comprehension and usage (Rogers 2003). Alternatively, Al-Jabri and Sohail (2012) described complexity to be the apparent difficulty of a person or group understanding and applying an innovation. Simpler or more user-friendly new technology innovations often inspire positive opinions among the adopting society. According to Mallat (2007), the apparent lack of user-friendliness and ease of use of any technology qualifies it as complex. On the other hand, the apparent unfriendliness can discourage acceptance and use of interfaces or technologies. This means that the degree of complexity of ICT in the design of the invention, technical infrastructure, and complexity of use influences its adoption rate (Rogers, 2003; Mallat, 2007). Therefore, the alleged degree of complexity connected with ICTs hinders their incorporation and use (Al-Jabri & Sohail, 2012).

Trialability, which is the degree to which a notion, idea, or invention may be tried in a concrete sense or experimented with, is an additional feature of ICT. According to Sahin (2006), trialability is the ability to assess new technologies through experimentation before their acceptance. Rogers (2003) argues that the opportunity for potential adopters to try an ICT device meant for adoption increases their proximity to the innovation, provides them with the requisite knowledge about the way a thing being considered for adoption functions, thereby lowering the fears associated with adopting new innovations. This is because if an innovation lacks trialability, it usually increases doubt, leading to its rejection. However, if a new idea can be submitted to experimental sampling, it helps to reduce different unknown fears and ease the adoption process.

Rogers (1983) defined ICT's observability to be the extent to which the outcomes of an invention might be seen by someone different from the person adopting it. According to Hall and Khan (2003), observability is the degree to which the impacts or results of technological use could be seen or ascertained beforehand. This attribute directly affects an innovation's acceptance because for a technological breakthrough to be deemed as credible and suited for the intended purpose, it needs to be able to produce observable results (Rogers 2003).

Hall and Khan (2003) assert that the ability to test and observe a technology shapes the adoption decision. The more ICTs can be observed and verified, the more likely the innovation will be embraced (Atiso & Adkins, 2015). Hall and Khan (2003) argue that there is a direct relation between the visible results of the innovation and ICTs rate of adoption. Consequently, the opportunity to witness an invention inside a social system acts as the stimulus for peer conversation and helps the new idea to be accepted (Rogers, 1983).

A study by Al-Jabri and Sohail (2012) in Saudi Arabia on mobile banking adoption revealed that observability and complexity are crucial traits have significant influence on technology-mediated banking acceptance than others.

Theoretical Framework

The Diffusion of Innovation Theory (DOI)

The diffusion of innovation theory (DOI) is a theoretical framework that analyses the dispersal and acceptance of innovations in a community. The use of this framework spans various fields like commerce, education, and information systems, even if it has its roots in sociology (Achugbue et al., 2022). The DOI theory presents a notional basis about how an innovation spreads within a society (Rogers, 2003).

Various academic fields have adopted the DOI to examine new inventions from diverse viewpoints. This theory has greatly influenced the development of several concepts and frameworks for determining how an innovation spreads among people and groups (Aizstrauta et al. 2015). In spite of the significance of this theory, Kee (2017) notes that its pro-innovation leaning, individual blame bias, and knowledge gap bias have attracted criticism.

According to Xue (2017), the criticisms against the DOI have not affected its significance in information systems research. It continues to be recognised as a reliable theory that enables scholars in recognizing the factors influencing the proliferation of an invention and the justification for same. Achugbue et al. (2022) observed that due to its use, researchers in information systems have been able to effectively answer core questions relating to an invention's acceptance rate in any community. This has encouraged its application in various spheres (Kee, 2017).

Achugbue et al. (2022) contend that using DOI theory will enhance libraries' ICT acceptance and use. This is so because the theory's strength lies in its ability to help identify how invention spreads, laying particular emphasis on its features from several angles (Aizstrauta et al. 2015). It is backed by a set of linked assumptions and premises (Achugbue et al., 2022). This approach clarifies the mechanisms and motivations behind the acceptance and application of innovation at the personal and organizational levels (Al-Jabri & Sohail 2012).

Al-Jabri and Sohail (2012) uphold the claim that the DOI is distinctive with the capacity for a comprehensive assessment of how an innovation's characteristics influence its deployment. Likewise, Aizstrauta et al's. (2015) argue in favour of DIO. According to them, the DOI offers a systematic categorisation of invention decisions and stages of acceptance, different from other theories. This way, researchers' knowledge and opportunity to track the varied and sequential stages during an innovation's acceptance and usage is enhanced (Chui, et al. 2017).

According to Rogers (2003), the notions of diffusion and adoption, fundamental to the diffusion of innovation theory, differ, even though many researchers have used these terms interchangeably. He defined diffusion as the use of identifiable communication networks to spread innovations between people over a period of time in a community. Adoption, on the other hand, relates to the rejection or acceptance of an innovation by an organisation, unit, or individual (Kee, 2017).

Diffusion is an acknowledged occurrence where an innovation's reception, usage, and spread ensue within a community or system (Hall, 2003). This process happens progressively through several stages, such as knowledge acquisition, persuasion, and decision-making (Al-Razgan et al., 2021).

Methods

Creswell (2014) claims that various factors, including the research topic, the research questions, the researcher's own experiences, and the intended audience of the research project have bearing on this, might affect the choice of methods, procedures, and design of the study. The qualitative research method and interpretivist paradigm utilising an instrumental case study design, were used for this study because the researchers needed to explore and

comprehend the social meanings attributed to individuals regarding ICT adoption and use strategies for the Accra Technical University library. The current research effort entails a single case study. The researcher gathered data from the whole twenty-two (22) participants, given the smallness of the population. Data was collected through semi-structured interviews and analysing existing records. The study utilised interviews to obtain primary data. The researchers also analysed existing documents to corroborate the interview data to ensure data reliability. These steps boosted the trustworthiness and credibility of the research outcome.

The study adopted content data analysis to analyse collected data. Through the verbatim transcription of the participants' responses, the researchers familiarised themselves with the collected data. After that, the responses were organised into several themes to allow for important conclusions to be drawn. The information gathered from the interviews, observations, and documentation underwent a thorough selection procedure whereby only the relevant material was kept for study. Throughout the study, participants were informed that their personal data would be kept anonymous and confidential.

Findings and Discussions

The paper aimed to investigate the influence of Roger's adoption characteristics in terms of relative advantage, compatibility, complexity, trialability, and observability on the adoption and use of ICT at the Accra technical university libraries in Ghana.

Demographic profile of participants

This part provides the background information on the participants. The background data of the participants, include age, gender, education level, etc., which will help the researcher to examine the human elements influencing the adoption and use of ICT by a group or a person in social system (Kusumaningtyasa & Suwanto, 2015; Dei, 2018). Central to this study is the Diffusion of Innovation Theory (DOI), which answers the "how" and "why" aspects of ICT adoption and use in a society, at both the individual and organisational levels (Al-Jabri & Sohail, 2012). Most of the participants were female (13) representing 59%. This finding affirms the assertion made by Mbambo-Thata et al. (2019) that, historically, most of the personnel in academic libraries have been women.

Relative advantage

According to Rogers (1995), diffusion of innovation theory has enabled system researchers to predict the acceptability and spread of an innovation based on its usefulness or relative advantages. Relative advantage is the supposed advantages of a new system over the current one in terms of higher value, reduced cost, less risk, and other like criteria.

Findings showed that relative benefits, like easy access and dissemination of information, provision of greater benefits, environmental safety and friendliness, and reduction in effort influence ICTs adoption and use.

Evaluating the benefits of modern ICT tools compared to the old ones, the expense and societal standing of adopting the innovation is its relative advantage. According to Ibrahim et al. (2015), superior offerings or benefits such as enhanced value, reduced costs, minimised risks, and other advantageous factors are comparative advantages of an innovation critical in the decision to adopt and use ICTs.

The perceived advantage of ICT is highly connected to the way academic libraries employ such technologies. Raghu (2023) claims that the assumed benefit of using ICT tools promote their acceptance, use, and dissemination in a social system. Therefore, the degree to which people believe an invention will help to replace and improve current systems directly determines its spread speed.

phases of ICT acceptance and implementation from, from knowing about the technology to ensuring its usefulness. This is so because the decision-making process to adopt or reject an innovation is contingent on the successful appraisal of the technology in terms of relative advantage.

Easy access and dissemination of information

The study found that the staff would change the present system for a new one that enable easy access to information to customers.

The participants believe that the simplicity and ease of acquiring and sharing information when using ICTs justifies the expenses that comes with it. Mostly involved in procurement, preservation, and distribution of intellectual resources, libraries are (Plockey & Pwadura 2018). Therefore, staff adoption and use of ICT hinges on their conviction that, the incorporation of ICTs into

the library operations will improve access and distribution functions of the library in contrast with the past manual operations.

According to Baada (2018), ICT's ability to provide information services in a reasonable and high-value manner even when ensuring that everybody may readily access them without the typical worry related with the conventional libraries has changed the role of librarians. Unlike the manual

library setting, the participant(s) suggested that the rapid distribution and acquisition information from the processes of cataloguing, indexing, and classification on computers as a benefit of ICT.

Adjei (2020) argues that efficient information management is the main benefit of ICT introduction in academic libraries. Libraries mediated by ICT can quickly provide knowledge to their, on-site or far away, with minimal difficulties.

The participants seem to have increased their interest in ICTs because these technologies facilitate the international exchange of information with a single click by methodically classifying, organizing, and storing documents. This has, therefore, heightened interest in ICT acceptance and application in the Accra Technical University library.

The research outcomes agree with Plockey and Pwadura's (2018) view on the digitization or reorganisation initiatives observed in a few government university libraries. According to the study, the libraries at the selected universities are turning various kinds of library resources, such as theses, conference proceedings, and publications, into digital forms. This has solved the access and storage problems that hitherto existed in the traditional library environment.

Environmental safety and friendliness

Features of perceived advantages of ICT that affect their acceptance and application were environmental safety and friendliness. According to the study, the incorporation of ICT tools into libraries has helped lower environmental contamination resulting from less paperwork.

Environmental safety and friendliness of ICTs guarantee that they agree with standards and devoid of risks to safeguard the environment and users'

wellbeing. From the findings, it seems that the adoption and use of ICT, leading to ICT-based services like e-library, e-journals, e-dissertation, electronic catalogue, email services, etc., have expurgated the amount of garbage produced from damaged books and papers.

Academic libraries, according to Adebayo, Ahmed, and Adeniran (2018), serve primarily as knowledge and information hubs in any form or shape. So, the collection of materials that might be obsolete or unusable could largely be due to the procurement and organization of these knowledge resources. The filtering of the unwanted information resources poses environmental challenges, including pollution.

Conversely, the use of ICT for library operations has changed the culture of acquitting and storing printed materials in the form of individual sheets of paper to digitised resources. Information is now stored on computers in bits and bytes, in an environmentally pleasant style. According to Ibrahim and Issah (2021), the modifications and inclination for storing information in electronic formats have made the environment safer and better.

Plockey and Pwadura (2018) offer sufficient support for the study's results. Their research into ICT use to stock and distribute information resources in three public university libraries in Ghana revealed that, the libraries have included electronic formats like CD-ROM databases to store information. This has limited the quantity of paper-based information materials.

Reduction in manpower

The results reveal that ICT adoption and use at Accra Technical University library has resulted in the reduction in the volume of work. This has also led to a decrease in the number of personnel required to undertake library tasks. This is a testament of the relative advantage of ICTs to academic libraries.

Alando and Ewuntomah (2021) posit that, academic libraries deploy ICTs to modernise their operations and services. Consequently, libraries and librarians' purpose and obligations have been altered, resulting in the remarkable changes in information management practices.

Reduction in manpower means library-related functions are performed with less personnel because of ICT use. According to Baada (2018), a key benefit of ICT use is moving libraries from manual to ICT-mediated ones,

significantly altering the working circumstances of users and librarians. This modification has created the opportunity for self-services, which has encouraged greater involvement of end-users in pursuit of their needs, reducing the burden on the information professional. This has caused a substantial reduction in the reliance on labour-intensity; thus, encouraging a further rationalised and productive work environment.

With ICT taking a centre stage in all library operations, alterations in information management, from people-centered to process-centered approaches, have lessened the demand for more staff. Also, the presence of the online public access catalogues, and the automation of basic library activities like circulation have caused a reduction in human intervention and interference in patron information searching and access.

Available literature has largely supported the claim that ICT use in academic libraries has yielded relative advantages of reduced manpower (Al-Razgan et al., 2021; Menzli, 20222016; Raghu et al., 2023; Ugur & Koc, 2015; Minishi-Majanja & Kiplang'at, 2005). The study revealed that there is a notable intention of students to utilise mobile learning due to the ease of learning with mobile learning compared to conventional mediums. Similarly, a study by Alrahmi et al. (2019) revealed that the intents of students to exploit e-learning systems in universities were caused by relative advantage and other attributes of the systems. Menzli et al. (2022) used Rogers' diffusion of innovation theory to look at how open educational resources are accepted in higher education and found that there is a favourable relationship between benefits, like saving effort, and the use of open educational resources.

Compatibility

The study recognizes that in academic libraries' acceptance of innovation, including Accra Technical University Library, is determined by the perceived compatibility of ICT to exiting systems. This is an indication that ICT acceptance and use at the Accra technical university library is directly influenced by its compliance with current organisational culture as well as library operations.

According to Rogers (1995), compatibility is the ability of two systems or technologies to operate together. This means that if an innovation fits into the existing system, the more likely that it is accepted and use.

Compatibility of ICT with Organisational Culture

The results show that ICT adoption and use at Accra Technical University Library are contingent on the degree of compatibility between the ICTs that are to be adopted and the current organisational culture. The results also demonstrate a synergy between the new ICT systems and the dominant organizational culture at Accra Technical University, which promotes ICT adoption and use. For instance, the progress of institutional and departmental social media groups, the use of institutional emails by departments and individuals, and the increase in the university's ICT infrastructure changed the working environments into a new one.

Baada (2018) notes that not much research has been done on how organizational culture elements affect the ICT use in libraries of tertiary institutions. This has resulted in less focus on the organisations cultural elements that are worth considering before and during ICT project execution, leading to project. Adjei (2020) claims that a lack of knowledge of organisational culture and suitable ICT culture in higher education institutions has hampered ICT adoption and integration in tertiary institutions' libraries.

ICT deployment and usage that is effective will depend on a supporting institutional culture. The choice to accept and apply ICT depends much on how well it fits the present corporate culture.

The management of the institution appears to recognize its role in enabling ICT adoption and use by means of the development and maintenance of a suitable ICT environment and culture for CT acceptance and use. The participants indicated that, the Accra Technical University backed by a university-wide ICT policy and required ICT infrastructure, has taken actions aimed towards an ICT-friendly culture.

The existing supportive institutional culture at Accra Technical University confirms Ntim-Kodua (2020) stance that the existence of favourable institutional politics and culture is sine qua non for the successful deployment of ICT-mediated systems in academic libraries.

The findings of this study support those of other studies about the influence of well-suited workplace cultures on ICT adoption and use. Present literature on ICT (Adjei 2020; Ntim-Kodua 2020; Okere 2022; Akca and Ozer 2021), has conclusively established a positive relationship between ICT acceptance and

usage and workplace culture. Al-Jabri (2012), for instance, examined the several elements affecting the acceptance of mobile banking using Rogers' theory on innovation diffusion, discovered a causal association between compatibility and ICT adoption and usage. In addition to other difficulties, Okere (2022) discovered that most ICTs deployments are impacted by cultural elements like lack of attention to maintenance practices and inclination towards traditional ways of performing task.

Compatible of ICTs with Library Operations

The results showed that 'compatibility of ICT with library operations' influences ICT adoption and use in Accra Technical University Library. Akca and Ozer (2014) note that ICTs' ability to solve existing needs, values, and corporate applications of the organisation is a central feature that accelerates its acceptance.

The demand of users for services supported by ICT resulted in a shift in values and beliefs within the library domain, leading to calls for ICT acceptance and usage in Ghana's technical university libraries. Thus, the level to which academic libraries believe ICTs match their operations will help to enable the acceptance of ICTs. Therefore, the deployment of ICTs is to enable the library fulfill its goals of offering information at any time and location, free from the usual limitations connected with the conventional library environments.

Complexity

The results showed a more significant link between the degree of complexity and the degree of acceptance and usage of ICTs. Rogers (1995) claims that the complexity feature of an invention directly influences its pace of diffusion according to diffusion of innovation theory. ICT acceptance and utilization are influenced by the degree of user-friendliness and convenience usually connected to technological developments.

Rogers (2003) argues that complication in ICT adversely affects its speed of adoption, in contrast to the other characteristics. Likewise, Ibrahim (2015) notes that if the prospective adopter requires new knowledge and skills to use ICT tools, it slows down the pace of adoption when weighed against other tools that are simpler and easier to use. Therefore, ICT's complexity substantially restricts its adoption.

The following themes arose: ICT use requires intensive education and training; ICT use requires motivation; environmental safety and friendliness; and reduction in manpower. These themes are presented and discussed subsequently.

ICT use Requires Intensive Education and Training

Education and training were found to affect ICT applications at the library. The act of instilling and equipping a person with ICT-based knowledge and skills to enable them to perform their functions well is what is termed as education and training. According to Akcer and Ozer (2014), it encompasses how people obtain knowledge and expertise for the enhancement of organisational success. Thus, the need for training, empowerment, and motivation to persons to enable them to perform at their utmost potential for the library to attain growth is crucially beneficial (Baada, 2018). Conversely, the lack of adequate training and education for ICT use also has affected ICT applications in the library.

It is conclusive that the need for extensive education and training for ICTs use at the Accra Technical University library has deterred the staff. This is because, the staff can alternatively, switch to the manual ways of performing their jobs. Also, the older staff do not see the need to invest effort and time into using ICTs when they have shorter period to go on retirement.

ICT Use Requires Motivation.

The study's findings show that ICT use requires motivation. According to the study's participants, even though, ICT adoption and use offers noteworthy benefits, their application require changes to individual values and working styles. Staff will, therefore, require some level of motivation to make the needed adjustments to their values to accommodate ICTs into their daily routines. This situation has affected ICT application (Rabah, 2015).

According to Teye and Duah (2022), there could be improvements in ICT adoption and use if there are fitting packages to motivate staff, such as librarians. Such motivational packages could be in the form of material rewards and managerial support systems. These motivated staff may forgo present workplace behaviours for newer ones.

Observability

The findings revealed a stronger relationship between the extent of observability and the extent of ICTs adoption and use in Accra Technical University library. It also revealed that the visible attributes of ICT tools affect its degree of adoption and use. This means that ICT tools must produce measurable outcomes.

An important attribute that influences ICT application, according to Rogers' (1995), is observability. The extent to which the outcome of an innovation is visible to others can influence prospective adopters. So, the opportunity to observe another individual utilising and acknowledging the safety and/or advantages of the ICT tool is likely to lead acceptance. Significantly, an innovation may be adopted and use if the usage outcomes is recognisable and encouraging for future.

The identified themes are the demonstrable benefits of ICT and the demonstrable results from its implementation and these are discussed below.

Demonstrable Benefits of ICT

Demonstrable advantages of ICTs are the conspicuous benefit of the innovation which facilitate their application in academic libraries. The beneficial uses of ICTs have led to their acceptance at Accra Technical University library.

ICT adoption and use offer many advantages to academic libraries. The need for ICT distinctive feature to be observable by others during usage or testing will lead to a positive assessment and acceptance for it (Teye & Duah, 2022). The observable features of ICT validate any claim about it. Thus, the ability to observe ICTs functionalities and effectiveness has allowed Accra technical university library to experiment with pilot editions before deploying them.

According to Rogers' (1995, because ICTs take time to spread through communities, late adopter categories like the late majority and laggards can witness their outcomes before deciding to also adopt same. This helps them to form cogent views on these technologies before adoption. For example, an ad hoc committee on the state of library compared the ICTs of other academic libraries within Accra to those of Accra technical university library and made recommendations. The committee recommended for the installation of closed-circuit television cameras (CCTVs) and radio frequency identifications

(RFID), just as it has been done at Balme Library, to reduce the incidence of pilfering in Section 8.2(iv) of their report the.

Demonstrated Results of ICT

The observability feature of ICTs, as shown by the results influenced their deployment at Accra Technical University Library. The participants were interested in ICT applications, because of what they have seen ICTs, like computers, the internet, printers, photocopiers, and KOHA, do to improve services in other university libraries.

It is Teye and Duah (2022) view, a favourable outcome during the trials of ICT will positively influence the opinions of would-be adopters. The visibility of an ICT tool is the observability element of innovation. The implication for this is that the deployment of ICT is premised on the outcomes of ICT tools used by other university libraries.

Trialability

The study used the one-on-one interviews to elicit responses from participants on how the opportunity to try an ICT affects its adoption and use. According to the findings, have been tried before their eventual acquisitions. Those that met the requirement of the library after the trials were acquired whilst those that didn't meet the requirement of the library were abandoned.

Trialability basically refers to the potential to use ICT before acquisition of same. This way, the library can try and establish its supposed effectiveness, as against its authentic capabilities. ICT adoption and use has severely been influenced by trialability feature. According to Ugur and Koc (2015), the opportunity to fangle with ICTs, quickens its deployment.

The study finds that the rate of ICT adoption and use at the Accra Technical University library is informed by its trialability attribute. Therefore, if the library gets the opportunity to put an innovation to trial, there is a higher chance of the innovation being adopted.

The Library Adopts and Uses Free Edition of Software.

According to the study results, the Accra Technical University library has deployed trial versions of ICTs like the KOHA software for cataloguing.

The opportunity to test an innovation brings the potential adopter closer to the innovation (Akcer & Ozer 2015). According to Ibrahim et al. (2015), the

chance to use ICT before deployment foster's positive inclination towards its application. This is because, trying the technology create the avenue for the library acquire the needed information about how the innovation functions, reducing the fear and risks that comes with using new inventions.

The result of this study agreed with earlier research by Ugur and Koc (2015), Akcer and Ozer (2015), Ibrahim et al. (2015), and Kaminski (2011). Ugur and Koc (2016) conducted a study that revealed a positive relationship involving the disposition to adopt and use ICT tools and its trialability.

Conclusions and Recommendations

ICTs have evolved from normal library tools to high-end technology-enabled libraries that uses artificial intelligence. Nonetheless, the Accra Technical University library in Ghana is still adopting and using basic ICTs for rudimentary services. Also, many of the earlier studies about this phenomenon have dealt with academic libraries in Ghana in general. Hence, the necessity to explore the effects of Rogers adoption attributes on ICT adoption and use in Accra technical university library in Ghana is justified. Therefore, this paper mainly addresses the adoption and use of ICT in Accra technical university library in Ghana. The study used the Rogers' (1995) diffusion of innovation theory to examine the case under study. The paper ends with recommendations meant to improve the adoption and utilization of ICT in Ghanaian technical university libraries.

The study recommends that ICTs should have better features, benefits, lower costs, guarantees, or replacement to facilitate their adoption and use at the Accra Technical University library. Also, ICTs should be compatible with the existing systems by closing matching the goals, value systems, norms, lifestyles, culture, and day-to-day actions of the institutions that accept them. There must be opportunities to try ICTs before adopting and using them on a larger scale.

Ethical Statement

The researchers sought the consent of all participants by signing the consent form designed by the researchers. The researchers conducted their research in strict compliance with other ethical standards such as anonymity, voluntariness, integrity of research, and respect for persons. The researchers

also sought and obtained the approval of the management of Accra technical university to conduct their research within their premises.

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Authorship contributions

All the authors have contributed meaningfully to this research study. The concept and design were done collaboratively by both authors. Whilst the first author did the data acquisition, data analysis and interpretation, and drafting the manuscript, the second author did the revision of manuscript, as well as technical and material support.

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Generative AI Statement

There was a minimal use of artificial intelligence tools for purpose generation bibliographies. AI tools were also used to undertake summaries. The final output is our handiwork and we, therefore take full responsibility for this publication.

References

- Abubakar, A. (2022). Adoption and use of information and communication technology in academic libraries in Ghana: A case study of Central University, Accra, Ghana. *United International Journal for Research & Technology*, 3(11), 46-51. <https://uijrt.com/paper/adoption-use-information-and-communication-technology-academic-libraries-ghana>
- Abdulai, R. T. & Owusu-Ansah, A. (2014). Essential ingredients of a good research proposal for undergraduate and postgraduate students in the social sciences. *SAGE Open*, 4(3), 1-15. <https://doi.org/10.1177/2158244014548178>

- Abdulrahman, A. B. (2016). Effective utilisation of ICT for repositioning of library and information science education in tertiary institutions in Nigeria. *European Journal of Basic and Applied Sciences*, 3(2).
- Adamou, S., & Ntoka, L. (2017). *The impact of digital technologies on academic libraries: A study in Greece* (Master's thesis, Linnaeus University). DiVA Portal. <https://bit.ly/4e1J5OB>
- Addy, N. A. & Ofori-Boateng, P. (2015). ICT and Education: An analysis into Ghana's Universities. *International Journal of ICT and Management*, 3(2), 23-28. <https://www.ijictm.org/pdf/folder-1/2015-12-10-09-01-10.pdf>
- Adom, D., Hussein, E. K., & Agyem, J. A. (2018). Theoretical and conceptual framework: Mandatory ingredients of quality research. *International journal of scientific research*, 7(1), 438-441. <https://doi.org/10.17406/ijsr.v7i1.154>
- Acheampong, E. (2019). *Adoption and implementation of mobile technology-based library services in Ghanaian academic libraries*. (Master's thesis, University of Ghana). <http://ugspace.ug.edu.gh/handle/123456789/33186>
- Achugbue, E. I, Ahimbisibwe, K. B., Odong, P. & Azih, A. C. (2022). Factors promoting the use of ICT hardware in university libraries in Two Nigerian Regions. *Regional Journal of Information and Knowledge Management*, 7(2), 70-85. <https://doi.org/10.70759/sxmn0993>
- Adams, E. (2010). The joys and challenges of semi-structured interviewing. *Community Practices*. 83(7),18-21.
- Adjei, K. O. K. (2020). *Managing information and communication technologies (ICT) at academic libraries in selected Public Universities in Ghana*. (Doctoral dissertation, University of South Africa). [https://bit.ly/3Xhzvyy\[^2\]](https://bit.ly/3Xhzvyy[^2])
- Adom, D., Joe, A.-A., & Hussein, E. K. (2018). Theoretical and Conceptual Framework: Mandatory Ingredients of Quality Research. *International Journal of Scientific Research*, 7(1), 438-441. [https://bit.ly/4f7JCSF\[^1\]](https://bit.ly/4f7JCSF[^1])

- Adu-Gyamfi, S., Donkoh, J. W. & Addo, A.A. (2016) Educational Reforms in Ghana: Past and Present. *Journal of Education and Human Development*, 5(3), 158-172. <https://doi.org/10.15640/jehd.v5n3a17>
- Alando, B. & Ewuntomah, F. N. (2021). Information Communication Technology use in academic libraries of selected tertiary institutions in Ghana. *International Journal of Research and Innovation in Social Science*, 5(9), 198-212. <https://doi.org/10.47772/IJRIS.2021.5924>
- Al-Ansari, H. (2006). Internet use by the faculty members of Kuwait university. *The Electronic Library*, 24(6), 791-803. <https://doi.org/10.1108/02640470610714224>
- Al-Fadhli, M., Corral, S. & Cox, A. M. (2016). Factors underlying technology adoption in academic libraries in Kuwait. *New Review of Academic Librarianship*, 22(4), 370-390. <https://doi.org/10.1080/13614533.2016.1138135>
- Anafo, P., Akpah, S., & Ofori, Y. (2020). The information and communication technology infrastructure on University of Mines and Technology campus and its impact on library e-resource accessibility. *Ghana Mining Journal*, 20(1), 75 - 83. <https://doi.org/10.4314/gm.v20i1.9>
- Chukwuere, J. E. (2021). Theoretical and conceptual framework: A critical part of information systems research process and writing. *Review of International Geographical Education (RIGEO)*, 11(9), 2678-2683. <https://doi.org/10.48047/rigeo.11.09.234>
- Creswell, J. W. & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed-methods approaches* (5th ed.). Sage. <https://doi.org/10.1177/1558689818772461>
- DalGLISH, S., Khalid, H & McMahon, S. (2020). Document analysis in health policy research: the READ approach. *Health Policy and Planning*, 35(10), 1424–1431. <https://doi.org/10.1093/heapol/czaa064>
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319-340. <https://doi.org/10.2307/249008>

- Elo, S. & Kyngas, H. (2007). The qualitative content analysis process. *Journal of Advanced Nursing*, 62(1), 107-15. <https://doi.org/10.1111/j.1365-2648.2007.04569.x>
- Gabbay, K. L., & Shoham, S. (2017). The role of academic libraries in research and teaching. *Journal of Librarianship and Information Science*, 51(3), 721-736. <https://doi.org/10.1177/0961000617742462>
- Ibrahim, A. K. & Issah, D. (2021). The adoption of ICT by libraries of teacher colleges of education in northern Ghana: Challenges and prospects. *Library Philosophy and Practice (ejournal)*, Article 5453. <https://digitalcommons.unl.edu/libphilprac/5453>
- Jamshed, S. (2014). Qualitative research method-interviewing and observation. *Journal of Basic and Clinical Pharmacy*, 5(4), 87-88. <https://doi.org/10.4103/0976-0105.141942>
- Kee, K. F. (2017). Adoption and diffusion. In C. Scott, & L. Lewis (Eds.), *The International Encyclopedia of Organisational Communication*. Wiley-Blackwell. <https://doi.org/10.1002/9781118955567.wbieoc058>
- Kodua-Ntim, K. & Fombad, M. C. (2020). Strategies for the use of open access institutional repositories at universities in Ghana. *Library Management*, 41(6/7), 515-530. <https://doi.org/10.1108/LM-02-2020-0023>
- Kohlbacher, F. (2006). The use of qualitative content analysis in case study research. *Forum: Qualitative Social Research*, 7(1), Article 21. <https://www.qualitative-research.net/index.php/fqs/article/view/75/153>
- Kolan, B. & Ocloo, P. E. D. (2018). Effect of social media on academic performance of students in Ghanaian universities: A case study of University of Ghana, Legon. *Library Philosophy and Practice (e – journal)*, Article 1741, 1-24. <https://bit.ly/3VzFgYk>
- Konlan, B. B. (2022). Availability of ICT facilities and utilisation for research output in Ghanaian academic libraries: The case of University for Development Studies Library Systems. *Library Philosophy and Practice (e-journal)*. Article 7131. <https://digitalcommons.unl.edu/libphilprac/7131>

- Korstjens, I & Moser, A. (2018). Series: Practical guidance to qualitative research. Part 3: Sampling, data collection and analysis. *European Journal of General Practice*, 24(1), 9–18. <https://doi.org/10.1080/13814788.2017.1375091>
- Koul, L. (2002). *Methodology of educational research* (4th ed., pp. 70 – 78). Vikas Publishing House. <https://bit.ly/3YVpQZY>
- Kumar, R. (2011). *Research methodology: A step-by-step guide for beginners* (3rd ed.). Sage Publications. <https://doi.org/10.1080/15348431.2019.1661251>
- Ministry of Communication, Science and Technology, Maldives (2005). *Education: Science and Technology Master Plan*. <https://bit.ly/4e3D4Vr>
- Ministry of Education (MOE). (2014). *Report of the technical committee on conversion of the polytechnics in Ghana to technical universities*. Author. <https://bit.ly/3LcQh5U>
- Ngulube, P., Mathipa, E. R., & Gumbo, M. T. (2015). Theoretical and conceptual framework in the social sciences. In E. R. Mathipa & M. T. Gumbo (Eds.), *Addressing research challenges: Making headway in developing researchers* (pp. 43–66). Mosala-MASEDI Publishers & Booksellers. <https://doi.org/10.7553/81-2-1577>
- Onn, C. W., & Sorooshian, S. (2013). Mini literature analysis on information technology definition. *Information and Knowledge Management*, 3(2), 139-140. <https://bit.ly/3Rqs12f^1>
- Plockey, FD & Pwadura, J. (2018). Examining the use of ICT storage and dissemination of library materials in academic libraries in Ghana. *UDS International Journal of Development*, 5(1), 171–180. <https://doi.org/10.47740/242.UDSIJD6i>
- Rogers, E. M. (2003). *Diffusion of innovations*. (5th ed). The Free Press.
- Rogers, E. M. (1995). *Diffusion of innovations*. (4th ed.) Free Press.
- Rogers, E. M. (1983). *Diffusion of innovations*. (3rd. ed.). Free Press.
- Sokari, V., Gama, U. G., Haliru, Z. A., Olayemi, K. J., & Yemi-Peters, O. E. (2017). Application of information and communication technology

- facilities in technical services operations at Bayero University library, Nigeria. *Information Impact: Journal of Information and Knowledge Management*, 8(1), 52–58. <https://doi.org/10.4314/ijikm.v8i1.6>
- Ugur, N., & Koc, T. (2015). Time for digital detox: Misuse of mobile technology and phubbing. *Procedure – Social and Behavioural Sciences*, 195, 1022 – 1031. <https://doi.org/10.1016/j.sbspro.2015.06.491>
- Walliman, N. (2011). *Research Methods: The Basics*. Routledge. <https://doi.org/10.4324/9780203836071>
- White, M. & Marsh, E. (2006). ‘Content analysis: A flexible methodology’. *Library Trends*, 55(1), 22 – 45. <https://doi.org/10.1353/lib.2006.0053>
- Wilkinson, D & Birmingham, P. (2003). *Using research instruments*. Psychology Press. <https://doi.org/10.4324/9780203422991>
- Xue, D. (2017). *Applying the diffusion of innovation theory to characterise STEM faculty attending professional development programmes* (Master’s thesis, University of Nebraska–Lincoln). University of Nebraska–Lincoln Digital Commons. <http://digitalcommons.unl.edu/chemistrydiss/87>
- Yin, R. K. (2018). *Case study research and applications: Design and methods*. (6th ed.). Sage.
- Yousaf, A., Tariq, M & Soroya, M.S. (2013). Management issues for female librarians: A case study of University of the Punjab. *Library Philosophy and Practice (e-journal)*. Article 930. <https://digitalcommons.unl.edu/libphilprac/930>
- Zainal, Z. A, & Zainuddin, Z. S. (2020). Technology adoption in Malaysian schools: An analysis of national ICT in education policy initiatives. *Digital Education Review*, 37, 172–194. <https://doi.org/10.1344/der.2020.37.172-194>