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A Comprehensive Framework for Mitigating Digital Divide Factors in Higher Education: A Case Study of Kabul University

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ABSTRACT: The issue of Digital Divide is a prevalent concern across various educational and non-educational domains in Afghanistan. The situation is particularly challenging at Kabul University, where numerous factors hinder the effective utilization of available digital technologies by students, teachers, and staff. Drawing on the existing factors, our research proposes a comprehensive solution framework to address this problem. Our framework aims to mitigate most of the Digital Divide factors that are present at Kabul University, thereby enabling its stakeholders to leverage digital technologies effectively. Compared to similar frameworks proposed in other developing countries, our approach is specifically tailored to the cultural and educational environments of Kabul University and Afghanistan. As such, it takes into account the unique challenges and opportunities presented by these contexts. Our research is a significant contribution to the discourse on Digital Divide in Afghanistan, and we believe that our proposed framework has the potential to transform the digital landscape of Kabul University. We hope that our findings and recommendations will inform further research and policy interventions in this area, ultimately contributing to the development of a more digitally inclusive society. In our research, we utilized a case study and design science methodology to address the issue of the Digital Divide at Kabul University in Afghanistan.

KEYWORDS: Digital Divide, Framework, Factors, Higher Education, Technology Adoption, Access, Connectivity

1. INTRODUCTION

The impact of technology on higher education is undeniable, as it has the potential to expand access and improve the quality of education worldwide. However, how technology is integrated into higher education varies greatly from region to region, country to country, and institution to institution, depending on a variety of factors.

Given that utilizing technology to improve higher education requires the necessary infrastructure, human skills, and means, and that it has significant implications for business operations, it is critical to recognize and pursue the potential to reduce inequalities in access to knowledge and information.

In light of these implications, higher education institutions and businesses need to leverage technology effectively to bridge divides and reduce inequalities. Doing so can unlock numerous opportunities for growth and innovation, enabling individuals and organizations to thrive in a rapidly evolving digital landscape.

The use of technology has revolutionized the way people communicate, making it easier to share thoughts, ideas, and perspectives. With the development of technology, traditional time and space constraints have been eliminated, and online tools have been created to share multimedia content. Simple interfaces have also been developed, enabling even non-experts to share and connect. (Chen & Wellman, 2004)

Access to technology has become an essential component of social, economic, and political realms, leading to a digital divide in society, which is the disparity in access to digital devices and social media. The digital divide is a significant issue in developing nations such as Afghanistan, making it difficult for people to communicate, access education, and participate in the economy. The

majority of economic transactions and educational interactions take place online, so Kabul University must address the causes of the digital divide to find better solutions (Warschauer & Matuchniak, 2010).

The increasing significance of social media among young people cannot be overstated. Students' use of social networking sites has grown in popularity over time as a means of connecting with friends inside and outside of school. However, economists and professors are concerned that excessive use of social media may negatively impact students' educational performance. According to Kist (2008), Mehmood and Taswir (2013), and Jacobsen and Forste (2011), the utilization of technology, such as the Internet, is one of the most significant factors that can have a positive or negative impact on student's educational performance. Many parents and guardians are concerned that their children are not studying enough because they are spending too much time on Facebook and other social media sites. Many students continue to use social media sites in their daily lives, despite parents' concerns about their children's excessive use.

In conclusion, access to technology is critical in today's world, and the digital divide remains a significant issue in many developing nations. The increasing use of social media and technology among young people has become a concern for educators and parents, and further research is needed to understand its impact on student's academic performance.

In Afghanistan, social media and new technology usage have become a widespread phenomenon, and it is reported that many people in Kabul spend a considerable amount of time on these platforms instead of working (Noori, et al., 2022). However, access to digital technology and connectivity has remained a challenge for most of the country, leading to a digital divide that isolates Afghan citizens from the rest of the world (World Bank Group, 2016). While the Ministry of Communication and Information Technology (MCIT) has made significant progress in this area since 2001, these efforts have not been enough to fully bridge the gap.

Despite the quality of services provided by the MCIT, the digital divide remains a significant issue in many areas of Afghanistan, including Kabul University (Khan et al., 2012). One of the primary factors contributing to the digital divide in universities is the lack of access to information technology for students, faculty, and staff. Furthermore, many government employees are not familiar with modern management systems, which leads to a significant gap between the advancements in information technology and the older workforce (Khan et al., 2012).

To conclude, the digital divide in Afghanistan has hindered the country's progress in many areas, including education and the economy. The Afghan government must take decisive steps to bridge this gap and provide access to digital technology for all citizens. This includes not only improving infrastructure and access but also providing training and education to ensure that people can effectively use modern technology and management systems.

The research paper focuses on a digital divide factor in the context of Kabul University. The problem is evident and there is limited research effort on this topic. The authors pose one main research question and two sub-questions:

MRQ: "How can factors of the digital divide at Kabul University be identified, and can we reduce the digital divide using a Framework?"

SRQ1 is "What are the primary causes of Kabul University's digital divide?"

SRQ2 is "What is the most effective framework for reducing the digital divide at Kabul University?".

The authors investigate the cultural and educational environment of the university and identify challenges and opportunities. The objective is to propose a framework that mitigates the digital divide factors.

To systematically address these research questions, the researchers will employ a variety of methods. The main research methods for this paper are case study and design science with the help of a literature review. This approach will allow for a comprehensive exploration of the digital divide in Afghanistan, as the topic has not yet been examined from various perspectives.

This study can contribute significantly to understanding the digital divide and its various dimensions in Afghanistan. Additionally,

it can catalyze other researchers to explore potential solutions to the problem. By identifying the factors contributing to the digital divide at Kabul University and proposing effective frameworks for reducing it, this study can play a critical role in bridging the digital divide and promoting socio-economic development in Afghanistan.

2. LITRATURE REVIEW

There are additional related articles that define the digital divide and details of the various factors that contributed to it.

2.1 Digital Divide in General

The term "digital divide" was coined by Horak and Fuchs (2008) to describe a situation in which individuals do not have equal access to information and communication technologies (ICTs).

1) Material access, which refers to the availability of software, hardware, networks, applications, and the usability of ICT devices and applications, is one category of the digital divide.
2) The capabilities required to operate ICT hardware and applications, create online content, and engage in online collaboration and communication are referred to as "use" and "skills access."
3) Benefit access refers to the use of ICT for the individual's benefit and the improvement of society as a whole.
4) According to Wei, Teo, Chan, and Tan (2011), institutional access refers to the empowerment of citizens by ICT to participate in political information, communication, and decision processes as well as their participation in institutions that govern the Internet and ICTs.

The majority of developed and developing nations are separated by the digital divide. Even though many people use the Internet, there is a growing digital divide in some nations. According to Wellman and Chen (2004), the demographics of new Internet users are comparable to those of current Internet users.

According to Antonio and Tuffley (2014), there are many digital divide factors in general, some of which are listed below.

- Societal Digital Divide
- Higher education digital divide
- Possibility of Bridging Digital Divide
- And many other factors are there

But here in this paper, we are concerned with the Higher Education Digital divide factors, now we will review some literature related to higher education.

2.2 Higher education digital divide

New technologies are still being used in university training today, according to Cavusa and Kanbulb (2010). Nonetheless, a critical issue originates from the incongruities that exist among college understudies. Due to the necessity of locating and analyzing such disparities, a study of college freshmen can be extremely beneficial. This qualitative study intends to examine the digital divide among such freshmen by employing techno-autobiographies: the understudies' depiction of their conditions. Some of these newcomers won't be able to use the Internet and won't have as many ICT resources because of these technological differences. It is essential to keep in mind that while some freshmen use digital technology more frequently for personal use than others, not all of them do so consistently for academic purposes.

The digital divide effects students from all over the world in some way. So, scientists have tried to look at this phenomenon at different points in a student's life to figure out what's going on, find explanations, and come up with possible solutions. Waycott, Bennett, Kennedy, Dalgarno, and Gray (2010) found, for instance, that teachers and students in Australia use technology in different ways in both their everyday lives and higher education. To justify these differences, they relied on personal motivations and social norms that encourage the use of ICTs. The study found that students are more receptive and enthusiastic about using ICTs than

teachers are. The study also showed that teachers primarily used ICTs for institutional purposes and pedagogical applications, whereas students used ICTs to organize their social lives. Edmunds, Thorpe, and Conole (2012) say that examining students' experiences with ICTs is a good way to look at the impact and attitudes of using them in educational, social, and recreational settings. They likewise say that an examination of how understudies use ICTs and collaborate with them can assist apprenticeships involving ICTs later on. In addition, this study reveals the student's prior knowledge and may serve as a foundation for innovative methodological approaches.

integrating teaching and policy dynamics to enable students in higher education to receive training through the integration of ICTs. Furthermore, it recommends that foundations should be responsible for giving such ICT support. Professors and students at more universities in Afghanistan, particularly Kabul University, have access to a variety of classroom-useful technologies. However, the university community is unable to incorporate these technologies into the educational system due to several obstacles. The lack of access to resources that are essential to lecturers and students but are available with internet access is one of the major issues caused by these factors.

Now here we will review some literature on proposed solutions and frameworks for such problems.

2.3 Utilization of ICT in education

ICT has a significant impact on human development in all areas, including health, economics, education, and so on. Utilizing ICT in education provides students with the opportunity to acquire and disseminate knowledge across and within various disciplines (Okolocha, & Nwadiani, 2015). The instructor-focused pedagogical approach to dealing with under-study-focused pedagogy may be altered by the utilization of ICT. According to Abdirizak (2013), using ICT services in a school can improve learning and teaching by providing resources that assist in transitioning from the current teacher-centered learning environment to an information-rich, student-centered learning environment.

According to Baha, & Diakoumi (2010), ICTs enable students to access their lecture notes and other learning materials at any time and from any location—at their college or remotely—at any time. The use of ICTs, such as e-learning and distance learning, gives students more options for courses, times, and locations (Isroani, Jaafar, & Muflihaini, 2022). In addition, ICT tools made it possible for students to communicate with teachers and other students in new ways, offered a wider range of learning resources and methods, increased the flexibility and quality of group work, and made it easier for teachers to give students feedback on assessment tasks.

2.4 ICT in Afghanistan higher education

ICT has spread worldwide in recent years. Every aspect of life, including higher education, has been impacted by this multiplication. ICT is currently firmly emphasized in education for teaching and learning in many developed as well as some developing nations. According to Pegu (2014), ICT has a significant impact on both the capacity and quality of education. According to Baha, & Diakoumi (2010), information and communication technologies (ICT) can offer lecturers and students an excellent opportunity to gain free access to a large library of information via the internet. Future generations should be educated in a manner that meets the requirements of the information age to prepare them for living in a developing society that is and will be heavily technology-oriented.

Unfortunately, three decades of war and instability have had several negative effects on the selection of ICT in education and its development, which is why ICT has less of an impact on Afghanistan's higher education system. In the areas of IT infrastructure, IT education, and IT management, significant progress has been made since 2002 (Hayward & Babury, 2015). In Afghanistan's higher education, for instance, some of the following IT infrastructures are implemented.

2.5 Ministry of Comunication and Information Tecnology Strategy

One of the Afghan government's strategic goals, according to MCIT (2015), is to provide all citizens with high-quality education.

They say that the Afghan government recognizes that ICT integration into education is essential to overcoming access and quality issues. In this regard, some policies are associated with the advancement of ICT in education: ICT education will be required in all primary and secondary schools nationwide; ICT instruction will be incorporated into all school educational modules nationwide; government schools, colleges, and universities will receive a sufficient ICT base, computing assets, and broadband internet to ensure the accessibility of ICT to educators, students, and administrators; and the provision of ICT facilities should be a requirement for private educational institution registration and licensing.

Electronic Learning (eLearning) would be advanced and incorporated as a crucial component of the government's approach to eliminating illiteracy, providing all-inclusive instruction to all children, and providing a stage for life-long learning and skill advancement among adults. The government will, in a staged manner, transform all primary and secondary schools into brilliant schools where serious use of ICT as an instructional device is made by both understudies and educators. The government will provide educational courses for instructors on the use of information and communication technologies in education (Oryakhail, Saay, & Nasery, 2021).

2.6 Frameworks for Digital Divide Inclusion

Various frameworks for the digital divide have been proposed by many scholars. Figure 1 shows a framework for Digital Inclusion in Nairobi.

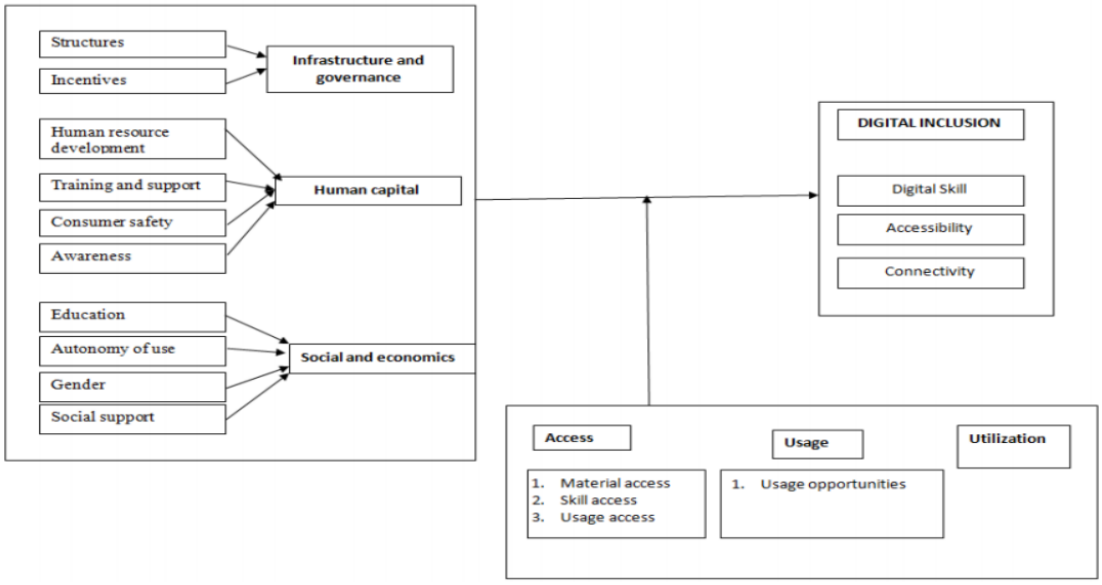


Figure 1. Framework for Digital Inclusion (Wambugu Naftaly Muriuki, 2016)

According to Dewan and Riggins (2005), the way to bridge the digital divide may be to develop a model, framework or other technologies that would help users bypass the traditional means of access to technologies. The following Figure 2 shows the analysis of bridging the digital divide in three levels including global, organization and individuals (Riggins, 2005).

A conceptual framework that contributes the teachers and students in the classroom to use ICT usefully and also the skills and attitude of the teachers and students. The following Figure 3 show the dimensions of the meaningful use of ICT in the classroom (Grigg, 2016).

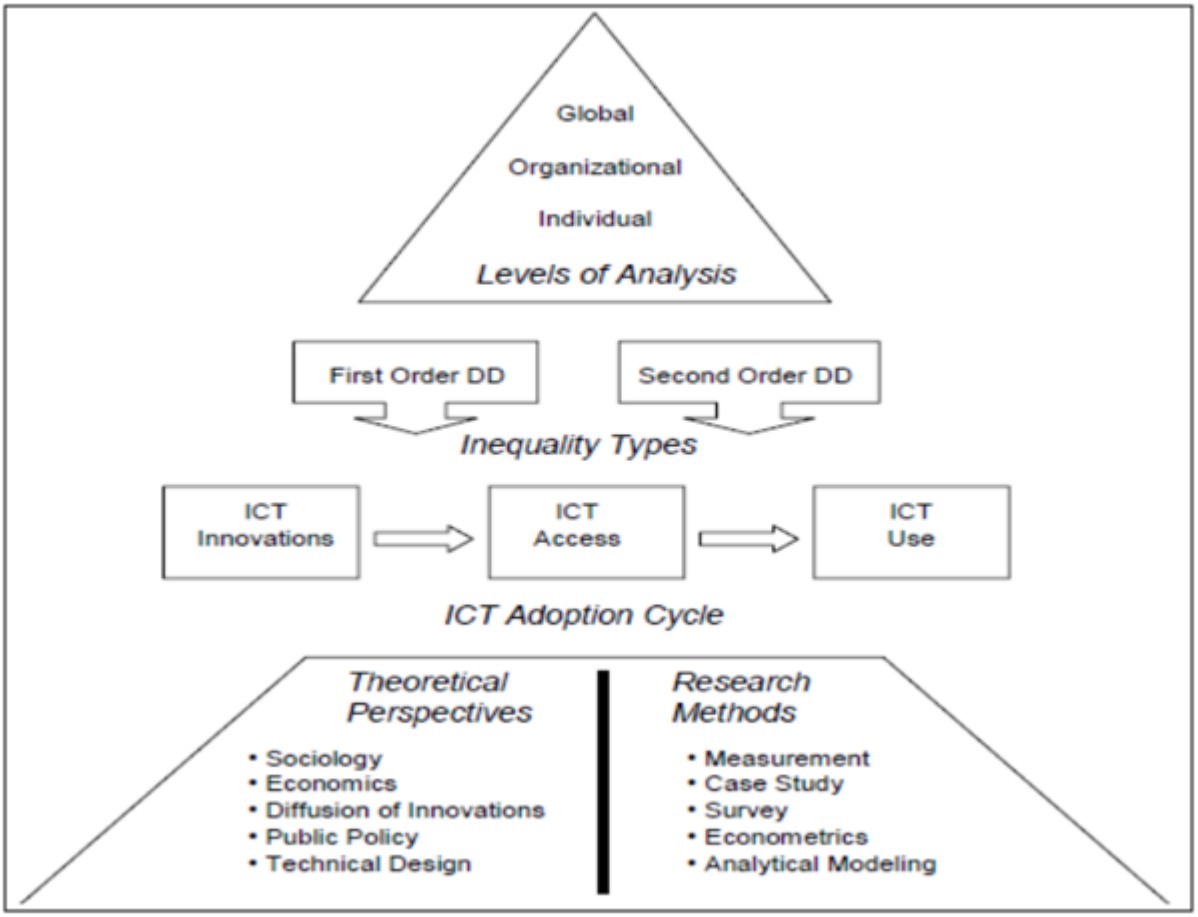


Figure 2. Conceptual Frame of analysis digital divide bridging

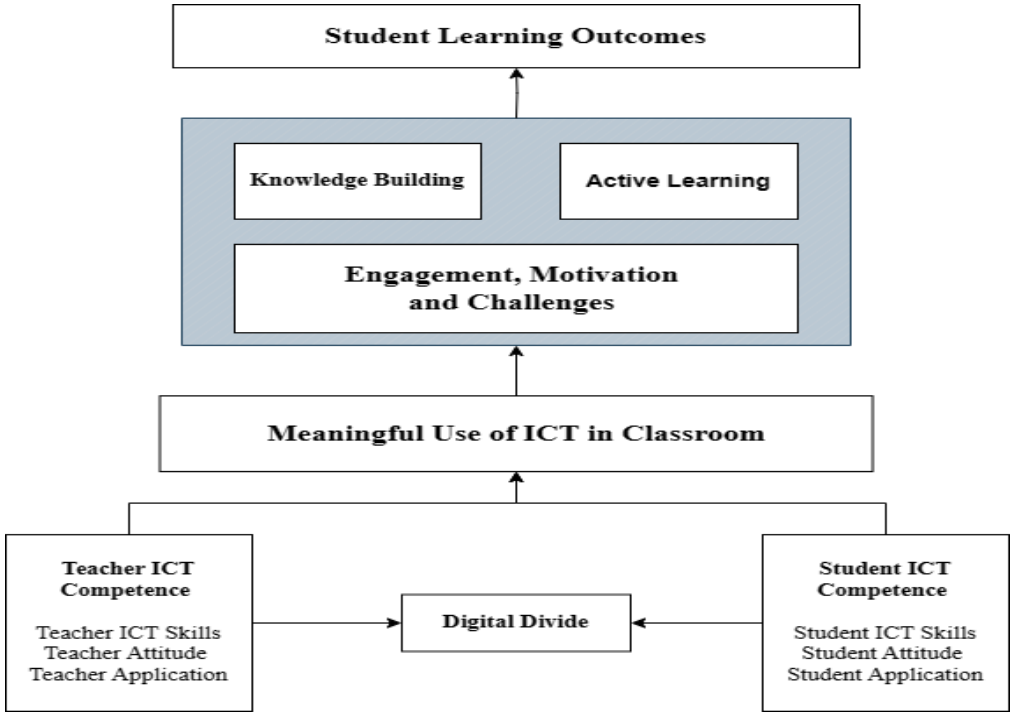


Figure 3. A conceptual Framework of the dimensions of the meaningful use of ICT in the classroom

3. RESEARCH METHODOLOGY

This research uses a mix of research methods, namely Case Study and Design Science research methods. In the Case Study research design, there are multiple methods such as interviews, observations, documentation methods, voice recordings, and images to collect data, but in this research, the interview is used. So, the research questions of this exploratory research are answered through a qualitative approach, with primary data collected through interviews, which includes all requirements of the proposed digital divide factors. The collected data is analyzed by the NVIVO tool, which is known to be an effective program for analyzing research data. To identify the digital divide factors and propose solutions to resolve these factors, the research is conducted at Kabul University. Based on Figure 4, the research is a single-case study approach, where the environment is examined for identifying digital divide factors.

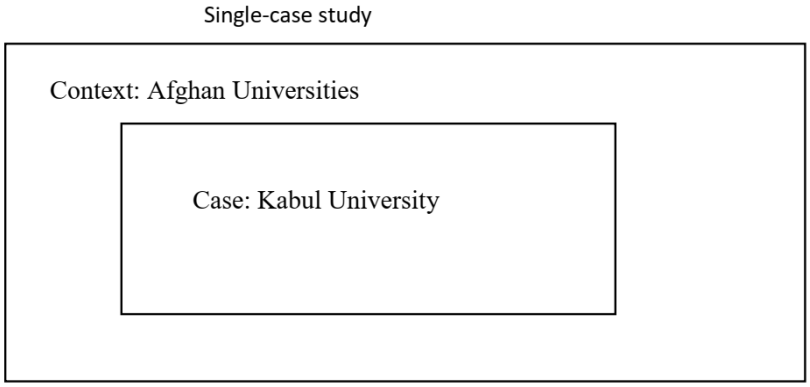


Figure 4. Holistic case study

3.1 Data collection process

The data collection method involves conducting interviews with students, professors, and technical staff at Kabul University. Specifically, a set of open-ended questions has been prepared for interviews with students, university professors, and technical staff. These questions are designed to elicit detailed responses, providing valuable insights into the identification of factors contributing to the digital divide at Kabul University.

Each interview session is structured to last approximately 60 minutes and follows a defined agenda, commencing with an introduction and then moving on to the main questions related to understanding the digital divide at the university. During these interviews, sound recordings are made to facilitate transcription, aiding in subsequent analysis and future reference.

Following the interviews, recorded sessions are transcribed into text files manually to prepare them for analysis. The transcriptions undergo a review process by the interviewees, allowing for any necessary corrections or clarifications. However, no alterations are made to the original transcriptions.

To analyze the interview data, coding techniques are applied to formulate transcripts. The interview approach was selected as the most appropriate method for data collection, as it ensures the acquisition of reliable

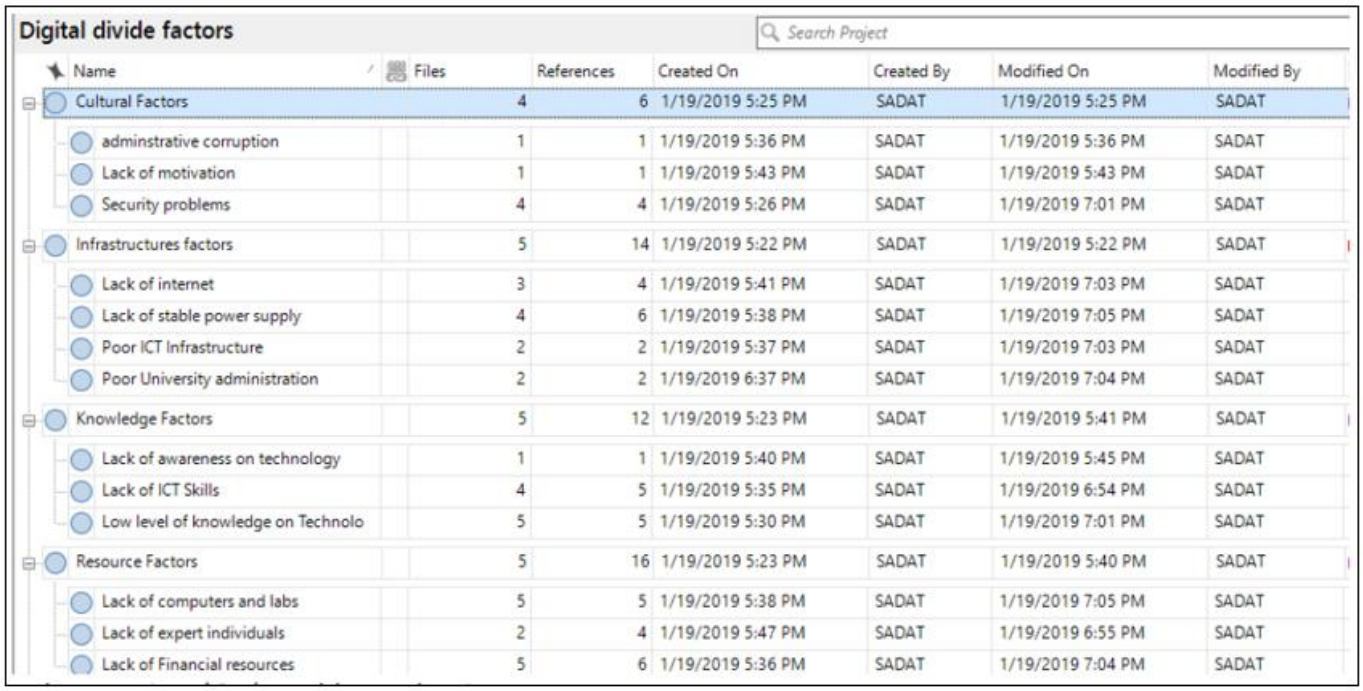
Figure 5. Case Study Process from Kabul University

Information from individuals with direct personal experience. Participants encompass technical staff, students, and university professors from Kabul University. A total of 40 students, 10 university professors, and 10 technical staff members from various faculties were chosen for these interviews.

Additionally, for the development and validation of the proposed framework, two workshops were organized. During these workshops, the framework was presented, and all participants, including individuals from computer science, law, physics faculties, and the Information Technology Center of Kabul University, provided questions and comments. It's important to note that these participants were distinct from those involved in the initial interviews.

3.2 Method of Data Analysis

After the interviews are transcribed and properly documented, thematic analysis is conducted using NVIVO software. The latent theme is used to focus on a specific question across the majority of the data set. To test the hypothesis, interview coding procedures are used to code, sort, synthesize, and theorize from the interviews. The NVIVO tool is used for categorizing and classifying the questions, showing percentages and the number of repeated words. A theme was created for each question, including names, sources, descriptions, and references. The sources showed the numbers of interviewees, and the references showed how many interviewees repeated one code's attributes. The below figures show the themes that have been extracted from the analysis of the interview. The first theme shows the digital divide factors, and the second figure shows the solutions to the digital divide factors at Kabul University.



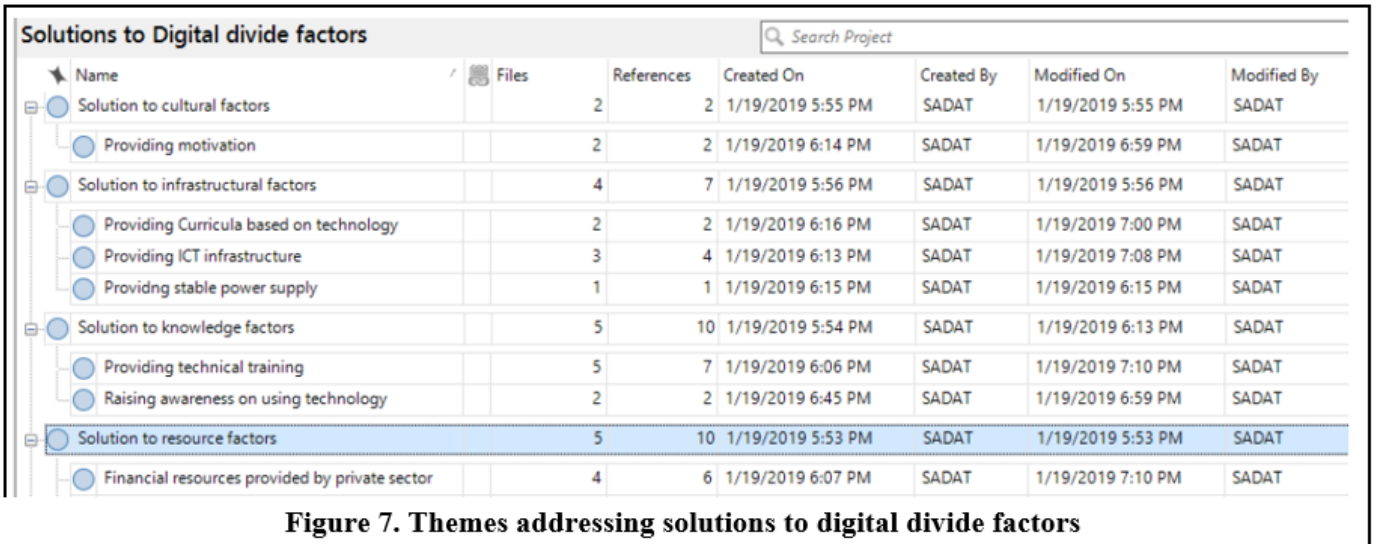
Digital divide factors

Search Project

Name	Files	References	Created On	Created By	Modified On	Modified By
Cultural Factors	4	6	1/19/2019 5:25 PM	SADAT	1/19/2019 5:25 PM	SADAT
adminstrative corruption	1	1	1/19/2019 5:36 PM	SADAT	1/19/2019 5:36 PM	SADAT
Lack of motivation	1	1	1/19/2019 5:43 PM	SADAT	1/19/2019 5:43 PM	SADAT
Security problems	4	4	1/19/2019 5:26 PM	SADAT	1/19/2019 7:01 PM	SADAT
Infrastructures factors	5	14	1/19/2019 5:22 PM	SADAT	1/19/2019 5:22 PM	SADAT
Lack of internet	3	4	1/19/2019 5:41 PM	SADAT	1/19/2019 7:03 PM	SADAT
Lack of stable power supply	4	6	1/19/2019 5:38 PM	SADAT	1/19/2019 7:05 PM	SADAT
Poor ICT Infrastructure	2	2	1/19/2019 5:37 PM	SADAT	1/19/2019 7:03 PM	SADAT
Poor University administration	2	2	1/19/2019 6:37 PM	SADAT	1/19/2019 7:04 PM	SADAT
Knowledge Factors	5	12	1/19/2019 5:23 PM	SADAT	1/19/2019 5:41 PM	SADAT
Lack of awareness on technology	1	1	1/19/2019 5:40 PM	SADAT	1/19/2019 5:45 PM	SADAT
Lack of ICT Skills	4	5	1/19/2019 5:35 PM	SADAT	1/19/2019 6:54 PM	SADAT
Low level of knowledge on Technolo	5	5	1/19/2019 5:30 PM	SADAT	1/19/2019 7:01 PM	SADAT
Resource Factors	5	16	1/19/2019 5:23 PM	SADAT	1/19/2019 5:40 PM	SADAT
Lack of computers and labs	5	5	1/19/2019 5:38 PM	SADAT	1/19/2019 7:05 PM	SADAT
Lack of expert individuals	2	4	1/19/2019 5:47 PM	SADAT	1/19/2019 6:55 PM	SADAT
Lack of Financial resources	5	6	1/19/2019 5:36 PM	SADAT	1/19/2019 7:04 PM	SADAT

Figure 6. Themes addressing the Digital Divide factors

The below figure shows solutions to all the five categories of digital divide factors.



Solutions to Digital divide factors

Search Project

Name	Files	References	Created On	Created By	Modified On	Modified By
Solution to cultural factors	2	2	1/19/2019 5:55 PM	SADAT	1/19/2019 5:55 PM	SADAT
Providing motivation	2	2	1/19/2019 6:14 PM	SADAT	1/19/2019 6:59 PM	SADAT
Solution to infrastructural factors	4	7	1/19/2019 5:56 PM	SADAT	1/19/2019 5:56 PM	SADAT
Providing Curricula based on technology	2	2	1/19/2019 6:16 PM	SADAT	1/19/2019 7:00 PM	SADAT
Providing ICT infrastructure	3	4	1/19/2019 6:13 PM	SADAT	1/19/2019 7:08 PM	SADAT
Providng stable power supply	1	1	1/19/2019 6:15 PM	SADAT	1/19/2019 6:15 PM	SADAT
Solution to knowledge factors	5	10	1/19/2019 5:54 PM	SADAT	1/19/2019 6:13 PM	SADAT
Providing technical training	5	7	1/19/2019 6:06 PM	SADAT	1/19/2019 7:10 PM	SADAT
Raising awareness on using technology	2	2	1/19/2019 6:45 PM	SADAT	1/19/2019 6:59 PM	SADAT
Solution to resource factors	5	10	1/19/2019 5:53 PM	SADAT	1/19/2019 5:53 PM	SADAT
Financial resources provided by private sector	4	6	1/19/2019 6:07 PM	SADAT	1/19/2019 7:10 PM	SADAT

Figure 7. Themes addressing solutions to digital divide factors

3.3 Design Science Research for solution

The design science research (DSR) method is used in this study to design a solution for resolving the digital divide factors at Kabul University. The DSR methodology is used to create innovative and practical solutions that can help solve complex problems in the fields of information systems and information technology. It is an iterative process that involves identifying a problem, designing a solution, building and evaluating the solution, and then refining it based on feedback. The following steps are taken to apply the DSR methodology to this research (Miah & Genemo, 2016):

1) **Problem identification and motivation:** The first step in DSR is identifying a problem that needs to be addressed. In this case, the problem is the digital divide factors at Kabul University that are affecting the learning and teaching environment.
2) **Solution design and development:** The next step is to design a solution that could resolve these factors. This involved developing a conceptual framework based on the research findings.

3) **Solution demonstration:** After designing and developing the solution, it is demonstrated by presenting a prototype of the framework to a group of students, university professors, and technical staff at Kabul University. Feedback is collected from the participants, and the solution is refined based on their comments and suggestions.
4) **Evaluation:** The final step in DSR is evaluating the solution to determine its effectiveness in addressing the problem through two workshops in the computer science faculty of Kabul University. This is done by comparing the learning and teaching environment at Kabul University before and after the implementation of the solution and by collecting feedback from the same group of participants who tested the prototype.
5) **Ethical Considerations:** In this research, ethical considerations are taken into account to ensure that the research is conducted in an ethical manner. The following ethical considerations are addressed:

a. **Informed consent:** All participants are informed about the nature of the research and provided with the opportunity to ask questions before agreeing to participate. They are also informed that their participation is voluntary and that they can withdraw at any time without consequences.
b. **Anonymity and confidentiality:** Participants are assured that their responses will be kept confidential and that their identities will not be revealed in any publications or presentations resulting from the research.
c. **Data protection:** The data collected from the participants is stored securely and is only accessible to the research team.
d. **Respect for diversity:** The research team is respectful of the cultural and religious diversity of the participants and makes every effort to ensure.

Overall, this methodology section outlines the research approach used in this study, including the research design, data collection, and data analysis methods that are used to identify the digital divide factors at Kabul University.

4. RESULTS

After analyzing the interviews, we found that most of the factors were: poor economic conditions of the university, lack of expert individuals, presence of negative mentality, existence of professional and technical problems, lack of awareness of technology, lack of computers, lack of persistent electricity, and lack of strong and cheap internet. Most of the respondents termed a lack of expert individuals in technological advancements and indicated the mentioned factor as an important factor in the failure of implementing the infrastructure projects at Kabul University. In addition to that, most of the respondents termed lack of awareness of technology as the main factor, which had a negative impact on the use of technology at Kabul University. Likewise, the respondents indicated that a lack of awareness of technology challenged the use of technology in the teaching and non-teaching areas. They termed the lack of expert individuals and teachers the factor that Kabul University officials did not pay attention to the related technological advancement. Likewise, the respondents termed lack of computers and strong and cheap internet as factors in the digital divide. The lack of capacity upgrading programs was also indicated as a factor in implementing programs for solving the problem of the digital divide at Kabul University, and this factor was advised to be prioritized in solving the problem. On the other side, the factors that prevented women from gaining equal access to technological devices were also indicated, as most of the respondents termed cultural issues that prevented women from gaining equal access to digital devices at Kabul University. The following table shows the main factors contributing to the digital divide at Kabul University. Table 1 shows the main factors contributing to the digital divide at Kabul University.

Table 1. Main Factors of the Digital Divide at Kabul University

Factors	Percentage
Lack of technical skills and knowledge	55%

Poor ict infrastructure	43%
Culture and policy	41%
Lack of awareness on technology	37%
Lack of expert individuals	34%
Poor economic condition of university	27%
Lack of computers	25%
Lack of capacity upgrading programs	21%
Professional and technical problems	20%
Presence of negative mentality	15%

4.1 Main Digital Divide Solution Factors

To address the identified issues at Kabul University causing the digital divide among professors, students, and university staff, we formulated specific solution inquiries. Upon thorough analysis of the conducted interviews, we identified the critical solution factors that impact the utilization of ICT in the daily activities of professors, students, and university staff. These are providing technical training, internet access, a stable power supply, the usage of technological devices in teaching, raising awareness about using technology in education and learning, and standards and policies. The following table 2 shows the main solution factors.

Table 2. Main Digital Divide Solution Factors

Factors	Percentage
Providing technical training	56%
Provision of persistent electricity and internet access	37%
Providing curricula based on technology	35%
Usage of technological devices in teaching and learning	31%
Standards and policies	30%
Raising awareness on using technology in education	28%
Establishment of technological centers	26%
Employment of professional and expert individuals	23%
Providing computers labs	18%

4.2 Proposed framework

Since technology is an essential part of the modern educational system, the integration of technology into the educational system is significant. In order to use technology in the educational system, we need computers, local networks, the internet, and other media outlets as an integrated part of the educational system at a university, as they are accessible anytime.

The new technology could be considered an important reformative factor that could help students enhance the process of learning, as technology could be a means for them to have access to study materials and impart their analyzed information to others so that the digital divide is eliminated.

Thus, ICT has had a positive impact on educational organizations and units; however, some researchers have predicted that online study materials could adversely influence university educational systems, but the fact is that online study and education could positively influence education and help enhance an educational system as ICT leads teachers, university professors, and managers towards empowerment, and thus they can bring about new attitudes towards learning.

Nowadays, what is important is the improvement of the educational system, and many researchers have raised their ideas saying that ICT could guarantee education and bring about positive changes in the areas of education across the globe. Given the

significance of ICT, policies and strategies regarding the integration of ICT into educational systems at universities should be devised by policymakers of higher education organizations in the country so as to eliminate the problem of the digital divide.

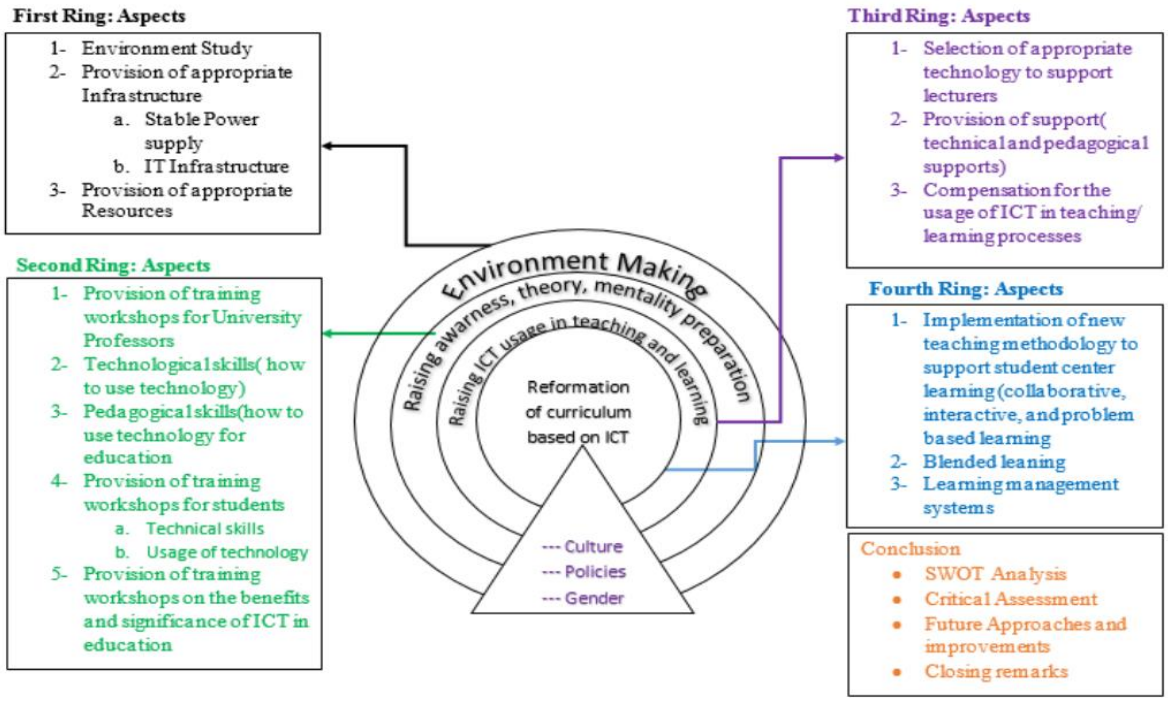
Each country across the globe devises its educational policies and strategies based on its national income, but in developing countries, such as Afghanistan, educational technology has not just developed considerably, but there has been a lack of educational infrastructure as well. Since discussing technology along with its other aspects is not that easy and implies a long range of full-scale requirements and requisite information, it would be better if we skipped the other aspects of technology, such as the attitudes towards learning with the integration of technology, using technology in education, setting standards and frameworks for online education at a higher educational level, and other aspects.

The integration of ICT has had a positive and progressive effect on the educational systems in many parts of the world; for instance, India, as a developing country, has had considerable achievements in this regard. But in Afghanistan, due to a lack of proper infrastructure, resources, and concepts with regard to the integration of ICT into the educational systems, this sector has remained sorely underdeveloped. Though the Ministry of Higher Education Afghanistan has expressed optimism for the years ahead, merely an infrastructure and notion in the context does not suffice; hence, a guideline is needed to steer the policymakers to come above the gap in the country.

The suggested framework was derived from the extensive analysis and findings of the case study and design science research conducted in this study. The researchers thoroughly examined the data collected from the case study, which involved unstructured interviews with students, university professors, and technical staff at Kabul University. The interviews provided valuable insights into the factors contributing to the digital divide at the university.

Additionally, the design science research method was employed to develop and refine the proposed solution for resolving the digital divide factors at Kabul University. The iterative process of design science research allowed the researchers to identify the problem, design a conceptual framework, and demonstrate a prototype of the solution. Feedback from participants, including students, professors, and technical staff, further shaped and improved the framework.

The combination of case study and design science research enabled the researchers to gain a comprehensive understanding of the digital divide at Kabul University and to develop a well-grounded framework to address the challenges effectively. This framework serves as a practical guide for policymakers and stakeholders in formulating strategies to bridge the digital divide and enhance the



educational system at the university. Based on Figure 6, the proposed framework consists of four rings that have been prioritized step by step, and all four rings are interrelated, describing the ways that can be positive in mitigating the digital divide at Kabul University.

Figure 8. Four-Ring Framework for Decreasing Digital Divide Factors at Kabul University

4.3 Framework Evaluation Process

To validate the proposed framework, two evaluation processes were used. First, in order to evaluate the research framework, the researcher presented the framework at Kabul University to a group of students, teachers, and technical staff in a workshop. They were from the computer science, Law, and Physic faculties and the Information Technology Center of Kabul University. In the first workshop, about two hours were taken, and the attendees agreed on most of the aspects of the framework and liked the points that have been kept into account for solving the digital divide at the university. However, they termed the framework as an effective means for solving the problem, but there were some points they asked to be added to the framework, which were: policy, cultural, and gender-related issues; the priorities of every ring aspect; and also some aspects added into all rings; for example, the environment study aspect is added into the first ring (Environment Making). In the second evaluation, the framework was presented and explained in detail in an hour, and then with corrected points that had been suggested in the previous workshop by technical staff, students, and university professors. After the evaluation and monitoring of the corrected points, the attendees of the second workshop agreed on the framework and said that it was the most effective means for solving the digital divide problem not only at Kabul University but all over the country.

As we can see, the framework consists of four main rings, which have been designed based on the requirements of the research study. The first ring suggests that training technical workshops for university teachers, training workshops for students, enhancement of technological skills at the university level, and training workshops on the benefits and significance of ICT in education are quite significant, which can initially pave the way to eliminating the factors of the digital divide at the university.

The second ring of the framework has been devoted to raising awareness and mentality preparation, which means that after the students, teachers, and other staff of the university are trained in different areas of technology, their awareness can be raised easily, as they have already acquired technological skills, and thus a mentality can easily be made for removing the digital divide from the university.

In the third ring, raising ICT usage in teaching and learning can significantly help support the idea. In this ring, teachers, students, and other staff can easily be made to help support the integration of ICT and other technological areas in the process of teaching and learning. In this process, the university is not only able to decrease the digital divide but also modernize the teaching and learning process so as to benefit from the experiences of the rest of the world.

After the first, second, and third rings are implemented, the fourth ring can be seen as a project, which can benefit the previously-trained staff at a higher level. For instance, the previously-trained teachers, students, and other staff of the university can participate in the reformation of the educational system based on ICT. This will not only further raise the awareness of the staff but also the economic capabilities at the university level.

The researcher designed this framework after exploring and analyzing the environment, which is the structure of Kabul University. After the environment was analyzed and examined, the researcher meditated on the questions that complied with the environment, including the staff of the university. The interview questions were planned, and the interviews were conducted with students, teachers, and other staff at the university. After analyzing the collected data, the results showed that most of the factors were: poor economic conditions of the university, lack of expert individuals, presence of negative mentality, existence of professional and technical problems, lack of awareness of technology, lack of computers, lack of persistent electricity, lack of strong and cheap internet, and lack of access to technological arenas for women. Most of the respondents termed the lack of expert

individuals in technological advancements and indicated the mentioned factor as an important factor in the failure of implementing the infrastructure projects at Kabul University. In addition to that, most of the respondents termed lack of awareness of technology as the main factor, which had a negative impact on the use of technology at Kabul University. Likewise, the respondents indicated that a lack of awareness of technology challenged the use of technology in the teaching and non-teaching areas. They termed the lack of expert individuals and teachers the factor by which Kabul University officials did not pay attention to the related technological advancement. Likewise, the respondents termed lack of computers and strong and cheap internet as factors in the digital divide. The lack of capacity upgrading programs was also indicated as a factor in implementing programs to solve the problem of the digital divide at the university. enhancement of infrastructure, particularly addressing the issue of insufficient power supply, is essential to resolving the digital divide. Furthermore, the study revealed that women faced barriers to gaining equitable access to technological resources. Respondents primarily attributed this to cultural factors that hindered women's equal access to digital devices within the university. Another contributing factor was the absence of dedicated technological resources tailored to the needs of women. Notably, a substantial majority of the respondents (55%) recognized the pivotal role of information and communication technology (ICT) in overall societal development.

Having in mind the abovementioned factors, which substantially created a context for the digital divide, the framework was designed based on these factors. Therefore, the content of the framework not only fits the environment of Kabul University, but all the public and private universities and other educational institutes can also benefit in the same way, as these factors are comprehensive across the country, which has created a digital divide. This framework is the only way to remove the digital divide from the country's educational areas. However, there are some problems that can prevent the implementation of the framework's content to some extent, for instance, the lack of persistent power, etc. But despite all these, the framework can pave the way for future work as well and can be seen as the only way towards eliminating digital divide factors not only at Kabul University but all the educational institutes in the rest of the country.

5. DISCUSSION

The research presented in this paper offers a comprehensive analysis of the digital divide at Kabul University, focusing on identifying and addressing the factors contributing to this divide. The study delves into an area with limited existing research, making it a significant contribution to understanding and bridging the digital gap in the academic environment of Kabul University.

The authors began by framing their research through a main research question (MRQ) and two sub-questions (SRQ1 and SRQ2). The MRQ aimed to understand how the factors of the digital divide at Kabul University can be identified and whether a framework could aid in reducing this divide. SRQ1 sought to identify the primary causes of the digital divide at Kabul University, while SRQ2 aimed to determine the most effective framework for reducing the digital divide. These research questions provided the necessary guidance for the study.

Based on the data collected from interviews with students, professors, and technical staff, the study identified several key factors contributing to the digital divide. These factors encompassed aspects like lack of technical training, inadequate internet and power supply, absence of technological devices in teaching, and gaps in awareness and policies related to technology use. The study further quantified the importance of these factors through a percentage-based analysis.

The proposed framework addressed these identified factors in a structured manner. It emphasized the need for training workshops, raising awareness, integrating ICT into teaching and learning, and ultimately encouraging staff involvement in the reformation of the educational system based on ICT. The framework was designed to be applicable not only to Kabul University but to other educational institutes in Afghanistan, highlighting its potential for a broader impact.

The authors evaluated the proposed framework through two workshops involving students, teachers, and technical staff from

various faculties at Kabul University. The feedback from these evaluations was used to refine the framework, incorporating valuable suggestions regarding policy considerations, cultural and gender-related issues, and additional aspects to be included in each ring of the framework.

The study demonstrated the critical role of technology in enhancing the educational system and mitigating the digital divide. It emphasized the need for policy development and the integration of ICT into the educational systems of developing countries like Afghanistan. The findings underscored that addressing the digital divide is crucial not only for improving access to educational resources but also for modernizing the teaching and learning process.

However, challenges such as a lack of infrastructure and resources were acknowledged as potential obstacles to the implementation of the proposed framework. The authors noted that, despite these challenges, the framework remains a viable solution for eliminating digital divide factors and advancing educational systems in the country.

In summary, this research not only sheds light on the digital divide at Kabul University but also provides a practical framework that can guide policymakers and stakeholders in their efforts to bridge this divide and enhance the overall educational system. The collaborative and iterative nature of this research approach ensures that the proposed framework is well-informed and effectively addresses the unique context of Kabul University and similar educational institutions in Afghanistan.

6. CONCLUSION

In conclusion, this paper illuminates the issue of the digital divide in Afghanistan, specifically at Kabul University. The research involved open interviews with students, professors, and staff, revealing numerous factors that contribute to the digital divide, such as poor economic conditions, a lack of experts, negative attitudes, technical issues, inadequate awareness of technology, the absence of computers, inconsistent electricity and internet access, and restricted technological access for women. The main factors that hinder the use of technology in teaching and non-teaching areas are the absence of experts and awareness of technology. Moreover, the need for capacity upgrading programs was recognized as a priority for solving this problem.To address the digital divide at Kabul University, this paper recommends the use of technological devices, the establishment of technology centers, the hiring of experts, computer donations, and the provision of consistent electricity and internet access. These solutions address the identified factors, ultimately eradicating the digital divide at Kabul University. This research also recommends that Kabul University can benefit from the experiences of other developing countries to address the digital divide. Overall, this study is a valuable contribution to ongoing efforts to reduce the digital divide and promote equal access to technology in developing nations.

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