

E-Services in Sudan During the Covid-19 Pandemic as a Model: a Case Study of University of Bahri-Sudan


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Abstract: The study aims to explore the barriers of online learning in Sudan. The achievement of the research purpose requires an approach which is not only describes the relations between variables, but also the experience of the stakeholders, therefore, the study adopted mixed method approach. To collect data, the study used two sources; secondary, and primary data sources. The secondary sources included peer-review international journals from recognized publishers, books, newspapers and reports. The primary sources included questionnaires and interviews. 132 participants were surveyed. Two professors were interviewed. SPSS was used to analyse the data. The findings indicate that there are five unique barriers to e-learning adoption in Sudan including; poor network infrastructure, lack of bandwidth in rural areas, electricity outages, lack of electricity in rural areas, and stakeholder's deficiency of e-skills. Furthermore, the study showed that some professors are old, and they resist the adoption of e-learning. Likewise, the study found that 67% of respondents were not able to access the internet in their areas during Covid19 lockdown, 25% of respondents do not possess computers, 35% of respondents did not receive training for gaining E-skills, and 74% of respondents prefer learning in classrooms. The study concluded that, E-learning to be adopted in Sudan, several steps can be taken such as e-skills intensive training for stakeholders, support of stakeholders, electricity and internet networks connection to whole parts of Sudan, poverty combat, and stimulation of students to accept e-learning.

Keyword: E-Learning; Barriers; E-Skills; Power Load Shedding; Poor Connection; Sudan.

INTRODUCTION

A lot of forms of activities and services provided by governments have been changed during the last three decades radically. The appearance of the internet made a good environment for delivering new applications and services. Based on new techniques of offering services, e-services were adopted and implemented by government institutions all over the world. The digital services are distinguished by decreasing cost, save effort, enhancing efficiency, save time, assuring transparency, and integrity. All over the world governments have worked hard to create models that include people, strategy, processes, and technology in addition to good action plans to delineate a successful application of non-traditional services through e-government ([Ibrahaim & Alabdallat, 2020](#)).

Public e-services is another name of e-government which refers to using the internet for offering and receiving public services, add to that, e-government uses technology to achieve reforms by fostering transparency, distance elimination, and empowering people to engage in the political processes that affect their lives. Whereas, the researcher defines e-government as the

government that utilizes information and communication technologies (ICT) in her activities, transactions, and dealings. Public e-services include many forms of services such as e-application, e-marketing, e-participation, e-business, and e-learning.

Electronic learning (E-learning) is one of the modern techniques convenient for distance education, it is very resilient and enables ongoing improvements, upgrading and updating of the educating material, adaptations to various knowledge levels, of course, engagers, using materials from the internet and ICTs ([Kollár & Brokes, 2009](#)). In other words, E-learning is a computer technology medium that could be used to innovate the application of learning and teaching. It is the utilization of new technologies of multimedia and the internet for increasing the quality of learning by making access to the resources, services, remote exchange, and collaboration easy ([Fadalla, 2018](#)).

Education in Sudan started expanding in the nineties, schools of higher education were provided by computers and linked to the internet. Numbers of computers were distributed to secondary schools in all states including the states of South Sudan in 2002. Distance learning is offered by some Sudanese Universities Such as the Open University of Sudan which was founded in 2002. It aims to adopt contemporary teaching techniques as well as providing an excellent education for those who care about anytime anywhere in education. Another university that offers distance learning is Sudan University of science and technology, It offers for postgraduates particularly in the Major of Computer-integrated education ([Salah, Elsammani, & Yousif, 2010](#)). Whereas the private universities that have been delivering e-learning during Covid19 in Sudan are four universities and one college: Al-Razi University, University of Technology, Arab Open University, Meroe University, and Al-Nahda College ([Altahkiir e-newspaper,2020](#)).

The response of the government of Sudan, like other countries in the world, when coronavirus started, the federal ministry of health of Sudan began to screen the travelers arriving to Sudan via various ports and to collect their information. On 16 March 2020, the Sudan Security and Defense Council declared a health emergency and the government closed all airports, land and sea border crossings with the exception of flights with assistance, technical and humanitarian assistance, and pre-programmed freight. The government of Sudan also used the police to impose a partial curfew in Khartoum State from 8 p.m. to 6 am on 24 March. The administration extended its curfew time by two hours from 6:00 to 6:00 on 31 March and granted leave until further notices to all governmental workers aged 55 and older, as well as pregnant and nursing women. Some private-sector businesses have sponsored their employees. The Labor and Social Minister have set up a committee to discuss the needs of people most affected by the steps to ensure confinement. On 13 April authorities declared that the virus has spread beyond the capital and that community meetings have been suspended and Friday prayers conducted at mosques located in the state of Khartoum and certain parts of the country. As of May 25, the Federal and Khartoum State Ministries of Health set up cinq isolation centers to separate and treat the COVID-19 cases: Khartoum Teaching Hospital, which consists of 110 beds, the Jabra Center, which is located in southern Khartoum and 110 beds ([Kunna,2020](#)).

To avoid or lessen the outbreak of Covid19 schools around the world were closed, cities made lockdown and many unnecessary trading places were shut down. In mid of March 2020 Covid19 which is currently circulating reached Sudan, by the end of May same year there were (5026) confirmed cases and (286) cases of death. But both numbers are expected to be more because of the limited number of tests and hesitation of people to report. Therefore, Schools and Universities were shut down, exams were postponed. Until the 4th of December 2020, there were **(18,535)** cases, **(1,271)** deaths, and **(10,672)** recovery cases. This according to ([worldometer.info](#)). Due to the Coronavirus pandemic, many schools and universities adopted E-learning techniques as alternative methods to the offline and face to face classes, but unfortunately, it did not happen in Sudan. There are around 36 governmental universities in Sudan, they have not been delivering online learning in the era of covid19 pandemic, except one university, its Sudan university of science and technology and it offers only for master students.

The linear below shows the total cases of covid19 in Sudan.

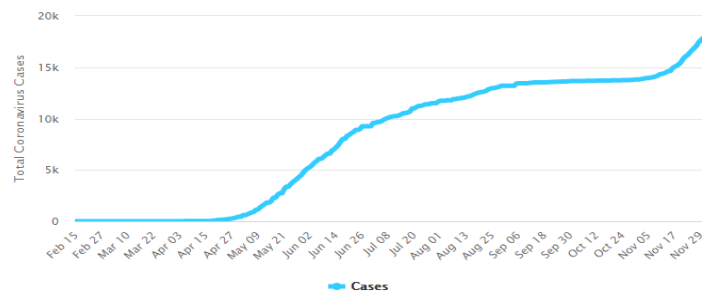


Figure 1. Total cases of covid19
Source: (worldometer.info, 2020)

The chart below shows the daily cases of coronavirus in Sudan.

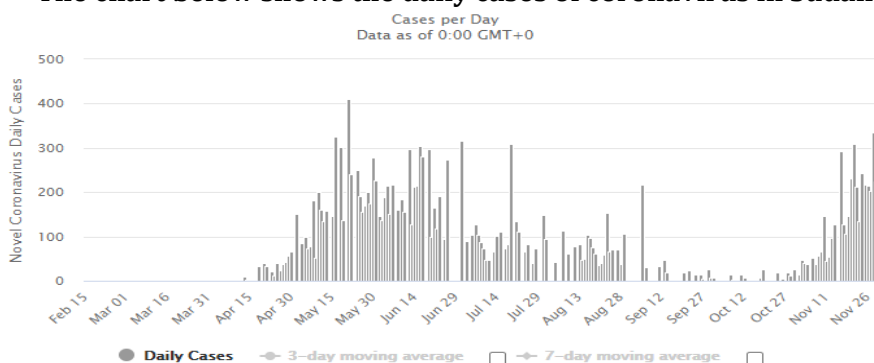


Figure 2. Covid19 daily cases
Source: (worldometer.info, 2020)

Concept of adaptive E-learning:

Electronic learning has many names such as technology-based learning, virtual learning, online learning, distance learning, technology mediated learning, ICT based learning, technology enhanced learning, and virtual education. The term e-learning is an umbrella terminology which means that it has various definitions, if four people were asked about it, then four different definitions can be received. But usually, the term e-learning is used to describe two different modes:

1. Distance learning: which refers to the delivery of educational services where the teacher is in one place and students are in other locations. The offering can be via satellite hook-ups, cable, CD, the internet, or through the intranet of the institution, to gain both performance and speed, also, distance learning can be through radio, TV, and tape-recording ([Elnour, 2006](#)).
2. Web-based learning: it is also named; online learning, internet-based learning, and computer-assisted instruction. This mode refers to the utilization of a computer network or internet for providing educational services via it ([Hussain, 2009](#)). The difference between the two modes is that online learning may involve in-person interaction between the teacher and the students on a regular basis, whereas distance learning involves no in-person interaction between students and instructors. While the researcher distinguishes, that online learning is the developed form of distance learning.

Adaptive e-learning is an innovative and modern type of e-learning that enables it to adapt and reform materials of the learning for each individual learner. Taking a lot of parameters for instance; goals, skills, abilities, learner performance, and characteristics into consideration. Tools of adaptive e-learning allow education to become more student-centered and individualized than ever before ([Al-atabi & Al-noori, 2020](#)). E-learning contributes to the transmission from traditional face-to-face education to the usage of technological tools of the web, which encourages collaborative educating and presents an entirely new platform of learning for students ([Francis, 2018](#)). It allows learners to learn from home and instructors to deliver from home too

([Samsudeen & Mohamed, 2019](#)). E-learning is characterized by (1) learning takes place anywhere anytime (2) it is not only linked to educational institutions because learning is lifelong process (3) process of learning takes place among communities of learning and communities of practice([Lwoga, 2004](#)). E-learning is there not to substitute only the method of teaching but also to expand the reach of learning ([Authors, 2016](#)).

Emergence and development of E-learning:

The terminology E-learning appeared for the first time only in 1999 when it was utilized first for Computer-based training (CBT) systems seminar, then other terms came out such as online learning and virtual learning, but the e-learning timeline was long ago when the internet launched, distance courses had offered to supply students with an education in a certain subject or skills. By the 1840s Isaac Pitman instructed his student's shorthand through correspondence. In 1924, there was the invention of the first machine of testing which enables pupils to test themselves, then in 1954, a professor at Harvard University BF Skinner discovered a machine of teaching which allows education institutions to manage programmed instructions for their students. The first systems of e-learning were prepared to deliver information to pupils, but by 1970 there were more interactions with e-learning. Expansion of e-learning tools and delivered methods started in the late 20th century.in the 1980s the first MAC allowed people to poses computers in their homes, making the process of learning and gaining skills easier, then in the decades after that, virtual learning space began to really thrive, with individuals gaining access to online information wealth and opportunities of e-learning.

By the early 1990s, many schools had been developed that only offered online classes, manipulated the Web, and took education to people who could not attend college because of time or geographical constraints. Technological innovation has allowed educational establishments to minimize the expense of studying from a distance, a reduction that will then be applied to students-helping to introduce schooling to a wider audience. Organizations began e-learning in the 2000s to educate workers. Fresh and existing workers were also willing to develop their information base in the sector and broaden their expertise. At the house, people were given exposure to services that improved their expertise and the opportunity to earn online degrees ([Epignosis, 2014](#)).

In a very short space of time between 1995 and 2000 electronic learning became the state of the art for the use of ICTs devices in education. A lot of people predicted that it was the eventual solution for company training and university programs alike. But by 2000 wired computers and wired telephones were beginning to be replaced by wireless computers and wireless phones. This has significant didactic dimensions as it frees the educator, who may have spent much of his or her working time in front of a wired computer, from learning in front of a computer screen too. Despite there is much evidence from e-Learning research of the interactive value of emailing, the validity of typed interactions for learning objectives can be questioned when compared with spoken interaction ([Phillip, 2020](#)).

E-learning in Sudan:

In Africa most of Universities support traditional system of education due to the lack of technological resources, poor infrastructure or lack of trained staff ([Abbas, 2016](#)). Sudan is one of the African countries, suffering from many challenges which are related to ICTs such as poor network, lack of awareness, lack of commitment of institutions and instructors, and lack of network coverage to the remote areas. The first initiative of distance learning in Sudan was (Open Sudan university). In the first phase of its development, it was depending on printed materials, TV, cassette, radio, lessons in CD ROM, and the modern one is a video conference, it takes place (between the main center and students in one province for one time). All facets of society and organizations were affected by the emergence of internet technology and multiple applications in Sudan. It was normal that universities in Sudan needed to introduce their teachers and students to such technologies in order to achieve more excellence in teaching and learning. Over the past, however, efforts have also been made to use e-learning tools to administer courses over Sudanese universities' education programs.

For example, some universities have already adopted Moodle, a Learning Management System (LMS) that is intended to provide students with multimedia-rich content, E-learning in Sudan can still be seen as a phase of early adoption and childhood; and much work is still necessary in order to fully implement the use and adoption of the E-learning processes in higher institutions, as are all developing countries. It is also regrettable that the Internet service has not yet been used fully for pedagogical purposes, despite its early introduction to the University of Khartoum. The University of Khartoum has not yet implemented a consistent strategy to ensure Internet inclusion in an educational environment, given that its teaching staff has a strong degree of computer literacy because they are either internet natives or native speakers. Despite its research heritage which could have helped its ranking as a world leader for higher education, the University of Khartoum continually failed to improve its Web presence. Both these facts may dissuade certain academic departments from attempting to utilize the Internet which, as opposed to conventional teaching, facilitates immersive research, allows feasible direct input, enables "learning to be constantly created under limited efforts" and provides quicker access to instructional information ([Fadalla, 2018](#)).

Current statuses of E-learning in Sudan:

E-learning which we are discussing in this research is the learning process that is delivered by government universities in Sudan, therefore it is important to know the current status of the e-government in Sudan. According to the 2020 report of the united nation on the ranking and index of e-government development and e-participation index and ranking around the world, Sudan's e-government development index of the year 2020 was 0.3154, whereas its ranking was number 170 of a total of 193 states that are members in a united nation. In addition to that, the Sudan e-participation index in 2020 was 0.2143, whereas, its ranking was number 175 out of 193 countries.

The Below table illustrates Sudan's e-government development index (EGDI), ranking, and change that happened to the next year. Also, it shows Sudan's e-participation index, it's ranking, and progress that took place between two years.

<u>E-Government (2020 EGDI: 0.3154)</u>	
2020 Rank	170
Group	MEGDI
2018 Rank	180
Change	-10
<u>E-Participation (2020 EPART: 0.2143)</u>	
2020 Rank	175
2018 Rank	179
Change	-4

Figure 3. Sudan e-government index.

Source: ([publicadministration, 2020](#))

Notice/the more the number is small the more improvement is adding.

This report, and the figures above, it illustrates clearly that Sudan slowly has moved ahead. Private and public universities in Sudan were instructed to commence online learning and teaching, around four months after all higher education schools were closed on 14 March 2020, owing to the outbreak of Covid19. Experts are concerned about the readiness of staff and university students to handle the transition. In her post on Facebook and Twitter, Intisar Saghiron, the Sudanese minister of higher education and scientific research (SMHESR), said, e-learning should start from 14 July 2020 but unfortunately, it did not start ([Sawahel, 2020](#)). Based

on the UNESCO report over 204,000 students of universities in Sudan have experienced a cut of their studies as a result of the locking of the Sudanese educational institutions.

The MHESR provides an electronic training system for the teaching process, supplying students with synchronous and Asynchronous multimedia instructional resources. The portal should exploit the resources of Sudan's Open University with eighteen divisions in Sudan, tv outlets, and radio. The SMHER has listed 6 universities to deliver educational materials, The Ministry proposed that the concentration should be on the final year of the study students. The content is being prepared, instructors and technicians are currently being trained. Students are being allowed to access freely all Sudan mobile networks (MTN, ZAIN, and other Sudanese networks such as Sudani), this only during the emergency of Covid19. Although there is the desire to adopt and commence e-learning in Sudan, challenges are facing the implementation of the SMHESR, instructions. E-learning is required during COVID-19 but there are various obstacles that do not currently render it feasible. The most critical of these are poor infrastructures, unstable electricity sources, Internet connectivity, and financial problems, with most studies in need of computers and internet prices. A Survey on an e-learning preparedness study conducted by the University of Khartoum for staff and students showed a poor degree of e-learning ability for supplies and facilities, workforce preparation, and support. In disciplines such as engineering, laboratory research is necessary and may involve the physical presence of students. The synthesis of the email ability (face to face and online learning) will be a feasible choice if this capability is strengthened.

According to the Internet World Stats (IWS), only 13 million of the Sudanese population have access to the internet, of a total of 44 million. Moreover, Sudan ranked at 164 from a total of 207 countries. The ranking refers to the internet speed. The Economist Intelligence Unit, which analyzed the expense of Internet connectivity with respect to the profits and degree of competitiveness in the sector, classifies Sudan as 75 out of 100 countries in the 2020 version of its Inclusive internet ranking (Sawahel, 2020). There were Minister instructions to commence the education process online, but on the ground its difficult, due to the network problems, lack of readiness of students and staff, interruptions of electricity, high prices of data packages, absence of electricity in some remote areas in Sudan.

Electricity outages in Sudan are scheduled and this is the biggest obstacle students will face if the classes are broadcast on television. Succeeds in the event that an application is created through which the teacher communicates with the student through sound and image, and in the event that the classes are broadcast directly via Facebook, but on the condition that official communication networks are available, a strong internet network at a nominal price. Malik pointed out that "universities are more advanced in this regard and can implement remote education immediately, unlike schools that are still behind, as Sudanese universities have specialized technical teams that can manage this issue, (AlShahir, 2020).

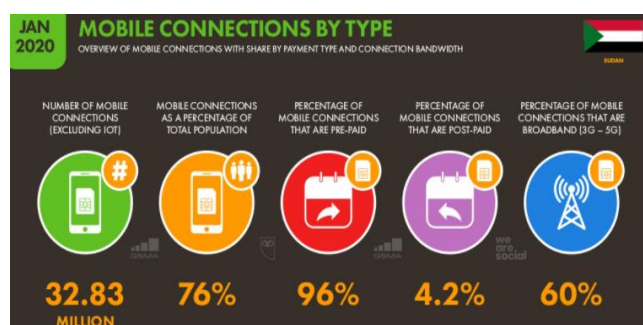


Figure 4. Mobile connections in Sudan

Sources: (Simon Kemp, 2020)

In January 2020, there were 32.83 million mobile connections in Sudan, the number of mobile connections increased by 2.3 million if compared by the Mobile connections of 2019, the rate of increase is 7.4% between January 2019 and January 2020. It points out that the total connections of Mobile in January 2020 were 76% of the total population.



Figure 5. Users of the internet in Sudan

Sources: [\(Simon Kemp, 2020\)](#)

Until January 2020, there were 13.38 million people using the internet. This indicates that the number of users of the internet has increased if compared by 2019. The number of increases was 316000, in other words, they increased by 2.4%. whereas the internet penetration stood at 31% until January 2020.

The major barriers of E-learning identified in the literature:

Many studies had dealt with the challenges and barriers of e-learning in developing countries, some of them can be shown as follows:

1. A study conducted by [\(Jokiaho, May, Specht, & Stoyanov, 2018\)](#) categorized the barriers of e-learning into three areas namely:
 - a. **personal factors:** these factors involve all barriers that are related to a person. Lack of time for preparation of online learning content is one of the personal barriers in E-learning, for the lecturers with fewer experiences in e-learning. Lack of time is always a problem, in addition to that, instructors with less experience and skill with e-learning have doubts about their skills to deliver classes online and seem to be less self-confident. Another personal factor of online learning barrier is a lack of individual motivation; many studies mentioned that lack of motivation is one of the hindrances of e-learning.
 - b. **institutional and cultural factors:** these include all hindrances that are shaped by institutions that instructors cannot control such as lack of support, lack of training centers of ICT utilization, and lack of recognition of online teaching.
 - c. **technical factors.** These factors related to the usage of technology and infrastructure. Technical factors include lack of skills in using E-Learning tools, lack of infrastructure (no stable WIFI connection), and usability. Also, lack of equipment such as computers, laptops, and tablets.
2. A study conducted by [\(Branch, 2016\)](#) in Iran found that there are various barriers to e-learning, these factors are:
 - a. **Infrastructure barriers:** these barriers represent a lack of financial support, the high financial cost of updating required blogs and preparing educational IT equipment, and the lack of virtual electronic classes relating to educational materials.
 - b. **Attitudinal barriers:** the attitudinal barriers include lack of belief in the usefulness of e-learning, less ability and low self-confidence in participating in e-learning style, lack of positive attitude in the certificates that being gained through e-learning, and lecturers preferring the idea of the traditional way of education instead of e-education
 - c. **Technical expertise barriers:** these obstacles involve low quality of used software, instructors' lack of skills and abilities in e-learning planning, and lack of excess to the various and convenient curriculum content in e-learning.
 - d. **Human barriers:** a human barrier include no excess to real teachers or lecturers to solve the problems of the students, lack of online responding personnel quick and accurately for learners, and lack of managerial support for keeping equipment of electronic learning.

- e. **Educational skills barriers:** educational skills barriers are lack of skills among headmasters of education area in using internet and computer, learners and familiarity with the English language to use it in cyberspace and not presenting electronic learning courses as a class teaching supplement for innovating teaching quality.
3. a study conducted by [\(Idris & Osman, 2016\)](#) stated that there are six fundamental challenges toward the implementation of e-learning at the University of Gazira- Sudan. These challenges are:
 - a. **language barrier:** in countries where English is not the first language, the English-language teacher is challenged to encourage e-learning. Teachers with low skills in English should not use e-learning, since the quality of the material in English could not be understood.
 - b. **Technical barriers:** in their study, most of the interviewees accepted that e-learning material, e-learning content loading, technological assistance, and availability of the University's hardware and software to promote e-learning adoption was not adequate. In addition, the internet outside the university is conveniently and quickly usable by 52,8% of respondents. The university should also concentrate more on internet services.
 - c. **access to computer barrier:** This ensures that both teachers and students can use computers during work hours. The university should have a computer lab with enough computers and easy internet access. Many students and teachers do not purchase their own computers in developing countries. Difficulty in computer access can adversely impact technology acceptance. Unfair access to online learning has been reported as contributing to social inequities within socio-economic groups. The study confirmed that the university of Gezira does not provide computer labs for the members of university staff.
 - d. **Skills and training barriers:** Some teachers lack the ability, skills, and education to use the technology to create online training courses, while some do not trust that the technology is used in education. The teacher and students need to gain unique skills for the success and usefulness of e-learning resources. Teachers should be competent and confident in using electronic equipment and in changing the method of supplying material. The training of teachers to use e-learning technology is obviously important.
 - e. **Privacy and security barriers:** The rapid development of the web application calls for the management of identity. The web penetration was, however, detected by the external regulation. Therefore, antivirus software should be used to prevent the website and information from foreign attack. The study stated that the antivirus that was adopted at the University of Gezira was not active.
 - f. **Attitude of lecturers toward e-learning:** The teacher's attitude towards e-learning is divided by culture and technology. Some of the teachers remain actively interested in traditional teaching. Other teachers are afraid of losing power and teaching quality if they are using e-learning because of culture or the lack of e-learning knowledge.
4. Also, [\(Al-Azawei, Parslow, & Lundqvist, 2016\)](#) mentioned that there are internal and external factors that hinder the process of e-learning in Iraq, the external factors are low internet bandwidth, insufficient financial funding, inadequate training programs, and frequency of electricity shortage. Where the internal factors include illiteracy of ICT devices, lack of awareness, and lack of motivation.
5. Moreover, [\(Rakhyoot, 2017\)](#) found that there are many challenges of e-learning in Oman the most important are: academics, lack of specialized training, lack of e-learning support, lack of solid ICT infrastructure, and lack of e-learning strategy.

As a result of the great progress that has occurred in the field of information and communications technology (ICT), which was clearly reflected in different lifestyles as general and in the teaching and learning process, in particular, it was necessary to implement this technology in improving and developing programs of education at different levels. This is extremely important, to introduce all that is new and updated in the educational curricula, which leads to improvement of output. Within this framework, many developed and developing countries have taken the e-learning technique as a systematic method for developing their

educational programs. E-learning technology is characterized by the speed in receiving information and providing an interactive educational environment that contains computers and Internet-based applications, so that the learner can access the learning resources easily and conveniently, at any time and place. E-learning is adopted intensively all over the world during the Coronavirus pandemic. When Covid19 broke out in Sudan, the government issued orders to lockdown Cities, Schools, Universities, and other government institutions.

RESEARCH METHOD

This study selected a case study of the University of Bahri because, during the coronavirus pandemic, the majority of universities in Sudan have not been commenced the learning and teaching process online, including the University of Bahri, while many other universities around the world were adopted online-learning. This research uses a mixed-method approach in order to gain a deep understanding and further perspectives on the obstacles of E-learning in Sudan as a whole and the University of Bahri in particular. The study depends on several data sources to identify the factors and reasons that, handicapped online learning in Sudanese Universities particularly the University of Bahri during Covid19, these sources include secondary and primary data. The secondary data that is being used are journals, books, previous studies, reports of Sudan government on e-learning, newspapers, recognized websites, the statements of ministers of higher education, and scientific research of Sudan on social media such as Facebook and Twitter. The articles and books have been collected from recognized publishers such as Emerald insight, Jstor, Wiley Google Scholar, IEEE Xplore, and Springer link.

The questionnaire will be distributed to the lecturers and students of the University of Bahri for the purpose of collecting data and information of the reasons which were obstacles of online learning in Sudanese universities specifically the University of Bahri, during Coronavirus (covid19). Also, interviews will be conducted for collecting more accurate data on the challenges and hinders of e-learning in Sudan and how Sudan can be ready in case of pandemics in the future. SPSS will be utilized for analyzing data. This research is being conducted from 2020 – 2021. The interview includes two instructors from the University of Bahri and, University of Khartoum. The researcher chose them because of their experience in the field of education and e-learning.

This study will be implemented at the University of Bahri which was established in 2011 when South Sudan was separated, it is an extension of the University of Juba. Most colleges of Bahri University are in the Kadro area of Bahri locality from the north-eastern side of the state of Khartoum, about 19 km north of Bahri locality, and about 22 km from the city of Khartoum. The University of Bahri currently includes 19 colleges and 3 specialized centers in addition to the Deanship of Scientific Research and a center for quality and development. The area of the University of Bahri is 130 acres, where the complex embraces 11 colleges: administrative sciences, natural resources and environmental studies, agriculture, education, Law, applied sciences and industry, social studies, economics, engineering and architecture, community studies and rural development, petroleum, and mineral geology in addition to investment and experimental farms. The rest of the colleges and centers are distributed in different locations in Khartoum.

The study includes professors, doctors, lecturers, teaching assistants, and students of the University of Bahri, in addition to an instructor from the University of Khartoum and, who will be interviewed. The sample of the study has been selected from the students and instructors of the University of Bahri -Sudan. The questionnaire was distributed to 132 of them to fill. As well as the interview of two (2) instructors from the University of Bahri and the University of Khartoum. The investigator selected the respondents randomly, including five (5) Professors, nine (9) Doctorates, thirty (30) lecturers, twenty-one (21) teaching assistants, and, sixty-seven (67) students, in addition to the interview of two (2) instructors from University of Bahri and, the University of Khartoum.

Table 2. data collection

Type of data	Inclusion	Sources
Primary data	1. Questionnaires	132 instructors and Students from the University of Bahri- Sudan.
	2. Interviews	Two experts in instructing from the University of Bahri and the University of Khartoum.
Secondary data	Books, Journals, published reports, newspapers,	E-libraries, Internet, government websites, Google Scholar, IEEEExplore, Emerald.com, science direct, Springer link, Lib Gen Iceland, Research gate, academic.edu, ACM digital library, and other recognized websites.

Interviews were collected from three Sudanese university staff members, one at Neelain University- Sudan, one from the University of Khartoum, Sudan. Online interviews were conducted with each participant at the University of Khartoum.

RESULT AND DICUSSION

Respondent's profile:

Table 3. Shows Respondents Genders, Illustrates Jobs of Participants, Demonstrates Years of Experience Respondents.

Gender		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	male	97	73.5	73.5	73.5
	female	35	26.5	26.5	100.0
	Total	132	100.0	100.0	
Job					
Valid	professor	5	3.8	3.8	3.8
	doctoral	9	6.8	6.8	10.6
	lecturer	30	22.7	22.7	33.3
	teaching assistant	21	15.9	15.9	49.2
	student	67	50.8	50.8	100.0
	Total	132	100.0	100.0	
Experience					
Valid	1-4 years	90	68.2	68.2	68.2
	5-10 years	22	16.7	16.7	84.8
	more than 10 years	19	14.4	14.4	99.2
	4.00	1	.8	.8	100.0
	Total	132	100.0	100.0	
Age					
Valid	.00	1	.8	.8	.8
	20- 25 years	59	44.7	44.7	45.5
	26 - 30 years	34	25.8	25.8	71.2
	31 - 35 years	20	15.2	15.2	86.4
	36 - 40 years	7	5.3	5.3	91.7
	more than 41 years	11	8.3	8.3	100.0
	Total	132	100.0	100.0	

Questionnaires statements analysis and discussion:

Statement:

Internet access: were you able to access high-quality Internet in your area during covid19?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	87	65.9	65.9	65.9
	Yes	44	33.3	33.3	99.2
	4.00	1	.8	.8	100.0
	Total	132	100.0	100.0	

Table 3. shows how many respondents were able to access the internet in their areas during the coronavirus pandemic. According to statistical analysis, 65.9% of respondents were not able to access the internet in their areas during the covid19. Only 33.3 % of respondents were able to access the internet in the era of the coronavirus pandemic. This is supported by the (internet world stats) report which says that out of around forty-four (44) million of the Sudanese population only thirteen (13) million have accessed the internet and Sudan is ranked at 164 out of a total of 207 countries in case of internet speed.

The figure shows the state of the internet, mobile, and social media in Sudan:



Figure 10. Digital information about Sudan 2020

Source: datareportal.com, 2020).

During Covid19, schools in Sudan were closed but, the learning process did not continue online in most Universities.

Table 4. confirmation of stoppage of learning process during covid19 lockdown.

Statement (2):

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	1	.8	.8	.8
	Strongly agree	69	52.3	52.3	53.0
	agree	33	25.0	25.0	78.0
	neutral	9	6.8	6.8	84.8
	disagree	13	9.8	9.8	94.7
	strongly disagree	7	5.3	5.3	100.0
	Total	132	100.0	100.0	

Table 4. shows that, during the breakout of coronavirus, pandemic universities in Sudan were locked down but the learning process did not continue online. According to statistical analysis, 59.8% strongly agree, 30.3% agree, 3.8% neutral whereas 3.8% disagree and only 2.3% strongly disagree. The answers of respondents indicate that Sudanese universities did not adopt online learning in the era of covid19. This statement is also supported by (Bekou, 2020) who stated that schools all over the world universities and schools were locked down for months or closed indefinitely. making things worse, nobody is sure when universities will open again as the covid19 pandemic shows no indicators of decreasing any time soon. Students. In Morocco, the pandemic has been delayed, and thus students are now in the national lockdown and the second half is postponed because teaching is carried out remotely to keep their homes. Again, very critical industries are forced to operate remotely to maintain a steady pace. A new way of learning is being introduced as far as education is concerned. In order to facilitate the use of an online platform called Microsoft Teams, the Ministry of Education in Morocco encouraged schools to launch a regular program of TV lessons for students to learn in their own country. Teachers in Morocco have made great efforts to launch e-learning lessons and lectures for students to do and follow their assignments at home some instructors deliver online classes via (Zoom) which is a video web conferencing App. The other teachers teach their students through possible available means such as Facebook, WhatsApp, hangout, and Google Meet. Statement (3) Slow and poor network in Sudan, is one of the obstacles of online learning during covid19.

Table 5. Shows Poor Network as A Barrier Of E-Learning.

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid strongly agree	79	59.8	59.8	59.8
agree	40	30.3	30.3	90.2
neutral	5	3.8	3.8	93.9
disagree	5	3.8	3.8	97.7
strongly disagree	3	2.3	2.3	100.0
Total	132	100.0	100.0	

Table 5. demonstrates that poor and slow network connection is one of the obstacles of e-learning in Sudanese universities during covid19. According to statistical analysis 59.8% of participants strongly agree with this statement, 30.3% also, agree with this statement, 3.8% neutral, whereas 3.8% disagree and only 2.3% strongly disagree with the statement. Therefore, one interesting finding in this study is that poor network in Sudan is one of the reasons that hindered the learning process to continue online in Sudanese universities during the lockdown of coronavirus which enforced all the governments around the world to declare lockdown of cities, institutions and to curfew gathering for lessening the infections of covid19. Sudan is no exception to that, also, Poor network infrastructure is one of the challenges that face the government of Sudan, for implementing the system of e-learning during Covid19. In terms of telecommunications companies, Sudanese citizens suffer from one basic problem, which is the slow pace of procedures, which are often due to frequent interruptions of the Internet. The weakness and disruption of the Internet in Sudan is mainly caused by the failure to modernize companies' devices, which results in weakness and this may lead to a complete outage that may include all institutions, whether educational institutions or other sectors. Expansion of Internet services and electronic dealings in Sudan was not accompanied by an expansion in the quality and improvement of services, which negatively affected the quality (Ahmed, 2019). There are four main Telecom companies-internet services providers- that deliver communications services in Sudan namely; Canar, Sudatel, ZAIN, and MTN. Sudatel, MTN, and Zain have a Global System for Mobile Communications (GSM) license that allows them to deliver services of the internet through mobile networks. Canar has no GSM license but it offers internet services via wireless, landline, and leased lines (Hamad, 2020)

This finding also was reported by [\(Mahmud, 2010\)](#) that load shedding of electricity in Bangladesh is one of the main obstacles of e-learning. Bangladesh is facing a big electricity load shedding and almost all parts of the country are suffering from the shortage of electricity. Every day at least four to five hours the electricity disturbs. In Bangladesh, electrical energy is not generated as much as the demand of citizens. Therefore, using technology heavily in such conditions is really a problem which implies that successful application of electronic learning despite electricity failure would be a real challenge in Bangladesh.

Sudan is also suffering shortages and disruptions of electricity power in Capital Khartoum and other districts. For many years, Sudan has been suffering from load shedding of electricity. Vital sectors in Sudan have been affected due to frequent and prolonged power cuts, which have caused losses in several commercial and industrial sectors, and the education sector of which electricity is the backbone. Fath al-Rahman Hamed, the owner of a steel industries company in Khartoum, said that the power cut caused the company's production to drop to about 10 percent, and caused a set of losses. Sudan's annual production of electricity is 3,000 megawatts, in addition to another share that comes from Ethiopia within an agreement between the two countries that provides for Khartoum to export its surplus gasoline production to Addis Ababa in exchange for Ethiopia's export of electricity to Sudan. Nevertheless, The Sudanese Ministry of Electricity acknowledged the continuous and recurring power interruptions, mentioning the reasons as following:

1. Scarcity of electricity supply due to the decreasing of Nile water to its lowest levels.
2. The delay in deporting fuel from the eastern port of Port Sudan also contributes to the power outages. However, there is coordination between the ministries of finance and oil to work on supplying fuel to the turbines faster to ensure continuity of service.
3. The problem of power cuts lies in the lack of electricity generation compared to consumption, with the absence of growth in a generation, as well as the need for some stations for maintenance that is prevented by the US blockade imposed on the country.
4. Economic analyst Balla Ali Omar attributed the electricity crisis in Sudan to the extension of electricity networks for thousands of kilometers, without being accompanied by an increase in the productivity of generation, whether thermal or hydro, and the lack of maintenance to thermal generation stations, [\(Mukhtar, 2019\)](#).
5. One of the reasons of the power outages is the weak production resulting from the weak water supply in a number of rivers during the summer period, but the Ministry prepared a clear and accurate plan to compensate for the water production with the thermal generation and began a few months ago to maintain the Port Sudan thermal station, the Qari station and the Umm Dabaker station. But, before the maintenance was completed by German and Indian engineers, Corona invaded the world, forcing the engineers supervising the maintenance to return to their countries, stressing that efforts are continuing to return them directly after the opening of the airports.

According to the 2020 report of (Trading economics) on the access of electricity power, it shows that 59.78% of the total population of Sudan are able to access electricity power, it means that approximately 40% of the Sudan population are not receiving electric power services, the majority of these populations are in rural areas. According to the African energy portal (AEP) Website, 82.5% of the urban population in Sudan access electricity, whereas, only 42.8% of rural inhabitants access electricity, and at the national level around 56.5% of the population gets electricity.

This indicates that one of the challenges of e-learning in Sudan during covid19 is the student's and teachers' lack of e-skills. Many students in Sudan have lack of good skills to deal with ICT devices, therefore, students need the important required skills, knowledge, and experiences to enable them to use information and communication technology such as computers, laptops, and smartphones. Add to that, the necessity of acquiring the skills of using internet applications such as zooms, Microsoft team, and google meet [\(Salah et al., 2010\)](#).

Furthermore, some of the lecturers also have a lack of skills and experiences to use information and communication technologies for preparing and designing online materials and online courses. Therefore, teachers of universities and higher schools in Sudan must receive adequate training in using ICT equipment. Also, instructors must change the method of delivering educational messages ([fadlelmoula abdalla Idris, 2015](#)). The poverty and deterioration of the economic situation in addition to the crises that Sudan suffers from are a major obstacle for students to buy computers, smartphones, and an Internet packages that allows students to access educational platforms. ([Salah et al., 2010](#)) emphasized that many families in Sudan are facing a financial crisis, which does not allow students to possess ICT devices that are considered as tools for receiving e-education. Also, ([Lancaster, 2020](#)) found that the financial situation has an impact on adopting e-learning.

According to the statistical analysis; there were five (5) professors; four (4) of them possess computers and only one (1) of them is natural; this indicates the possibility of owning a computer, but that device is not used in e-learning programs. The reason may be that the computer is an old version, or the Internet is not available on the site that the professor resides, or there are other obstacles such as frequent electricity cuts or the lack of experience and skills in dealing with the applications that are used to provide online lectures. Moreover, nine (9) of participants hold a doctorate degree, eight (8) of their own computers while only one of them does not own a computer. This indicates that out of nine (9) college doctors, one (1) of them does not own a computer, and this negatively affects the adoption of e-learning in Sudanese universities. There are also thirty (30) lecturers who participated in the study, and twenty-one (21) of the lecturers' own computers and use them for e-learning purposes. One (1) of these participants is neutral, and this may indicate that he owns the computer, but he does not use it for e-learning purposes. There are eight (8) lecturers who do not have computers, and this negatively affects the adoption of e-learning in Sudan, even if at critical times.

It can be said that out of thirty (30) lecturers in Sudanese universities, eight (8) of them do not have computers, and this is one of the obstacles that do not encourage the adoption of e-learning in Sudan. Also, among the participants were twenty-one (21) teaching assistants, twelve (12) of teaching assistants' own computers that they use for e-learning purposes. Six (6) of these participants are neutral, and this indicates that they own the computers but do not use them for e-learning purposes and three (3) of them do not own computers, and this affects the e-learning process in Sudan negatively. The number of students participating in the study reached sixty-seven (67) and thirty-seven (37) of them own the computers that they use for e-learning purposes, while nine (9) of them are neutral, and this indicates that they own the computers but were not able to use in the e-learning programs for reasons that may be technical or reasons related to skills, experience, or other factors. Twenty-one (21) of the students do not own computers at all, and this negatively affects the adoption of the e-learning system in Sudan. Therefore, concerned authorities must provide students and teachers with computers so that they can play their role in digital education. The number of students participating in the study was sixty-seven (67) students, twenty-eight (28) of them received computer training while eleven (11) of them were neutral, and twenty-eight (28) of them did not receive any computer training, and this means that these students lack the necessary expertise and skills that help them in dealing with computers in educational programs.

Interview results

An interview is one of the techniques that is used in qualitative research, therefore, informal conversational interviews were conducted to collect data needed for this research. The participants were identified by their first and second initials, Participant (MU) from the University of Bahri and, (AN) from the University of Khartoum. The interview contained three main questions namely;

Q1: In your opinion, what are the main Barriers of E-learning in Sudan during Covid19?

Q2: In your point of view, how to overcome the challenges of online learning in Sudan?

Q3: What is the extent of satisfaction and acceptance of students and lecturers for e-learning in Sudanese universities?

Participant (AN)

Participant (AN) said: Yes, many obstacles hinder the adoption of the e-learning system in Sudan, the most important of these obstacles are:

1. The lack of an integrated system that connects teachers and students, which allows the teacher to perform his/her duty in an optimal way.
2. The instability of the electrical current: frequent power cuts in Sudan lead to the shutdown of educational electronic devices such as computers, televisions, and radios.
3. The instability of the Internet networks and the poor connection to the Internet are also obstacles to e-learning in Sudan, and the high price of Internet subscription is one of the factors that do not help students to subscribe to a high-quality Internet service. Here participant (A) suggests that internet prices be lower so that students can buy it
4. Age: The participant says: There are professors in universities who are over the age of 60 and 65 years, and they have become accustomed to teaching in traditional methods in classrooms, so it is difficult for them to adopt the electronic system in teaching.

For e-learning to be adopted in public universities in Sudan, the participant submits a set of suggestions, which are:

1. Electric current stability: The participant says that this issue is related to the government.
2. Providing Internet networks in all regions of Sudan: The participant suggests that providing Internet networks in all parts of Sudan contribute to the process of adopting electronic education in Sudan, and the researcher also suggests that Internet subscription prices be cheap so that students can buy and benefit from attending online lectures.
3. The existence of an information technology system: The existence of this system helps in assimilating a quantity of information and establishing databases for all working groups in universities, whether they are professors, students, employees, or workers.
4. Training: The participant says that training teachers and students in how to use electronic devices, especially computers and smartphones, contribute to imparting the necessary skills and expertise required in e-learning. The participant adds that without electronic skills, the goals of e-learning cannot be achieved.

The participant (AN) says if there is the instability of electric current, the weakness and lack of internet networks in some areas, undoubtedly these factors affect the acceptance and satisfaction of students to e-learning, the participant (AN) adds by saying: But the current generation students are not like the students of former generations, students of the current era usually depend on the Internet and globalization, therefore the current generation is less resistant to electronic education in Sudan, however, the issue of e-learning in Sudan to some extent faces difficulties because most students are unable to access the Internet due to the lack of equipment and devices that enables them to access the Internet in addition to electricity cuts that negatively affect even to students who own devices. Participant (AN) says that most universities in the world have adopted e-learning as an alternative system to traditional education that takes place in classrooms and intensified the adoption of this type of education after the spread of the Corona epidemic. The participant (AN) is not excluded from adopting e-learning in Sudan if the government does Establish a reasonable and acceptable budget for education.

Participant (MU).

Participant (MU) said that the adoption of e-learning in Sudan faces many difficulties and obstacles, which are: 1. Poor infrastructure. 2. Weak internet networks and the unavailability of networks in some areas of Sudan, especially rural areas. 3. The poor Internet connections and its lack of coverage for all parts of Sudan, especially rural areas. 4. Electricity cuts and its instability. 5. High Internet prices negatively affect most students who suffer from poverty. 6. Lack of skills and experience for some students and some teachers. 7. Poverty in Sudan.

Participant (MU) said that most of the teachers have knowledge in Internet applications and the use of the Internet, but the skills that contribute to the adoption of e-learning must be

developed and improved efficiently and effectively. The participant (MU) says that I had the experience of teaching two subjects online in some private universities in the Sudanese capital, Khartoum, but although we are in the capital, students and professors complain about power outages and poor internet. Participant (MU) believes that the Internet price and lack of skills are not major obstacles in adopting e-education in Sudan, but poverty, poor internet, lack of electricity, and lack of internet networks in some rural areas are among the prominent reasons that prevent the establishment of e-learning in Sudan.

Participant (MU) said that overcoming these obstacles requires joint work between the government and telecommunications companies. Concerning electricity, students can be gathered in centers where electricity is available continuously (this idea is suitable in the case that the country does not suffer from epidemics). On the other hand, the participant talks about internet networks and says: The telecommunications companies should work to develop and improve the internet services they provide to subscribers and work to cover the internet networks all over the rural and urban areas of Sudan and make the Internet prices reasonable and acceptable so that students can buy. The participant says: To gain the necessary skills, training must be provided to students and professors who lack skills and expertise on the Internet and its applications. Regarding poverty, the participant says that fighting poverty takes a long time, but if we can overcome the three obstacles (poor internet, lack of network coverage, and lack of electricity) then the issue of poverty - student-related poverty - is not one of the main obstacles and can be overcome through the cooperation of telecommunications companies with students and government support for students.

The participant (MU) said, me as a professor, think that the e-learning experience is a comfortable and acceptable for me because e-learning allows the professor to conduct his/her lectures everywhere and at all times without any restrictions related to time and place. E-learning also saves the professor effort and costs of transportation from home to the university and from university to home, as well as for students. E-learning finds acceptance among most students. Students must realize the importance of e-learning and that e-learning requires patience, especially in following up on the recorded lessons, performing assignments, and sending them to the teacher.

All in all, it can be said that adopting electronic education is the solution to the problem of closing universities due to the Corona pandemic. Previously, many obstacles were mentioned, including poor infrastructure, lack of technical personnel for equipment maintenance, lack of dedicated centers for maintaining computers and smartphones, especially in the countryside. Also, some teachers resist adopting this type of education. To overcome all these obstacles, the infrastructure must be improved through the development and modernization of energy sources, telecommunications companies, and holding workshops and training courses, because e-learning is still important because it is characterized by low costs, lack of adherence to time and place, and contributes in a self-learning process.

Based on the findings of the study revealed that the obstacles of adopting e-learning in Sudan are various some of them related to government, some to instructors and, others to students, therefore the researcher provides the government, instructors and, students with the following recommendations to government is poverty in Sudan is one of the factors that hinder the adoption of e-learning, and poverty is a factor linked to the state. Therefore, the researcher recommends the Sudanese government to fight poverty among students by providing job opportunities for students so that they can buy computers and smartphones that help them in the e-learning process, as well as the state. Providing students with computers or smartphones at lower prices. The frequent power cuts in Sudan are also one of the main obstacles that prevented the adoption of electronic education in Sudan during the Corona epidemic, this factor is related to the government, so the researcher recommends the Sudanese government to provide electricity and search for other sources of electricity such as solar and hydroelectric energy. The study also found that there is no electricity Exactly in remote rural areas, so the researcher recommends that the government deliver electricity to all parts of Sudan so that students in the countryside can follow their courses online. Also weak internet networks, poor internet connectivity, and the absolute lack of internet services in some rural areas in the regions such as

Darfur, Kordofan, Gedaref, and the far north. These factors also stand as a stumbling block in the way of adopting electronic education in Sudan. Therefore, the researcher recommends the Sudanese government to cooperate with Telecommunications companies and connect Internet networks all over Sudan and provide Internet subscription services at cheap prices so that the student can buy.

CONCLUSION

In the past three decades many ways of providing government services have changed in the world, thanks to the use of the Internet. All governments around the world have thought to adopt the provision of services electronically, and e-government has emerged, it has another name, which is electronic public services. The services provided through the use of (ICT) are characterized by speed, accuracy, saving effort, saving time, efficiency, transparency, integrity, and non-restriction of time and place. There are many services provided through the use of this technology, including health, such as an electronic pharmacy, electronic complaints, voting for elections by mail, as happened in the American elections 2020. One of the most prominent services that are provided electronically is education, which is known as e-learning. When the Corona epidemic broke out in the world, universities were closed and gatherings were banned, most universities in the world adopted e-learning. In Sudan, the matter was a little different, universities were closed, but the education process did not continue online. Therefore, this research attempted to explore the major obstacles to e-learning in Sudan. This research has reached that five main factors have prohibited Sudanese universities from adopting e-learning, these factors are the frequent power outages, lack of electricity in some areas; especially rural ones, the weak internet networks and its lack of coverage for all areas in Sudan, especially the rural ones, the lack of electronic skills among students and some professors, the widespread of poverty, and finally the weak communication infrastructure. Furthermore, the study showed that some professors are old, and they resist the adoption of e-learning. Likewise, the study found that **67%** of respondents were not able to access the internet in their areas during Covid19 lockdown, **25%** of respondents do not possess computers, **35%** of respondents did not receive training for gaining E-skills, and **74%** of respondents prefer learning in classrooms. The study concluded that, E-learning to be adopted in Sudan, several steps can be taken such as E-skills intensive training for instructors and learners, provision of laptops or smartphones, electricity and internet networks connection to all remote rural areas of Sudan, poverty combat, and stimulation of students to accept e-learning.

Recommendation for instructors the study showed that the lack of skills in dealing with computers by some professors is one of the obstacles that contributed to the lack of adoption of electronic education in Sudan. Therefore, the higher departments of Sudanese universities must devote training courses so that the professors can acquire the skills of dealing with computers and smartphones efficiently and effectively. The study discovered that there are several professors in Sudanese universities who do not have computers, and this negatively affects the adoption of electronic education in Sudan. Therefore, the state must grant the professors computers to perform their duties. The research showed that there are professors in Sudanese universities who are elderly and cannot keep up with the rapidly changing world. Therefore, the researcher recommends university administrations appoint young professors who are distinguished by energy, enthusiasm, and ability to adapt to the accelerating changes.

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