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E-learning Trends and Internet challenges in Iraq

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Abstract: The Iraqi education sector has faced obstacles for decades due to the multiple past crises, and recently social tensions and political demonstrations that led to students' reluctance to join the university in late 2019. These problems are applying even more pressure on the fragile education system and affecting education access. Therefore, the urgent need for electronic learning (E-learning) has emerged, putting the situation of the current education system and telecommunication infrastructure in a real challenge. In this research, the internet signal of the University of Kufa (UoK) was monitored for five months during the quarantine to study the effect of the productivity and availability of the Internet on e-learning at the university. However, this paper focused on and studied three main dimensions: Students and Faculty, Educational Platforms, and Information Technology Services, to identify and evaluate the primary factors that directly affect e-learning. The study also presented the current status and penetration rate of the Internet in Iraq and presented an analysis of a questionnaire targeting the level of technology acceptance and lecture specifications for the e-learning experience at UoK.

Keywords: University of Kufa, Internet usage, E-learning platforms, Quarantine

1. INTRODUCTION

The learning process is not limited to traditional methods in recent years [1]. The ICT (Information and Communication Technology) plays a vital role in the current days. Many sectors are using information technology to make digital transformation and adopt digitalization in their operations worldwide, and learning is one of these sectors. "E-Learning" can be defined as the use of information technology in the learning process [2]; it encompasses using the ICT in educational facilities such as schools and universities, where the beneficiaries can reach many learning materials at any time [1].

Recently and especially in the covid-19 Pandemic time, the "E-Learning system" has been widely adopted in Iraqi educational institutes; however, many challenges can prevent this new learning approach, especially the weakness of infrastructure [2] and lack of awareness.

Although Iraq was one of the backward countries in adopting the e-learning system [3], many efforts have been made in Iraq to adopt an E-learning strategy, especially from universities and other few organizations.

The learning process has been evolved lately by using new free technologies to make education more efficient [4]. One of the essential attempts from the ministry of higher education and scientific research to establish an e-learning strategy was the Avicenna center, which started in many Iraqi universities. Besides, the OPATEL project was another step that supported this strategy, which was developed by the United Nations Organization and UNESCO [5].

Other non-educational governmental activities participated in this approach as well, and this can be seen in the University of Kufa targeting students, and the Ministry of Oil targeting their employees, which issued the e-learning system platform for management and training their employees [6].

There are other few notable examples of E-learning platforms in Iraq; the first example is "e-madrasa" this platform is supported by the ministry of education and is based on the intranet infrastructure of Earthlink Co., the leading internet service provider in Iraq. Later, Earthlink officially launched their E-learning platform to serve primary and secondary schools [7].

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The second example is MOOC platform named Kufa Open Online Courses (KOOC). It launched in March 2012 in the University of Kufa, considered the first open e-learning platform that targeting the local public people with short videos in local language formed in courses related to different interesting topics, such as educated people about Information Technology, Archeology and cultural heritage, and other social topics.

The paper is organized as follows: Section two discusses the internet challenges in Iraq, section three describes the research methodology, and section four explains the result and analysis. Finally the conclusions and future works are explained in section five.

2. INTERNET CHALLENGES

E-learning in quarantine is becoming increasingly dependent on IT systems and internet networks. The primary issue for the students to use the E-learning is fast internet access. So lack of electricity outage and low-speed Internet will not be adequate for using the e-learning system and to use the right technology, for both university and the student. The internet effect on E-learning will be discuss in this part. All reasons behind the deterioration of internet services in Iraq will be presented in detail in this section [2, 3].

This study seeks to provide a technical explanation, problems with the internet speed, penetration details, and internet usability in Iraq. Nowadays, users want to access several applications and services and content anywhere and anytime. This desire is increasing data traffic and triggering a mobile data explosion [8, 9]. According to the UN population division, the statistics showed that Internet usage jumped from 2.21 million in 2012 up to 19 million users in 2017 in Iraq. The current expected internet users are more than 29.8 million (75% penetration in 2020) with 40.89 million mobile connections [8, 10, and 11].

It is not a secret that Iraq is one of the least countries in terms of internet speed. The current total traffic in Iraq is about 850-1000 Gbps through Ministry of communication (MOC) networks [8]. This lack of services is because of two main reasons: First, most internet service providers (ISP) rely on free licensed wireless services (last mile access). MOC adopts the wireless broadband last mile access as an inexpensive solution with low Quality of Service (QoS).

Also, ISP (which is the private sector) can import the Internet across Iraqi borders after coordination with MOC to use their infrastructure [12, 13].

Iraq ranked 138 in mobile internet speed and 117 in fixed broadband services. Nevertheless, in Iraq, speed details are illustrated in figure 1, the variation of speed for both fixed and mobile since March 2020. The monthly average in March (quarantine) is 7 and 4.18 Mbps for download (purple line) and upload (green), respectively to 84 ms latency in mobile services. The report also shows the speed as a fixed broadband 19 and 19.31 Mbps in download (light blue) and upload (red), respectively with 37 ms latency. [14]

The Wireless Fidelity (Wi-Fi) technology uses radio waves to connect devices. And there are two essential terms in the internet wireless service, which are the bandwidth and range. The first one refers to the speed over a wireless network, that is mean higher download and upload requires more bandwidth. The second term is the range, which is the maximum coverage.

In Iraq, generally, two different free licensed frequencies are used: 2.4 GHz and 5 GHz (latest). This will lead to limited bandwidth and very high interference, but with low cost (cheaper to produce devices) and more extensive coverage (because the radio waves can penetrate walls and floors) with respect to the 5GHz. The 5 GHz has been used recently after the interference and low bandwidth troubles. It has a higher bandwidth with more channel availability. The main disadvantage of this frequency is low coverage (not able to penetrate solid objects). As mentioned above, most Iraqi people are using free licensed (Wi-Fi) technologies for their internet services [8, 15, and 16].

Moreover, Iraq has an ideal location to carry Internet traffic between Asia and Europe. This reason is enough to improve an Iraq network, enabling Iraq to become a super transit route for Internet traffic through the borders and

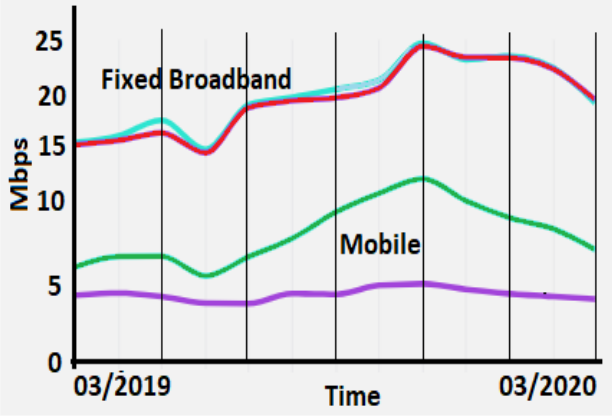


Figure 1. Internet speed variation (mobile and fixed broadband).

Arab gulf by submarine cables from Basra city. According to Cisco, from 2012 to 2017, Internet traffic is grown-up at the highest rate (about 39%) compared with other areas [17, 18].

3. RESEARCH METHODOLOGY

Many research studies have constructed critical findings related to E-Learning. Many of them have significantly studied the dimensions and critical success factors (CSFs) of the E-Learning system. Some studies

[19, 20, and 21] have classified the CSFs of E-Learning into different dimensions such as System and Technological, Institutional Management Service, Students, Instructors, and Content Design.

In this research paper, the University of Kufa has been considered a case study, and many possible CSFs related to E-Learning were identified, then reduced to 20 factors, and then grouped into three dimensions based on the current needs of the University of Kufa. The three main dimensions as following (Students and Faculty, Educational Platforms, and Information Technology Services) as seen in figure 2.

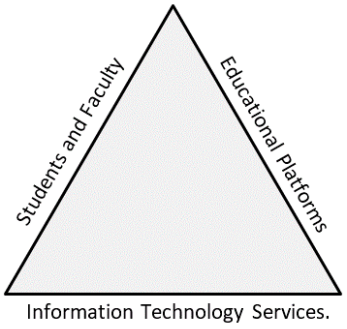


Figure 2. E-learning dominant keys.

3.1 Students and Faculty:

Students are counted as one of the significant stakeholders of E-Learning system. It has been stated that students are given preference over the other shareholders as they are the primary beneficiary of the E-Learning system [19, 22, and 23]. Furthermore, students are expected to obtain support from the system, and the system would be more effective and useful if students utilize it properly.

On the other hand, the faculty is one of the main inputs in any learning process. Thus, their role becomes different from what it used to be, especially in the ICT system, as they are no longer merely a transmitter of information from a textbook to students' minds. Still, they must work on their positive participation in obtaining information. Therefore, the teachers' role in e-learning is essential and more complicated than the traditional education process.

To complete the teachers' role, they must change it from a mentor of scientific content to become a multi-role, as the instructor may be a manager of the learning situation, a designer of the learning process, a producer of educational materials, a guide to the learner, and a constant evaluation of the educational system.

Therefore, the teachers need continuous training to learn the best ways to achieve integration between technology and the topics they are teaching, such as the use of computers and the Internet; and between topics related to each other on the other hand to possess the ability to teach with distinct skill and high competence. Many factors grouped in Students and Faculty dimension were discussed in [24] and can be mentioned here shortly:

Students' factors:

a. Attitude towards E-Learning
b. Students' Motivation
c. General Internet self-efficacy
d. Interaction with Other Students
e. Commitment towards Online Studies

Faculty factors:

a. Instructors' Attitude towards E-Learning
b. Instructors' ICT skills
c. Easy Language Communication
d. Appropriate timely Feedback

3.2 Educational Platforms:

The first Iraqi official attempt in E-learning usage was in 2010; Moodle as LMS was implemented and utilized through limited sectors of Iraqi universities departments [25].

In 2010, the University of Kufa was one of the first Iraqi universities and academic institutions that applied Moodle as a Learning Management System. Later, in 2013, the University of Kufa developed and prepared the open-source system to suit the university's educational environment. Many intensive workshops and seminars were given to technicians and teaching staff to train and qualify them for Moodle [26].

Moodle is an open-source platform for learning management systems LMS, with advantages such as low-cost implementation, open support community, and continuous update and development. This platform includes Linux operating system, LAMP (Linux, Apache, MySQL, PHP PERL and PYTHON), Moodle, and theme plugin. Karkar and others in [27, 28] a study on UoK e-learning platform proved that social media, despite some of its merits for e-learning, is an influential negative factor that discourages educators from fully utilizing any customized education management system platforms that offer enhanced learning capabilities.

Moodle systems and servers located in UoK datacenter with the care of solar energy and monthly internet contract. Hosting Moodle servers and building a server farm by UoK is putting Information Technology Research and Development Center ITRDC team in daily technical challenges. Although these challenges can be coped with the E-learning team experts, the demand for internet bandwidth services keep growing, and this embarrassing financial resourcing of UoK.

Figure 3 shows that internet bandwidth increased to 120 MB three times in 2020 during the Coronavirus pandemic and the high demands on e-learning compared to internet bandwidth in 2018 when were regular classes attendance in UoK. Internet signal has been monitored by the PRTG Network Monitor software for five months during the quarantine Figure 3 shows the growth of Internet bandwidth in the first half of 2020 according to practical academic study in ITRDC of UoK [29]. Remarkably, we can notice in Figure 4 the high request for internet bandwidth for 2020 compared to last ten years.

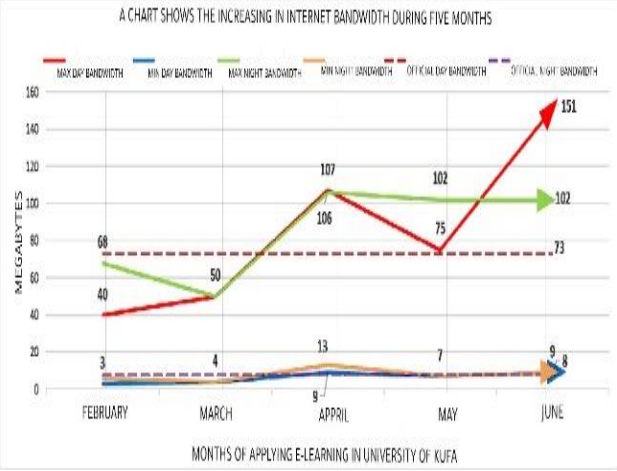


Figure 3. The internet usage at the University of Kufa during COVID-19 Pandemic and e-learning needs [29]

3.3 Information Technology Services:

The unprecedented challenge that the Corona pandemic imposed on the world showed the great importance of the Internet, whether for businesses, companies, governments, societies, and individuals, which created a massive burden on the World Wide Web. The burden was represented in the high demand for Internet connectivity and electronic services. As witnessed in unprecedented growth in the demand for organizing online conferences, e-learning platforms, remote work, and mobile phone applications, which constituted an actual test of the stability of the global Internet.

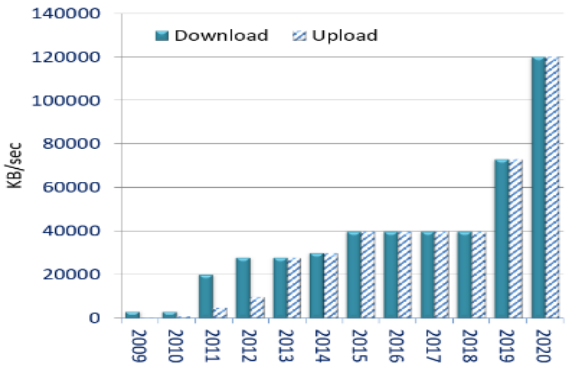


Figure 4. Internet bandwidth Over 10 Years. [30]

Thus, this massive demand on the Internet in a short period prompted searching for a solution to expand the capabilities of this network to ensure the continuity of internet connectivity. Therefore, there is a need for new technology characterized by the speed in the transfer of data and the ability to network devices and individuals without any reduction in speed or stumbling in transferring data and reducing response time to the minimum.

It is expected that the high rate of Internet usage will continue to rise, especially since the Coronavirus will not end up soon, which therefore requires extensive cooperation by governments and stakeholders concerning continuing the development of Internet infrastructure to maintain its flexibility, operational efficiency, and sustainability. In UoK, Sophos firewall system measure traffic for e-learning exchange data on the Moodle servers, the figure 5 and figure 6 show data traffics, and user hits dramatically increased during terms exams of 2020. Unless the Corona pandemic ends data traffic on e-learning servers expected to increase in 2021 when universities relying on blended learning [31].

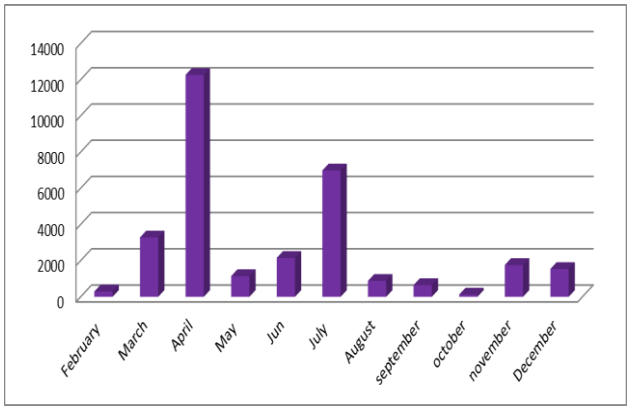


Figure 5. E-learning data traffic in GB from February to December 2020 in University of Kufa [29]

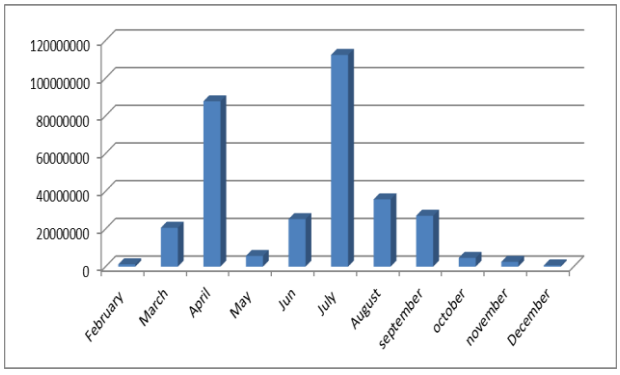


Figure 6. E-learning users' hits from February to December 2020 in UoK [29]

4. RESULTS AND ANALYSIS

Due to the challenging circumstances that Iraq tackle, E-learning plays a significant role in continuing the studies. The study has been done based on the questionnaire. Since the questionnaire focuses on Iraqi citizens as a test sample, the questionnaire is made in Arabic and then translated to English. The questionnaire has been implemented based on two ways: the first method used the poll in Telegram and the second one using Google Forms, preparing a soft copy of the questionnaire, sending it to the students, and then receiving feedback. The questionnaire is spreading among more than 1000 students, and contains eight questions divided into Personal Information, Questions related to information and communication technologies. These questions are listed from the figure (7)

(Fig. 7.a) shows the percentage of students who prefer the E-learning or to wait until to reopen the universities. The figure shows 90% of students prefer regular study. (Fig. 7.b) present the main reason for not attending the E-learning were 26% student direct the reason for the problems in the E-learning programs, on the other hand, the other 42% choose technical problems like the Internet and the tools as the main reason.

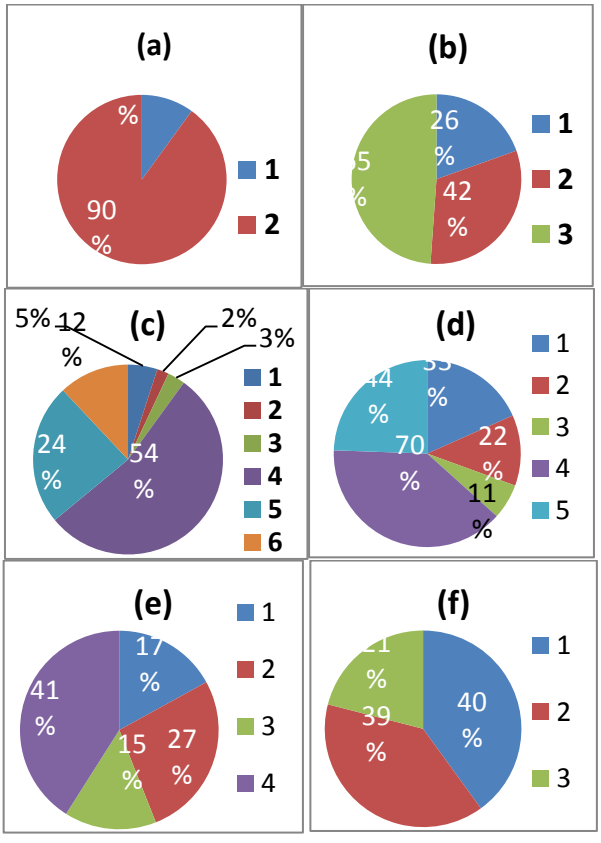
Simultaneously, the highest percentage of students pick out other problems for not attending the E-learning. In addition (Fig. 7.c) shows the main problems of the E-learning at Kufa University, 5% select the difficulties in using the Moodle platform, in comparison 2% chose the difficulties in using the google classroom, 3% The hardship of the interaction with the instructor. However the highest percentage which represents 54% tap the presentation is not easy to understand. Nevertheless, 24% select Limitation Clarification tools, and the rest select others.

On the other side (Fig. 7.d) clarify the personal technical problems. The percentage has been divided into five problems, 33% state that they don't have 24-hour internet service, 22% don't have PC, 11% don't have a smartphone, 44% The large size of the uploaded material, the highest percentage chooses the weak internet service. As personal information (Fig. 7.e) shows the type of the device that the students have, the answers are divided into 4 categories 17% Personal PC, 27% smartphone or tablet, 15% non-smartphone. In contrast, the rest which is the most significant percent pick I don't have any of the above (I'm using a family smartphone).

The sixth question presented in (Fig. 7.f) deals with whether the students prefer to record the lectures or virtual class (online class). Almost the percentage is equal between recorded lecture or virtual class while the rest don't care about the way of presenting the lectures. (Fig. 7.g) discuss if the participates prefer recorded video lectures or regular file lectures (text file).

The blue part represents the recorded video form about a quarter of the percentage. Both red and purple areas form 9% of which represent regular files and don't care about the way, while The highest percentage of the participants choose both ways.

The last part (Fig. 7.h) represents the last question, if free Wi-Fi provided by the government, do you prefer to continue in the E-learning. Mostly the participants about 67% answered yes, on the other hand, 22% answered no, a small present of them don't care since there are more problems than providing the Wi-Fi.



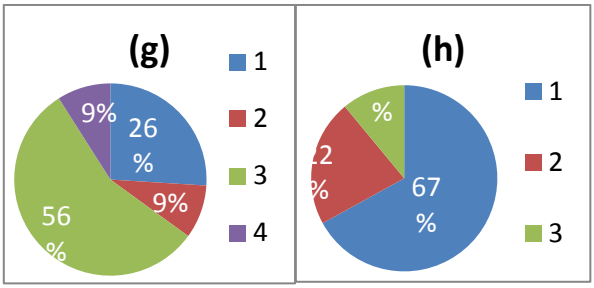


Figure 7. a-h Summary of the primary responses to the questionnaire.

The second part of the questionnaire represented in figure (8) discusses specific details about the E – lecture. The figure below shows two parts: the left part question what is the favorite lecture duration? The right part question is about how was the first time E- lecture? The result by the percentage can be seen clearly in the figure.

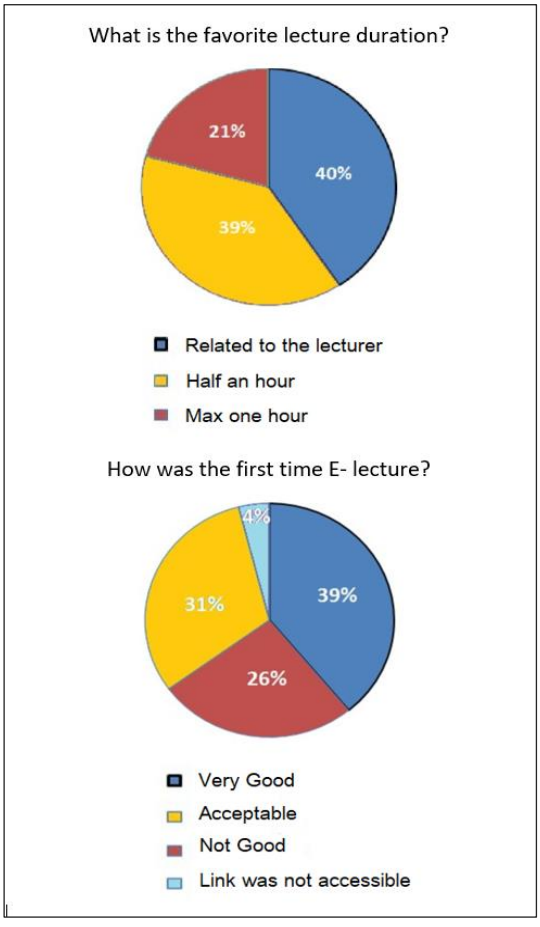


Figure 8. E- learning lecture specification.

5. CONCLUSIONS AND FUTURE WORKS

This paper focused on and studied three main dimensions: Students and Faculty, Educational Platforms, and Information Technology Services. Also, the current state of internet service with Wi-Fi traditional ways and the solutions are clarified and described. And the internet effect on E-learning has been discussed in this work carefully. All reasons behind the deterioration of internet services in Iraq been presented in detail. The poor service of internet problem is not only a result of a weak infrastructure but also a matter of lack of management and organizational vision.

More, this paper shows that internet bandwidth usage has been tripled in E-learning servers of UoK during 2020 study terms. In future works, we will study the second dimension of CSFs group related to educational platforms extensively. This dimension should consider clearly in cooperation with official decision-makers in order to give alternative that could be easy in education system and may reduce internet bandwidth consumption.

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