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Bridging the Digital Divide and Enhancing the Quality of Engineering Research in Libyan Universities

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Abstract:

This paper aims to identify the factors enabling the bridging of digital divide and enhancing the quality of engineering research at Alfateh University through an effective ICT implementation. The authors study the global digital divide with emphasis on the Info-tech disparities between developed and African countries (including Libya) in relation to generalised rates of social and technological development. Also, investigate the relationship between the digital divide and Higher Education (HE) teaching and the current status of digital divide in Libya. It is obvious that an effective ICT implementation should focus on understanding individual faculty needs. Then a thorough investigation of the importance of implementation of electronic education at Libyan universities and the challenges and solutions of ICT implementation is performed. Stakeholders are advised to include faculty members in every step of the planning and implementation of up-to-date technologies.

This paper presents the factors that affect the Internet use by the staff members from Engineering Faculty at Alfateh Universit. A questionnaire is designed to find answers to the following research questions:
*   a. What are the patterns of internet use of faculty members?*
*   b. What are the main purposes for using internet resources?*
*   c. How does the internet affect research and teaching?*

Keywords:

Electronic education; internet; user acceptance; technology transfer; ICT gap; digital divide.

Introduction:

Miniwatts Marketing group (2011) published the results of Internet usage statistics for Africa which show that 5.7 % of the users in Africa and 5.4 % of the users in Libya were subscribers. In the case of Libya, an Internet subscription is often used by several members of the household, by clients of cybercafés, and by visitors to libraries.

The main restrictions on Internet use is relative poverty, poor quality of Internet services due to infrastructural shortcomings, low Internet bandwidth, unreliable electricity, outdated end-users. These problems pose serious limitations and frustrations for African users and Libya too. Internet access officially came to Libya at the end of 1998, but it was not widely available until early 2000. Internet penetration remains lows, at around 3.8%, and change in 2011 about 5.4 % see Table 1.

The primary means for people to connect is through Internet cafés. The state-owned General Post and Telecommunications Company (GPTC), regulates and operates Libya's telecommunications infrastructure, and owns and operates the country's primary ISP, Libya Telecom and Technology (LTT), which offers Internet services via dialup, DSL, broadband, and satellite. At least seven companies other companies are licensed but are effectively subordinated to LTT, as LTT maintains a monopoly over the country's international Internet gateway. In October 2006, the Libyan government reached an agreement with a non-profit United States group, One Laptop per Child, to develop an inexpensive, educational laptop computer with the goal of supplying a machine to every Libyan schoolchild by June 2008. As the country contained only 130,000 computers in 2002, this promised to be a major boost to the availability of information communications technology (ICT) technologies and the Internet. Thanks to the recent oil boom, Libya has one of the highest budgetary surpluses and one of the lowest government debt levels worldwide. Libya has now embarked on a process of economic reform and the list of challenges to be addressed is long, particularly the low

penetration of the latest technologies to improve the overall level and quality of education. Table 1, shows the growth of Internet usage in Libya and countries near Libya.

Table (1): The growth of internet usage in Libya and the adjacent countries 2011.(www.Cia.gov.)

The Countries	Population (2009)	Internet Users Dec/ 2000	Internet Users, Latest Data (2009)	Population Penetration	User Growth (2000-2011)
Libya	6,324,357	50,000	**353,900**	5.4 %	**3,44%**
Tunisia	10,629,18	100,00	**3,600,000**	33.9 %	**3,50 %**
Algeria	34,994,93	50,000	**4,700,000**	13.4 %	**9,30 %**
Egypt	82,079,6	450,00	**20,136,00**	24.5 %	**4,37%**

It is not possible to discuss the Internet in Libya and adjacent countries without considering the state of its applications, including the number of ISPs, and the cost of Internet access. The LTT monopoly in Libya raises the cost of an Internet connection and, to some extent, exacerbates the deterioration of the service. Many Arab governments, for political reasons, create a monopoly in the ISP market by preventing new firms from entering the market by e.g. control of licences. Another reason why Internet costs are high and connection speeds are low in Arab countries is because Internet service providers are not allowed to provide their own international gateways. Table 2 shows the number of internet providers in each country.

Table (2): internet service providers in countries near Libya (Elzawi, 2008)

Number of Internet Service Providers in countries near Libya		
Country	**Number of ISPs**	**Example of ISP**
Libya	**1**	**Libya Net (www.libyanet.net)**
Tunisia	**5**	**Global Net (www.gnet.tn)**
Algeria	**11**	**Cerist (www.cerist.dz)**
Egypt	**38**	**Link Egypt (www.link.com.eg)**

Literature review:

Hamdy (2007) mentions that several indicators can be used on a global scale to determine the digital divide between countries. Hamad (2006) points out that generally the research projects within Libyan universities aim to satisfy academic requirements (students' certificates; job promotion, etc), but have not emerged from the real needs of society.

Porter and Yergin (2006) present the conclusions of the Libyan business executive survey/global competitiveness report (LBES/GCR). Libya has the rank 97 (out of 111 countries) in university/industry research collaboration. The usefulness of research activities could be increased by employing innovative models for the creation and use of content, as well as the production of knowledge-based products (such as software). Increasing the use of Internet will support the development of researchers in transdisciplinary areas as well as entrepreneurs in stimulating the growth of alternative approaches to digital copyright. Porter and Yergin (2006) formulate several research questions to be considered over the next five years:

- What new models for publishing academic and scientific journals, alternative IP licensing schemes (i.e., creative commons) are most appropriate for African development and Libya too?
- What is the impact of new Digital Rights Management technologies on access to digital content in Libyan universities?

Digital Divide of ICT in Libyan Education:

Libyan national ICT policy for education aims to provide access to ICT tools and build a

strong Infrastructure. It also promote research and development to ensure the provision of suitable learning , one of the main objectives of the national ICT policy for education is human resource development, and the investment in human resources is the key factor to achieve the goals and objectives of the national ICT strategy. UNDP and UNESCO work hand in hand with Libyan government agencies to ensure appropriate and timely implementation of the ICT strategy. This support also opens the door for the partner community and encourages investment in Libya. Libya has faced a number of constraints and challenges. Therefore, the implementation of the ICT policy is still at an early stage, as is access to ICT tools and the implementation of the national ICT policy and the development projects in different domains still lag behind. Cause to digital divide between researchers in members academic universities such as (Table 3), numbers of researchers (per million from 1990-2005), Human development report 2007/2008 UNDP. In addition, there is an acute shortage of ICT qualified and trained teachers, who are needed to bring ICT into classrooms and educate a new generation of technically qualified students (Hamdy, 2007).

Table (3): Number of Researchers (per million people) 1990-2005.
(Source: Human Development Report 2007/2008 (UNDP).)

No.	Country	Researchers
1	Libya	361
2	Tunisia	1013
3	Algeria	..
4	Egypt	493

The concept of the Digital Divide has historically referred to the lack of physical access to important information technology such as computers and the Internet (Gorski, 2003). The digital divide exists for the Libya and negatively affects the ability of the group to use information technology Libya experiences limitations of ICT access due to geographic, infrastructure, and education limitations along with a history of restrictively traditional cultural values. This process affects the experience and development of Libyan member's universities, which eventually affects students. This general problem evolves into a twofold manifest that includes limited research on staff members from Engineering Faculty and understanding the perspectives of these universities in the context of the digital divide. However, support research on innovative models for the creation and use of content, as well as the production of knowledge-based products such as software. It will also support the development of researchers in this transdisciplinary area and especially the interests of academics, as well as entrepreneurs in stimulating the growth of alternative approaches to digital copyright. Research questions to be considered over the next five years include:

1. What new models for publishing academic and scientific journals, alternative IP licensing schemes (i.e., creative commons) are most appropriate for African development and Libya too?

2. What is the impact of new Digital Rights Management technologies on access to digital content? And where is it Libya for development and implementation.

Research methodology:

Yin (2003) has pointed out that surveys are generally part of a positivist approach to research. Surveys have weaknesses (such as low response rate, possible ambiguities in the questions). The use of questionnaire is considered to be appropriate in this case due to advantages mentioned by Remenyi et al. (1998) and Saunders et al. (2003):

- Highly economical research tool - large amount of data collected easily and efficiently from a large number of members;

- The survey data collected from standardized questionnaires allows for easy comparisons and statistical analysis.

The responses are analysed with quantitative and qualitative methods by considering the issues of reliability, validity, bias and triangulation.

Findings:

The findings indicate the existence of a digital divide, but also suggest that the availability of digital content has helped overcome the substantial scholarly information divide. The questionnaire was conducted to provide comments on the final survey (Elzawi, 2008). The pilot study gave valuable experience in using the internet for academic research and in contacting and communicating with the respondents, and the explaining purpose of the survey. The main results of this work can be summarized as follows:

- Making alterations and adaptations that were deemed necessary.

- Excluding engineering faculty non-academic employees from the final survey, concentrating on faculty members. The postal survey strategy has been adopted to satisfy the objectives of the study and the need for a large sample to carry out the data analysis.

The overarching finding was that there were three primary elements that affected the use of the Internet by the respondents: job requirements, self-perception, and technology availability. However, within these three fairly obvious elements were subtleties that provide thought-provoking consideration. In order to show the development of the findings, the analysis is presented here in a building block approach, starting with each of the major questions considered in the research.

Usage of IT Strategy:

To discover whether the Faculties should have an IT strategy independent of University IT strategy. Table 4 shows that 31.25 % of respondents agreed with separate IT strategies while the majority were in favour of having similar IT strategies at Faculty and University levels.

Table (4): The faculty IT strategy should be independent from University IT strategy.

Case	Frequency	Percent
Yes	10	31.25%
No	22	69.75%

Type of the network:

Table 5 shows the responses to the questions on the type of computer network in faculty.

Table (5): Types of the networks.

Case	Frequency	Percent
Only one computer/PC	2	6.25%
Currently in process of networking	4	12.50%
No need for networking	0	0.00
Networking is too expensive	12	37.50%
Networking is unreliable	6	18.75%
Need to improve understanding	8	25.00%
Other	0	0.00

These responses indicate a need for managerial support, a new strategy and economic support from the responsible authorities. Networking importance none less then computer / PCs.

Usage of Internet:

Table 6 shows the responses to the question on the frequency of use of the internet and its applications. One quarter of staff, apparently, do not yet use the internet while just over a third uses it frequently.

Table (6): Usage of the Internet. (Source.ITUestimate)

Case (hours used/week)	Frequency	Percent
0--2	6	18.75 %
2--5	17	53.125%
6 --10	7	21.875%
>10	2	6.25%

The difference here is directing to difference in the opinions of functionary office for the (intranet and internet) to the necessarily extent that search serving. Internet users per 100 inhabitants 2010 equal 14 and 2009 approximately 10.80 in 2010 (Source.ITUestimate) in Libya.

Weekly use of Internet.

Table 7 shows the weekly use on the internet, in hours, by the respondents. Nearly one fifth of the respondents use the internet for academic purposes less than two hours a week. Only a quarter use the internet for more than an average of one hour per day. Only 2 respondents (6.25%) are more frequent in Internet use with a minimum of 10 hours weekly. The relevant analysis showed no obvious gender difference in time spent on the Internet. Based on common sense, it is presumed that the people with science backgrounds spend more time on the Internet, but the data do not support the assumption.

Table 7 shows that lower income does not become an obstacle for members to surf on the Internet; spends more than 10 hours on the Internet each week. Exhibits the time spent on the Internet according to different subject fields.

Table (7): Respondents weekly use of the internet

Case	Frequency	Percent
Not used and no plans to use	0	0.00
Not used but plan within next 6 months	8	25.00%
Not used but considering it for the long term	0	0.00
Rarely	4	12.50%
Occasionally	2	6.25%
Quite often	6	18.75%
Frequently	12	37.50%

Barriers those are most likely to keep staff from using the Internet.

To avoid future problems in the use of internet for research purposes it is necessary to discover any likely barriers and take action to remove them. The responses to this question suggested fifteen factors that could keep them from using the internet for academic research purposes, these are:

1- Lack of Internet access. Twenty (62.5%) members considered the absence of Internet access in their institutions is what has prevented faculty from using it.

2- Lack of access of specialized online databases. Seventeen (53.13%) indicated that not having access to specialized online database is what is keeping them from using the Internet for research. And using in universities Libya members for research with web site's researcher. (I.e. science direct/Emerald's/Cambridge Journals online) before 1998 with every membership.

3- Low speed of connection. Twenty (62.5%) members suggested that having a low speed internet access is what kept them from using internet.

 4- Quality of the information source.
(strategy for searching information, variety and availability of information, information convenience, quality of information, unfiltered information, speed of finding information, newness of information and opportunity for update).

5- System availability. Eighteen (56.25%) cited the lack of computer availability in their institution as the barrier to their use of the Internet.

6- Lack of educational institutions' encouragement and incentives. Fourteen (43.75%) members believe that not having the encouragement or incentives from their institution is a barrier to their accessing the internet.

7- Lack of skill in the English language. Twelve (37.5%) members indicated that being not proficient in English is one of the main reasons that prevent them from using the internet.

8- Field of study. Thirteen (40.63%) members mentioned that they could find information sources in their field of study, without the aid of the internet.

9- Unfiltered information. Eight (25%) members indicated that the unfiltered information from the government sometimes that prevented them from using the internet

10- Clarity and ease of use. Thirteen (40.63%) members considered the internet as a complicated and unclear source of information.

11- Technical difficulties. Thirteen (40.63%) members mentioned that there is a barrier to their internet use related to technical problems.

12- Lack of interest. Twelve (37.5%) members mentioned that not having sufficient interest to learn about the internet is what is preventing them from using it.

13- Social factors. Eleven (34.38%) members mentioned that certain social factors prevent them from using the internet. (Because the internet is considered by a large proportion of the community as source for finding prohibited information, some schools or universities place restrictions on using the internet.)

14- High cost of Internet connections. Seven (21.88%) members indicated that the expense of internet connection is one of the reasons that prevented them from using the internet.

15- Lack of training, support computer and Internet skills. Sixteen (50%) members indicated that lack of computer and internet skills and the training, keeps them from using the internet.

Implication for future research:

There are significant differences in the perceptions of Libyan academics as to the potential use of the Internet for research purposes and the likely benefits from Internet access. The paper proposes several solutions to reduce the level of resistance displayed by some members of academic staff in using widely ICT tools and implementing the national ICT policy.

The primary conclusion from this study is that there are significant differences in the perceptions of Libyan academics as to the potential use of the Internet for research purposes and the likely benefits from Internet access. Staff, such as in the engineering faculty members, who are focused on new knowledge are less likely to see the Internet as a danger and more likely to see it as a powerful tool for work enhancement. What was somewhat startling was that none of the responses mentioned the Internet as a way to bypass the constraints of their culture.

While several of the questionnaires mentioned the use of the Internet as a way of collaborating with colleagues, none specifically mentioned the ability to work more. It is clear that proficiency in the English language is necessary for effective use of the Internet since most of the sources on the Internet are in English. However, while there is an understanding by most respondents that they should improve their computer literacy and Internet skills; as many responders reported that they needed more Arabic websites as realised they needed to improve

their English language skills. This abstraction identifies a rich field for future research. Most obviously, the abstraction should be validated. Furthermore, the relationships of the nodes and their levels or values can be explored to develop a rich body of knowledge specific to Internet access.

Our findings indicate that the Internet is utilized by faculty for teaching purposes more than for communication and research. Previous studies examining faculty Internet usage in the local situation have consistently reported email and communication as the major purposes for their online activities when compare to teaching or research purposes. Integrating Internet technologies in the teaching process generally indicates higher utilization. This may be an indication that comparable studies conducted in the past showed that Internet adoption is in its early stages, the Internet is being utilized to a wider extent as the resources become more accessible to faculty in higher education institutions. In our examination of the hypotheses, the study showed that there is no connection between available university resources and Internet use. This finding is in line with findings of studies that reported that organizational factors have minimal effect on faculty use of the Internet.

Utilization of research in higher education in Libya, conducted across the world, provides explanation for low implementation rates by putting the blame on the faculty; either they are stuck in traditional methods of teaching, and are labelled as resistors, or charged with negative attitudes towards technology. These unjust explanations are based on a poor understanding of different faculties with different needs. The challenge of increasing the benefits gained from Internet technologies should focus on understanding individual faculty needs. Stakeholders are advised to include faculty members in every step of the planning and realization of up-to-date technologies. If they are involved from the early stages, then their requirements would be met, and this should allow for increased levels of efficient integration of Internet technologies that meet their particular needs.

This study offers an in-depth understanding of problems in utilizing the Internet and engineering faculty perceptions towards the Internet. Technology solutions are not likely to be the quick fix to all educational problems and issues. It is generally known that technology solutions do not improve enough teaching methods. Therefore, the focus should be on adopting the right technology solution that fits the education context and the faculty involved. The being factor should always be considered as the starting point on making the decision on how technology, and more specifically the Internet, could be employed to improve teaching and research efforts. Faculty should be given the chance to participate in decision making with regard to the appropriate use of technology in their specific academic control.

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