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## Future Potential of ICT Implementation in University eEducation in Jordan

*A. Y. Al-Zoubi, Bassam Kahhaleh, Omar Hasan and Husam Kharouf,*

Princess Sumaya University for Technology, Jordan.

**Key words:** *ICT, Higher Education, University eEducation, Technology-Enhanced Learning.*

### Abstract:

*The emerging information and communication technology (ICT) has become a strategic alternative for universities all over the world to enhance learning and deliver both quantity and quality programs. The status of ICT infrastructure in Jordan is investigated through a number of core indicators to identify the underlying factors which emerge as serious obstacles to the progress of university eEducation. Findings show that Jordan has made a good progress in international ranking in both the networked readiness index, to stand 44 among 104 nations, and the digital access index with a position of 78 amongst 181 economies. An online questionnaire has also been conducted to probe university academics perceptions on the utilization of ICT as a tool in university teaching. Results show that a large majority of respondent professors make advantage of the internet in making presentations and lectures, preparing lessons and preparing teaching materials. However, almost two-thirds of professors do not receive any training on ICT before or during their teaching career and that the main area where ICT training seems to be essential is web page design.*

## 1 Introduction

The information and communication technology (ICT) revolution, coupled to changes in society, have placed great pressure on higher education institutions and universities worldwide to create efficient infrastructures to handle the continued growth in the numbers of incoming students while ensuring the delivery of high-quality education [1]. There is a continual need to improve ICT infrastructure and develop innovative approaches to quality teaching and learning that fully exploit ICT. However, as countries continue to invest in ICT for use in education, drawing financial resources from a variety of sources, there is a greater need for performance indicators to monitor the use and effects of ICT.

Information on the extent of ICT impact on education, however, remains scant, due to lack or absence of a monitoring and evaluation system. As such, there is an urgent need to formulate a set of indicators of ICT use and impact in education. Universities in Jordan are no exception [2] as they face serious challenges such as accommodating the socio-economic developmental requirements of the country as well as responding to the increasing demands on higher education. ICT is, indeed, envisaged as the future tool that will empower professors to transform teaching and learning processes from being highly teacher-dominated to student-centered. Major efforts have consequently been made in a number of universities to integrate ICT in learning and teaching systems and in managerial and organizational operations. In addition, Jordan has drafted national ICT strategic plans and policies to move forward with

ICT technologies in higher education. The higher education development project (HEDP), funded by the World Bank in 1999, the national strategy for ICT in higher education, 2003, and the National eLearning strategy are few of the initiatives and projects that have already been implemented [3]. Moreover, the ministry of higher education and scientific research has recently launched an initiative to develop a consolidated strategic view for clear ICT policies in the higher education systems in Jordan with the objective to create a climate that allows effective resource allocation and utilization, improved efficiency, optimized operational costs and improved educational outcomes [4]. Furthermore, university administrations are transforming university computer centers into standard “best practice” data centers and preparing plans to make available state-of-the-art data centers equipped with scalable server infrastructure and network devices that can securely and reliably support university e-services [5].

In this paper, a review of the ICT state of play in Jordan, with specific emphasis on the rate of adoption of technology-enhanced learning in university education is presented. The ICT infrastructure is also investigated through a number of core indicators which are compared to regional and world figures. Factors affecting the use of ICT in teaching and the perception of university professors towards its utilization are also investigated by means of an online questionnaire which allowed for a large sample, a wide geographical distribution, and a fast collection and analysis of data.

## 2 ICT Infrastructure

Statistics on use of ICT are critical to formulating policies and strategies concerning ICT-enabled growth, for social inclusion and cohesion, and for monitoring and evaluating the impact of ICTs on economic and social developments. The Global Information Technology Report has become a valuable and unique benchmarking tool to determine national ICT strengths and weaknesses, and to evaluate progress [6]. It also highlights the continuing importance of ICT application and development for economic growth. The Report uses the Networked Readiness Index (NRI) to measure the degree of preparation of a nation or community to participate in and benefit from ICT developments. The NRI examines the readiness of economies according to the general macroeconomic and regulatory environment for ICT, the readiness of individuals, businesses and governments to use and benefit from ICT, and their current usage. In 2005 Jordan, climbed two positions in NIR international ranking to stand 44 among 104 nations with a score of 0.1.

The digital access index (DAI) is another index, which measures the overall ability of individuals in a country to access and use new ICTs. The DAI is built around four fundamental vectors that impact a country's ability to access ICTs: infrastructure, affordability, knowledge and quality and actual usage of ICTs. The DAI allows countries to see how they compare to peers and their relative strengths and weaknesses. The DAI also provides a transparent and globally measurable way of tracking progress towards improving access to ICTs. The DAI has been calculated for 181 economies where Jordan was ranked 78 with a medium score of 0.45 [7].

The Global Partnership on Measuring ICT for Development has also developed a core list of ICT indicators that could serve as a basis for internationally comparable statistics on the information society. The core list of ICT indicators included a stocktaking exercise through which metadata on the status of official information society statistics were obtained from national statistics offices (NSO) worldwide, as well as a series of regional events that discussed core ICT indicators. The core list contains four sets of indicators: ICT infrastructure and access; access to, and use of ICT by households and individuals; use of ICT by businesses and ICT sector and trade in ICT goods. The principal objective of the list is to help countries which are developing ICT surveys, or adding ICT questions to existing

collections, to produce internationally comparable data. There are 10 basic and 2 extended core indicators on ICT infrastructure and access, all given as per 100 inhabitants. The main 4 basic indicators which are related to implementation of ICT in eEducation in universities are fixed telephone lines, mobile cellular subscribers, computers and Internet subscribers [8].

Comparisons of fixed telephone lines, mobile cellular subscribers and Internet subscribers in Jordan to world average and to those with both developed and developing countries over the period 1999-2005 are shown in Fig. (1) [8]. Fixed telephone lines and Internet subscribers, which are interrelated, remain below world average contrary to mobile subscribers which touch and almost exceed world average. The reason for the decreasing number of telephone lines in Jordan is obviously due to the overwhelming popularity of mobile phone, particularly among the young generation. Fortunately, internet subscription has evidently increased continuously to almost reach world average.

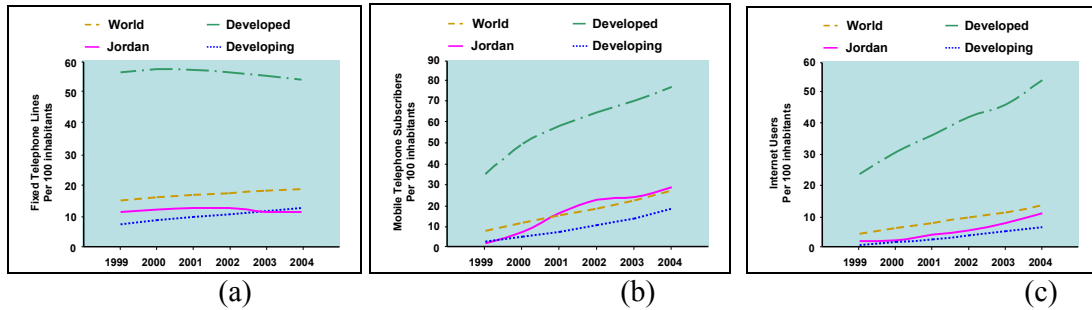
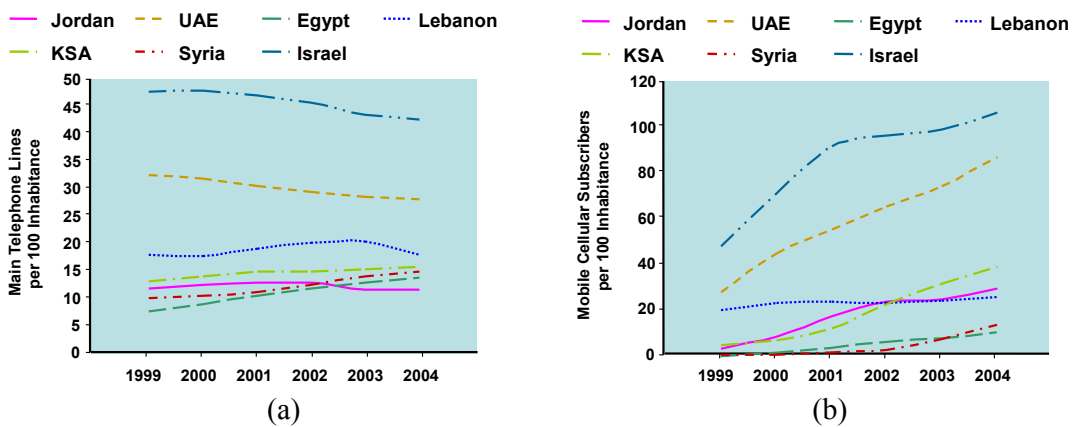


Fig. (1) Comparisons of Jordan ICT infrastructure relative to the world over the period 1995-2005, for: a) fixed telephone lines, b) mobile phones and c) internet users.

The status of ICT infrastructure in Jordan was also compared to 7 other countries in the region, as shown in Fig. (2), where fixed telephone lines, mobile, computer and Internet subscribers are shown over the same period 1999-2005 [8]. Again, Jordan compares well with other countries in terms of mobile and internet subscribers while fixed telephone lines and PC penetration are still surprisingly very low, and having decreasing trend.



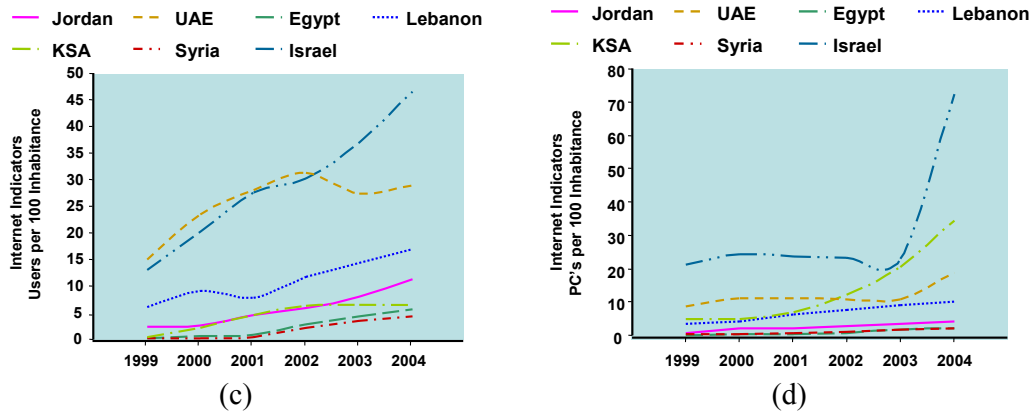


Fig. (2) Comparisons of Jordan ICT infrastructure relative to 6 countries in the Middle East over the period 1995-2005, for: a) fixed telephone lines, b) mobile phones, c) internet users and d) PC users.

These contradicting findings send an alarming signal to future eEducation plans' chances of success because of the low fixed telephone lines and PC penetration as well as the modest internet subscriptions. This will limit internet access from the home, particularly with the relatively high cost of dial up facilities, and will eventually result in a reduced unavailability of broadband services.

### 3 Higher Education System

University education in Jordan began with the second half of the twentieth century through the establishment of the University of Jordan in 1962. Nine more public universities were established in different parts of the Kingdom since that date. In 1989 the Council of Higher Education endorsed the first policy document authorizing the establishment of private universities. Thirteen private universities were founded since that date. The higher education system in Jordan has since undergone a remarkable progressive change, in terms of both quantity and quality. A number of diverse new institutions have consequently been established, with innovative programs and new specializations, to meet the demands of the society and the economic development plans. Higher education in Jordan is entering a period of transformation and high participation rates of the student body are rapidly diversifying. This is identified by the total number of B.Sc, M.Sc and PhD students' graduates, both female and male, and number of professors in all universities as shown in Fig. (3).

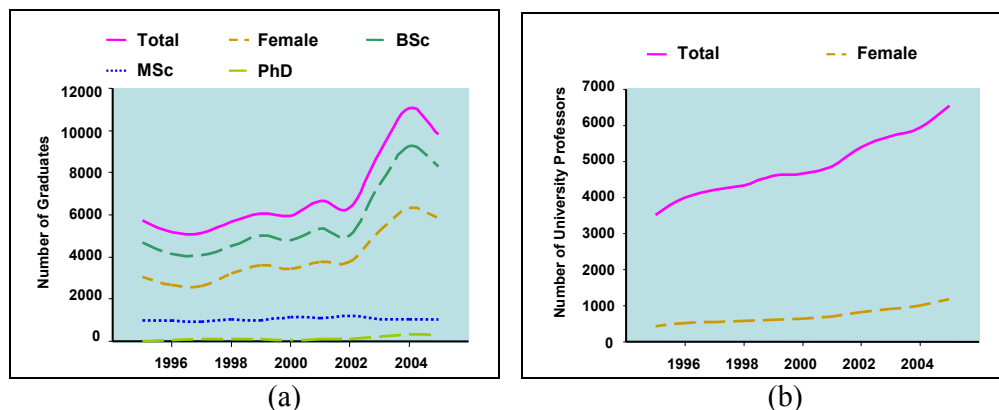


Fig. (3) Numbers in Jordanian universities over the period 1995-2005 of: a) student graduates and b) professors.

Furthermore, higher education in Jordan is part of an international system of education that is faced with many challenges, and affected by many relevant changes and factors such as globalization, demographic structure, and the crucial need for quality improvement to meet and maintain accepted international standards. One of the strategic alternatives for higher education to confront and address such challenges is, perhaps to push the boundaries of eLearning technologies. In attempting to frame a strategic response, universities recognize that eLearning is indeed recognised as a key element in a changing landscape.

The state of play in respect of ICT in higher education in Jordan thus indicates that there is a strong sense of awareness of the potential of technology-enhanced learning in terms of achievable low level goals. Standalone multimedia resources are generally used at both departmental and faculty levels, e.g., CD-ROM, multimedia learning resources such as the internet and accompanying web-based resources. In addition strategic planning for organizational change is already taking place at national level within the university sectors particularly the efforts to harness the expertise that have arisen from the many pilot projects that have been undertaken within the Jordan Education Initiative (JEI), which was launched in 2002, with the objective to implement education projects in order to stimulate and accelerate development and speed up educational reforms. The Initiative aimed at building the capacity of the local ICT industry for the development of innovative learning solutions in partnership with world class firms, and thus may be taken as a model of reform that can be brought to the higher education sector.

Jordan, however, still needs to provide stable, robust, secure and efficient in-campus infrastructure with sufficient network bandwidth, while strengthening its availability and reliability and providing mobile and remote access to campus resources [8-9]. Installation of data shows in every classroom with state-of-the-art teaching and learning technologies including desktop computers, display screens and video conference facilities and laboratories based on various platforms are being envisaged by universities to include campus-based wireless infrastructure and student acquisition of laptop. In addition, high-bandwidth and secure network infrastructure that supports wireless communication and fast Ethernet connections to all laboratories, classrooms, and offices are one major technically valuable facility which should be provided in all campuses to facilitate easy internet connectivity.

## 4 Results and Discussion

The status of ICT utilization in higher education institutions in Jordan for technology-enhanced learning purposes was investigated through an online questionnaire conducted in the first quarter of 2007. The questionnaire consisted of 26 questions aimed to cover a wide range of subjects and then posted into the Princess Sumaya University for Technology website [x]. An email list containing over 2700 emails for professors in the 22 universities, public and private, was also prepared and used to circulate a call for participation in the online questionnaire. Only 102 professors responded, 16.67% female and 82.35% male, of whom 8.82% were lecturers, 43.14% assistant professor, 15.69% associate professor, and 31.37% full professor. The majority of responses were from science oriented disciplines lead by the medical sciences with 29.41%, natural sciences 26.47%, engineering 22.55%, business and economics 8.82%, education 6.86%, languages 1.96%, art 1.96%, social sciences 0.98% and with no response from law and Islamic studies.

The results show that 95.10% of university professors in Jordan have a computer at the work office and 92.16% have a computer at home, while 97.06% have an internet connection at the work office but only 69.61% have an internet connection at home. They can also have access to computers at work 89.22%, home 75.49%, commercial places 23.53% and ICT training centres 25.49%. Furthermore, 88.24%, of professors use computers outside of working

hours and 79.41% access the internet outside working hours. In addition, 64.71% of professors own a laptop, 41.18% a tablet PC, 71.57% a mobile phone, 15.69% a PDA and only one third of professors have their own personal website.

However, even though 90.20% professors have been using computers for more than 4 years and 84.31% use the internet at work everyday, it was found that 64.71% did not receive any training on ICT before they joined the teaching profession, while 56.86% still did not receive any training in ICT during their teaching career and 64.71% did not receive any training in ICT over the past 3 years. The majority of 61.76% of professors have expressed their wish to attend computer training courses for career enhancement and personal development with very few with financial reasons. The main areas where ICT training seems to be essential are web page design and spreadsheets as can be shown in table (1) which reflects the degree of experience and skills that professor possess.

<b>Expertise</b>	<b>Word Processing</b>	<b>Spread-Sheet</b>	<b>Power Point</b>	<b>E-mailing</b>	<b>Internet Browsing</b>	<b>Web Page Designing</b>
<b>Excellent</b>	59.80	27.45	51.96	68.63	64.71	9.80
<b>Very Good</b>	31.37	28.43	33.33	26.47	19.61	10.78
<b>Good</b>	6.86	22.55	7.84	3.92	9.80	16.67
<b>Fair</b>	0.98	13.73	4.90	0.00	4.90	18.63
<b>No Capability</b>	0.00	6.86	0.98	0.00	0.00	43.14

Table (1): Expertise of professors in the use of various ICT software tools.

This finding is justifiable because web-page design is an important component of eEducation, particularly for posting lecture notes, homeworks, quizzes and other appropriate material which are essential for interacting with students using portals or websites in a virtual ICT environment.

This is again reflected in the field of study in which ICT is used as a teaching tool where medical sciences leading the list with 26.47% of professors have indicated that they actually utilize ICT in teaching their courses as shown in Fig. (4). Engineering professors came second with a percentage of 18.63, followed by computer science and IT 16.67, natural sciences 12.75, education 12.75, social science 5.88, language studies 1.96, Islamic studies 0.98 and art 0.98.

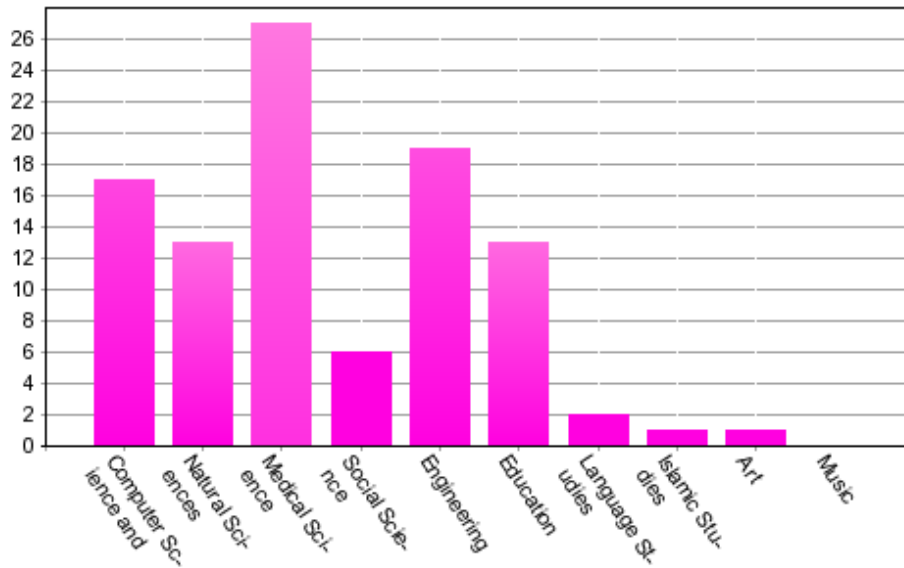


Fig. (4) Number of university professors' using of ICT use as teaching tool in the fields shown.

The use of ICT by professors for teaching purposes was also investigated as shown in table (2), where results indicate that this use is still at a modest scale when the internet is utilized in eEducation at universities. Almost half respondents seem to use the internet for teaching specific subjects, making presentations and lectures or preparing lessons, but a lower percentage use the internet for communicating with other professors and students or monitoring and evaluating their progress .

Purpose	Very Often	Often	Seldom	Never
Teaching-learning for specific subjects.	56.86	27.45	7.84	4.90
Teaching computer skills.	31.37	23.53	23.53	18.63
Accessing information and educational materials.	64.71	22.55	5.88	3.92
Making presentations/ lectures.	50.00	31.37	9.80	4.90
Preparing lessons.	46.08	33.33	11.76	4.90
Communicating with students.	23.53	31.37	27.45	13.73
Communicating with other professors.	37.25	35.29	15.69	7.84
Monitoring and evaluating students' progress.	20.59	25.49	26.47	23.53
Preparing reports.	51.96	23.53	11.76	6.86
Further personal development.	46.08	29.41	5.88	6.86
Others.	32.35	14.71	8.82	6.86

Table (2): Use of ICT tools for the various purposes.

Finally, the use of internet for teaching purposes was also investigated as shown in Fig. (5), where almost 80% of professors in universities in Jordan make advantage of the internet in making presentations and lectures, preparing lessons preparing papers and teaching materials. This is a most encouraging finding which shows the seriousness of professors in improving their teaching methodologies at the personal level. This matter should be investigated further in order to arrive at a conclusive opinion on the actual state of play



regarding eEducation in Jordan. One therefore needs to further study the trends of ICT and internet implementation for teaching purposes and the main obstacles of their use from students' perspective [10-11].

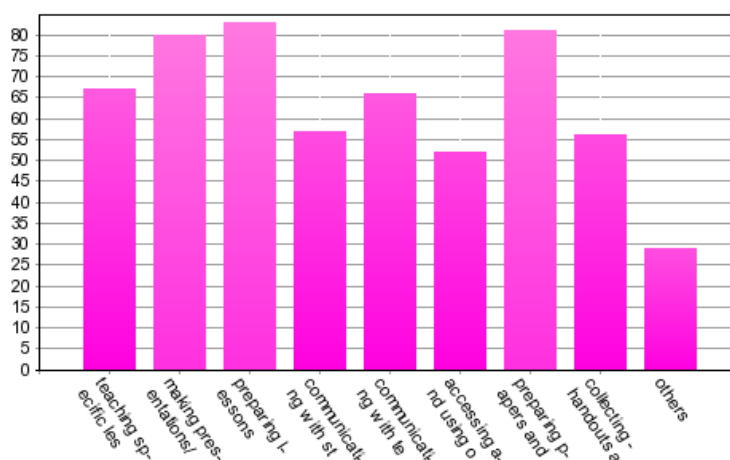


Fig. (5) Number of university professors' using use the internet for the various purposes.

## Conclusions

The status of knowledge and experience of ICT infrastructure and deployment in Jordan was investigated in order to explore the prospect and potential of future university eEducation. The backbone infrastructure seems adequate in terms of supporting access to online courses and resources but the role and strategic impact of ICT for teaching and learning has yet to be realized. An online questionnaire reveals that a large majority of professors make advantage of the internet in making presentations and lectures, preparing lessons and preparing teaching materials. However, almost two-thirds of professors do not receive any training on ICT before or during their teaching career and that the main area where ICT training seems to be essential is web page design. The medical sciences lead all fields of studies in responding to the questionnaire and using ICT as teaching tool, and thus become candidate for any future pilot projects to test the viability of eEducation implementation in the kingdom.

The main future obstacle for the utilization of technology-enhanced learning may be the surprisingly very low subscription of fixed telephone lines and PC penetration which show a decreasing trend over the past few years. This is an alarming indicator as it will lead to limiting internet access from the home, particularly with the relatively high cost of dial up facilities, and will eventually result in a reduced broadband services.

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**Authors:**

A. Y. Al-Zoubi,  
King Abdullah II School for Electrical Engineering,  
Princess Sumaya University for Technology,  
Al-Jubaiha 11941,  
Amman,  
Jordan.  
[zoubi@psut.edu.jo](mailto:zoubi@psut.edu.jo).

Bassam Kahhaleh,  
King Abdullah II School for Electrical Engineering,  
Princess Sumaya University for Technology,  
Al-Jubaiha 11941,  
Amman,  
Jordan.  
[bassam@kabhaleh.org](mailto:bassam@kabhaleh.org),

Omar Hasan and  
King Abdullah II School for Electrical Engineering,  
Princess Sumaya University for Technology,  
Al-Jubaiha 11941,  
Amman,  
Jordan.  
[ohasan@psut.edu.jo](mailto:ohasan@psut.edu.jo),

Husam Kharouf,  
King Abdullah II School for Electrical Engineering,  
Princess Sumaya University for Technology,  
Al-Jubaiha 11941,  
Amman,  
Jordan.