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Barriers to Effective Information Technology Integration in Jordanian Schools As Perceived by In- Service Teachers

Tayseer Khazaleh * and Tariq Jawarneh *

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Abstract: *The main goal of this qualitative study was to explore perceptions and opinions of a group of in-service teachers to derive barriers to effective information technology integration in Jordanian schools. Based on the grounded theory analysis of relevant data obtained from open-ended face-to-face interviews with sixty-one exemplary information technology using teachers in basic and secondary schools, six categories of barriers were identified: (1) serious shortage of computers and related information technology equipment in schools,(2) lack of efficiency of information technology teacher training programs, (3) Students' inadequate information technology basic skills, (4) insufficient time for teachers to prepare for information technology curricular integration,(5) lack of access to computers available in schools, and (6) scarcity of locally produced good quality instructional software. Discussions of such barriers were provided, and concluding reflections and recommendations were made. (**Keywords**: Information Technology, Teacher Training, Instructional Software).*

معوقات التوظيف الفعال لتكنولوجيا المعلومات في المدارس الأردنية كما يراها المعلمون في الميدان

تيسير الخزاعله وطارق جوارنه، كلية التربية، جامعة اليرموك، إربد، الأردن.

ملخص: هدفت هذه الدراسة الى الكشف عن معوقات التوظيف الفعال لتكنولوجيا المعلومات في المدارس الأردنية من خلال تحليل تصورات المعلمين في الميدان. وقد جمعت المعلومات من خلال إجراء مقابلات مفتوحة مع عينة قصدية تكونت من واحد وستين معلما ومعلمة من أفضل مستخدمي تكنولوجيا المعلومات في مدارس المرحلتين الأساسية والثانوية. وحللت المقابلات وفقا للنظرية المجذرة المستخدمة في تحليل البيانات النوعية. وقد أظهرت نتائج الدراسة أن معوقات التوظيف الفعال لتكنولوجيا المعلومات في المدارس الأردنية تقع في ست مجموعات رئيسة هي: (١) النقص الحاد في أجهزة الحاسوب والتجهيزات المتصلة بتكنولوجيا المعلومات في المدارس، (٢) ضعف فعالية برامج تدريب المعلمين في مجال تكنولوجيا المعلومات، (٣) قلة امتلاك طلبة المدارس لمهارات وكفايات تكنولوجيا المعلومات الأساسية، (٤) قلة كفاية الوقت اللازم للمعلمين للتخطيط والإعداد لتوظيف تكنولوجيا المعلومات في التدريس، (٥) صعوبة الوصول الى الأجهزة والمعدات الخاصة بتكنولوجيا المعلومات في المدارس، (٦) قلة توافر البرمجيات التعليمية ذات النوعية الجيدة المنتجة محليا. وفي ضوء المعوقات التي أظهرتها نتائج الدراسة، تم تقديم عدة توصيات لمعالجتها. (**الكلمات المفتاحية**: تكنولوجيا المعلومات، تدريب المعلمين، البرمجيات التعليمية)

Introduction

Computer applications are witnessed in practically all sectors of the modern society; computer related technologies are increasingly becoming part of almost everyone's life, including house management, workplaces, businesses, schooling, communications and leisure activities. Almost all Man's transactions involve some form of computerization. Simply stated, today's people may find it difficult to lead or manage their life affairs without computers. The notion that individuals of the 21st century must be prepared for the "Computerized Society" is commonplace. The utilizations of computer technologies in today's society are so widespread that individuals who are still uncomfortable with the computer are at a distinct disadvantage. As such, individuals as well as institutions scramble to catch up with computer generated realities. The world is becoming interconnected by an electronic network over which ever-increasing varied amounts of information flow at nearly the speed of light. Similar to other societal institutions, schools are undergoing profound changes as a result of the computer technology surge that prompted a call for change in the educational system (Jonassen, 1996; Wales, 1995).

As such, educational systems worldwide are moving rapidly toward a future when computers will be the major delivery system in education for almost all subject matters in all grade levels (Cope & Ward, 2002). Indeed, no other technological devices have borne such implications for the instructional process more than the computer. The changes brought about and those about to occur in education as a result of computers will affect all of us in one way or another. It seems that a future with computers as the dominant delivery mode of instruction is inevitable. Heralding the major role of computers in education, the famous computer educator pioneer, Alfred Bork (1985), puts it succinctly as follows in his extravagant conclusions about the role of computers in education:

It appears likely that computer will soon be more important in our educational process than books, and, indeed may entirely replace the book medium for many purposes.(P.5)

* Faculty of Education,Yarmouk University, Irbid, Jordan.

Along the same lines, the famous scholar educator, Herbert Simon (1982), states that:

Nobody really needs convincing these days that the computer is an innovation of more than ordinary magnitude, a one-in-several-centuries innovation and not a one-in-a century innovation or one of these instant revolutions that are announced every day in the papers or on television. (P. 37)

Such a state of affairs spurred bodies responsible for educating the youngsters to reconsider the curriculum of elementary and secondary schooling for the purpose of preparing students for the "computerized society." Similar to educational systems worldwide, the Ministry of Education (MoE) in Jordan has recently culminated its schools' computerization projects with a curriculum reform movement steered by major initiatives of investment in information technology for the purposes of increasing learning opportunities, assisting students to learn efficiently and effectively, and coming to terms with the knowledge economy reality characterizing information production-based societies (Ajlouni , 2005).

Computers in sizeable numbers are introduced to Jordanian schools, even in a time of monumental financial problems. More and more schools are getting wired. Millions of US dollars are invested each year in order to equip schools with computer related technologies, and to provide for training sessions of all school personnel including teachers, principals, and student councilors to utilize computers in their daily instructional and administrative activities respectively (MoE, 2003).

Intensified efforts to secure a safe ride in the computer technology bandwagon are made by the MoE after realizing that old standards of quality and competence described by Peters (1995) are no longer adequate. As today's talk is mainly about global economy, the educated population of any nation is increasingly becoming the most important infrastructure of such economy. As such, in its transformation towards knowledge economy, the MoE places an unprecedented emphasis on maximizing the intellectual skills of young generations to create that infrastructure of knowledge workers. In the last five years or so, the government of Jordan had become preoccupied with major reforms in the educational system. Such reforms centered around structuring the educational system to maintain lifelong learning, accessing and using computer related technologies to achieve effective instruction, maintaining that the educational system provides instructional activities responsive to the economy, and creating quality instructional experiences and environments.

Also, in this context, the Educational Reform for Knowledge Economy (ERfKE) project which started in 2003 focused mainly on reorienting education policy objectives and strategies as well as transforming educational programs and practices to ensure relevance of educational experiences provided to the knowledge economy (MoE, 2004).

Increasingly, the MoE in-service teachers are taking part in training programs for the purpose of arming themselves with computer skills deemed necessary to carry out their daily administrative and instructional activities. Examples of such training programs include the International Computer Driving License (ICDL), the Intel as an instructional program for the future, the "World links", and the Eduwave project in Education. According to the MoE's 2005 yearbook, it was reported that 21000 teachers had obtained the ICDL; 15200 teachers had been trained on computer courses Intel 1 and 30 teachers had been trained on Intel 2; 1000 teachers were being trained on "Worldlinks", and 120 teachers were given a 40-hour training on "Eduwave Module." Empowering Jordan's individual citizens to employ information technologies successfully in their daily life activities is the landmark of the "knowledge economy society." Consequently, the government of Jordan is striving to reach such society through major investment in its educational system expected to play a significant multidimensional role in preparing youngsters for that society (MoE, 2005).

Rationale and purpose of the study

In Jordan as well as elsewhere, information technologies are invading schools at a fairly phenomenal speed. Computer technologies are being provided to schools; plans are set to employ these technologies in teaching-learning activities and to train teachers to utilize computer technologies productively. This is done so with the hope that computer technologies will solve all long outstanding educational problems and, in turn, lead to a better educational system.

Computerization in Jordanian schools had a fairly long history indeed. Since 1984 when the MoE launched its first experience with computers in schools (Hawkridge, Jaworski & McMahon, 1990), too much talk had been said about the state of information technology integration in Jordan's educational system. The present researchers believe that a discrepancy exists between what is said about computers in Jordanian schools and what is actually done with them. Repeated remarks made by a number of school teachers throughout informal encounters indicated that computers were in some cases kept in locked storage rooms. In other instances, some teachers maintained that a number of computers available in schools are never enough to the increasingly large numbers of students, and that their exploitation for actual instructional activities in computer labs was still minimal. And in many cases of direct involvement with computers, students spent most of their time playing games.

School teachers worldwide have very often been viewed as the main backbone of the educational structure and are expected to lead the educational change. Educational systems are indeed undergoing a

transformation process due to the integration of information technologies in schools. Teachers' viewpoints, perceptions, and experiences in this regard are usually underestimated or less recognized. This lack of recognition of teachers' perceptions or understandings with regards to schools computerization process is usually based upon the assumption that teachers have no major say in this concern, and are expected to handle the instructional applications of information technologies successfully. However, when incorporating information technologies in schools, teachers' appropriate perceptions of them should be considered. It is the belief of the current researchers that technology can be utilized successfully in the classroom if views, experiences and perceptions of school teachers are considered.

The desirability of learning with computer related technologies should not be taken for granted. Successful utilization of information technology in schools demands that individual teachers identify relevant and/or proper information technology applications to match the curriculum from a pedagogical perspective rather than from a technological perspective. Teachers' clear understandings of the functions computers may perform in classrooms can inform their practice and place computerization projects in the right direction.

Indeed, it is clearly evident that large expenditures and great efforts are being made by the MoE in Jordan to transform investments in information technology into a successfully productive experience in education. A great deal of the MoE theoretical reports portrays such experience as a rewarding one. Theoretical reports as reviewed by the present researchers are by no means a conclusive proof of successfully fruitful investment of school computerization projects. As university professors of "educational technology" and "vocational education" teaching introductory computers in education courses for the last five years or so, the current researchers had frustrating experiences with large numbers of first year university students enrolled in such courses. Through repeated observations of those students in computer labs, the researchers noted that in many cases students lacked the basic computer literacy skills and competencies. Hence, information technology implementation in Jordanian schools may not be as portrayed.

For certain, incomplete or unrewarding investment in school computerization projects does not come from in and out of itself. There may be some inhibiting factors accompanying the process of school computerization that hinder or limit the effective information technology integration in Jordanian schools. To put things in perspective, the researchers feel that Jordanian schools have not risen fully to the information technology in education challenge. Great efforts are still needed to manage issues influencing in one way or another the information technology integration in Jordanian schools. Believing that schools' reform should start from within, the present researchers herald that exploring the perceptions of in-service teachers about information technology applications in schools helps pinpoint such issues associated with barriers to effective information technology integration in Jordanian schools.

Significance of the Study

This explorative study is carried out particularly because of the almost absence of available in-depth scholarly investigations that dig into the underneath facts of the actual reality of information technology applications in Jordanian schools. The sound value of this exploration stems from its attempt to find out whether the technoromantic tendency manifested by the MoE efforts towards investments in information technology for instructional purposes is justified. Furthermore, the value of this study relies on the fact that, based on analysis of the data obtained from the interviewed teachers, the researchers hope to derive the major inhibiting factors encountering the computerization process in Jordanian schools, and, consequently, to offer some recommendations that may be helpful in directing information technology school integration projects. This explorative inquiry is, therefore, needed to shed light on actual in contrast to presumed outcomes of information technology uses in Jordanian schools.

Research Objective

This study aims to explore barriers to effective information technology integration in Jordanian schools as perceived by in-service exemplary information technology skilled teachers. In so doing, this study intends to address the following research question:

What are the most problematic issues or concerns viewed by teachers as inhibiting factors of fruitful information technology integration in Jordanian schools?

Review of the Related Literature

In view of the paucity of locally-based in-depth explorations of what school teachers really believe and/or perceive of the actual reality of information technology applications in Jordanian school settings, the researchers have tried to describe some investigations of relatively similar issues. What follows is a summary of the related literature.

Qualitative research findings stressed the need to motivate teachers in general and ones with negative attitudes towards school computerization to effectively use computer related technologies in their instructional practices (Fullan, 1993; Simsek, 2005). Findings of such studies also stressed that bodies responsible for educational staff development be aware of teachers' continuous training needs, and provide for them any technical support needed (Ellsworth, 1994; Mulqueen, 2001; Ruthven et al., 2005). Teachers' viewpoints highlighted in those studies revealed that a major challenge facing teachers was not only access to

information technology resources, but also the provision of relevant and supportive training in schools.

Computer related technologies have great potential to education. They can assist teachers to adapt to their new instructional roles as organizers and facilitators of instruction (Al-Far, 2002; Altawalbeh, 2003; Fulton, 1997). As teachers are increasingly realizing the potential of electronic learning innovations (Jamison, 2001), schools are continually required to be concerned with information technology professional development for teachers including up-to-date and continuous training sessions in schools. A positive change in the faculty members' perceptions was noted due to taking part in the activities of the professional development project which aimed at preparing the teaching staff for a technologically oriented future (Hunbain, 2003). In order that teachers be prepared to meet the challenges of the new millennium, in-service teachers must be provided with effective professional development (Garet et al., 2001).

It seems that the issue of eagerness and ability of school teachers to integrate information technologies into their teaching practices is heavily dependent on the professional development activities they participate in. As Schofield (1995) and Sherwood (1993) reported, it was clear that one of the everlasting barriers to the productive integration of information technologies in teaching was perceived to be the professional development in-service teachers receive.

Reiterating the relevance of teachers' professional development to the question of effective information technology integration into teaching and learning, it seems crystal clear that a well-defined program for teachers' professional development is critical to information technology success in actual classroom practices (McDougall & Squires, 1997) and (Mumtaz, 2000).

Another important issue of direct relevance to information technology incorporation in classroom situations is that of time availability. Significance of such an issue was repeatedly emphasized in the body of literature concerned with school computerization processes. In his study of teachers' complaints of little time to use the internet, Trotter (2001) asserted that most teachers were convinced that information technologies were major contributors to the betterment of overall instructional quality; however, teachers expressed shortage of time to make the most of it.

Significance of information technology in education is dramatic. As far back as the early eighties, Meighan and Reid (1982) pointed that the ever changing developments in educational practices were such that education as they knew it could be destroyed. Information technologies have major implications for the underlying fundamental principles of education itself. School teachers need no convincing evidence that information technologies can make all kinds of information readily available. However, as reported by Baker (1995), teachers demanded that an ample time be made available to them in order to absorb the very frequent changes brought about to schools because of information technology integration.

Schooling institutions are increasingly getting more serious about strategic planning for effective integration of information technology in teaching and learning activities. Initiatives for school computerization are proposed in times when technological advancements occur on an almost daily basis. It seems that the present and the future are sometimes difficult to distinguish. As computer technologies are certainly here to stay, in his analysis of teachers' needs for new competencies to use educational multimedia, Witfelt (2000) maintained that acquisition of computer technology competencies demanded careful planning as well as providing enough time for teachers to absorb frequent changes in technological advancements. In this context, Alvin Toffler's argument is worth noting. In his book entitled Future Shock, Toffler (1970) mentioned that human beings have been recognized as very adaptable to change creatures, but warned that their ability to absorb frequent changes was not indefinite. Changes in information technologies are very frequent. Teachers find it very difficult to keep pace with these changes. Such a state of affairs enforces primal consideration of the teachers' need for enough time to absorb fast changes in information technologies.

As computer related technologies play increasingly important roles in education, issues of teachers' easy access to computers become more and more important. In his exploration of teachers' understandings of the nature and purpose of information technology in primary schools, Loveless (2003) reported that teachers' access to information technology resources greatly affected their teaching expectations and, in turn, enhanced the educational achievement of their students. Loveless also emphasized the direct relationship between primary teachers' perceptions and their school pedagogical practices.

Unequal access to computers is still a critical issue related to computer use in the schooling system. This unequal access to computers is often called the digital divide (Freedman, 2003). Freedman describes this digital divide as "the difference between those who have computers and high-tech gadgets in general and those who do not." Educational ramifications growing out of the unequal access to computers may widen the division between the have and have-nots. Being aware of problems associated with unequal access to computers, teachers can be more sensitive to individual needs of students in this regard, and probably help them get access to computers after school hours (Sharp, 2005).

The provision of basic level of information technology hardware and software coupled with continued information technology teacher training makes an issue that is widely recognized (O'Mahony, 2003). In order to get confident use of information technology in schools, O'Mahony asserts that teachers'

ability must go hand-in-hand with easy access to information technology resources.

Within the same context, Altawalbeh (1997) maintains that, in general, Jordanian teachers held positive attitudes towards the utilization of computers in instruction. However, Altawalbeh asserts that computers in schools are not fully utilized because of teachers' lack of training to use them. Even when computer related training programs are available to teachers, Tarletonk (2001) points to the inefficiency of such programs as teacher training usually takes place after school hours when teachers are almost exhausted.

In a comprehensive survey of teachers' information technology skills and attitudes, conducted by the Australian Department of Education and Children's Services, results showed that the main factors impacting teachers' instructional utilization of information technology were: access to computers, professional development opportunities, teachers' confidence levels and good examples of how best to apply information technology in classroom settings (Travers, 2004).

Method

Participants

Participants of the study included sixty-one basic and secondary male and female school teachers who teach different school subjects. Their experiences in terms of teaching years ranged between five and seventeen. Technically speaking, researchers of this study believed that such participating school teachers could be described as having exemplary information technology skills and as being among the potentially best information technology users. All of these participating teachers were armed with either ICDL or ICDL and Intel accreditations. They were purposefully selected from students enrolled in three sections on the "production and utilization of instructional media" course, and two sections on "educational computing" graduate course offered during the first and second semesters of the academic year 2004/2005. The participants are described in Table 1.

Table 1: The description of the participants

Teachers	Basic Grades	Secondary Grades	Total
Numbers	39	22	61
Experience	5-13 years	6-17	
Female	15	11	26
Male	26	9	35

Data Collection Instrument

In this explorative study, the qualitative research method was employed to find out the most problematic issues or concerns viewed by teachers as barriers to productive information technology integration in Jordanian schools. To examine the research question, the researchers conducted in-depth open-ended face-to-face interviews with the study participants. The researchers believed that employing the interviewing technique was more suitable for explorative studies as it gave the researchers freedom to probe more deeply and to extend the responses of the study participants (Cohen, Mannion and Morrison, 2000).

The interviews were conducted to explore deeply the participating teachers' views and perceptions about the information technology integration in Jordanian schools. The participants were assured of the confidentiality of their responses that would only be used for research purposes. As such, the teachers were asked to express freely and honestly their views, concerns and perceptions with regards to the information technology integration in Jordanian schools. With the participating teachers' permission, the interviews were tape-recorded. The teachers were asked to respond to a set of questions that made the interview schedule (See Appendix 1).

Data Analysis

The tape-recorded interviews were transcribed for analysis. To ensure reliability of the transcripts, the researchers gave them back to the interviewees for feedback. All interviewees ascertained that transcripts were consistent with their views, concerns or understandings. None of the interviewees was dissatisfied with what she/he had said.

To ensure the content validity of the interview questions, the researchers did their best to prepare the questions carefully, state them as clearly as possible, remain neutral throughout the interviewing process, and conduct the interviews in the most convenient circumstances possible. The form and content of the interview questions were also validated by expert opinions. Such procedures were in line with the guidelines provided by Patton (2002) concerning the qualitative data analysis which worked well for Al-Barakat and Al-Karasneh (2005) in their qualitative research.

As applied in other qualitative studies, transcripts were coded in a systemic manner using open-coding procedures (Miles & Huberman, 1994). Responses of the interviewees were examined thoroughly and deeply. A deep analysis of such responses enabled the researchers to identify the general patterns or themes of the participating teachers' views, concerns and perceptions concerning information technology integration in Jordanian schools. Such general patterns of thoughts expressed by interviewed teachers had direct relevance to the purpose of the study. Viewed as such, and after scrutinizing consideration of thematic issues emerged, it was possible to group them into six main categories that were used as bases for the interpretation of issues perceived by teachers as barriers to effective information technology integration in Jordanian schools. Frequencies and percentages of such issues were provided (See Appendix 2).

Findings and Discussion

This explorative study reports on interviews with (61) information technology oriented teachers. The deep analysis of data obtained from such interviews revealed that the participating teachers' views, concerns and perceptions, interpreted as barriers to information technology integration in Jordanian schools, were categorized into six main barriers. Based on a thorough analysis of the perceptions voiced by the respondents, the researchers found out the following barriers :

* Serious shortage of computers and related information technology equipment at schools.
* Lack of efficiency of information technology teacher training programs.
* Students' inadequate information technology basic skills.
* Insufficient time for teachers to prepare for information technology curricular integration.
* Lack of access to computers available in schools.
* Paucity of locally produced good quality instructional software.

Elaboration on each of the listed categories is presented below:

1. Serious shortage of computers and related information technology equipment at schools

The vast majority of the participants reported that computers available in schools were never enough to ever-increasing numbers of students. Comments made by many participants in this regard included the following:

Computers available in schools are not sufficient at all; numbers of computers located in schools' computer labs are not proportionate with numbers of students in classes; in many cases not all computers located in computer labs are functioning.

Related to lack of computers in Jordanian schools, many participants reported that:

Schools have poorly based information technology infrastructure including cabling systems, networking and well-furnished computer labs.

The responses given above show that, generally speaking, Jordanian schools suffer serious shortage of computers and related information technology equipment. Fifty-seven out of 61 respondents (93%) ascertained such findings. The ever-increasing numbers of students in schools demand more computers and related information technology equipment. Of course, the present researchers as well as the study participating teachers realize that some private or public schools like the "Discovery Schools" have the latest versions of high-tech information and communications technologies. They are also fully aware of the limited financial resources of the MoE to provide for the building of rich information technology infrastructure and the purchasing of computers for all Jordanian schools to make them similar to the example of the " Discovery Schools" (Yousef , 2006) .

Without going into further details in this regard, the researchers assert that what concerns them is the availability of enough and proper information technology equipment in all of the schools rather than in some of them.

This finding about shortage of computers in the schooling system is echoed by Jawarneh and El-Hersh (2005) who maintained that lack of computers was perceived to be a major barrier to effective integration of information technologies in a teacher education program.

2. Lack of efficiency of information technology teacher training programs

The participants reported that information technology teacher training activities, usually provided in the form of after school workshops, were not productive. Examples of statements showing the respondents' dissatisfaction with the information technology teacher training workshops include the following:

Information technology teacher training workshops are held after a long school day when teachers are almost exhausted; information technology teacher training sessions organized by educational directorates are offered in very short time; most of the information technology teacher training activities are condensed; in many instances information technology teacher training courses are supervised by nonqualified trainers; in many cases the theoretical part of the information technology teacher training programs is more than the practical one; follow up training for continuous teacher professional development is rare.

Undoubtedly, such statements voiced by 49 out of 61 (80%) respondents clearly pointed to either the inefficiency of the information technology teacher training and professional development programs, or at least to the inadequacy of such programs for preparing teachers to effectively integrate information technologies in their instructional practices as emphasized by many researchers (Ellsworth, 1994; Fullan, 1993; Hunbain, 2003; Simsek 2005; Tarletonk, 2001). In those studies, researchers maintained that the question of providing for information technology teachers' continuous training or professional development was viewed to be critical to the successful integration of information technology in actual classroom practices.

Indeed, preparing school teachers for the information age is not simply a process of information technology integration in schools. It is a process of innovation, adaptation and willingness for change (Fullan, 1993). Phenomenal growth in information technologies has placed significant pressure on Jordanian teachers to change their teaching practices and adopt the use of newly emerging technologies (Ajlouni, 2004). In Jordan's educational system, the emergence of "knowledge economy" has multiplied the demands from schools to incorporate information

technology within a broader framework of educational reforms.

The effectiveness of information technologies orchestrated by the computer is not guaranteed by their mere presence in schools. Higgins, Moseley and Tse (2001) maintained that teachers who viewed computer use as an integral constituent of an instructional plan tend to use computers more likely. As such, in order that Jordanian teachers integrate information technologies in their instructional practices effectively, they need to view computers less as "add-on" and more as an integral component of their teaching plans. Continuous experimentation and hard work are needed by school personnel, particularly teachers, to achieve the utmost effectiveness of computer applications in the classroom (Harlow, 1984; Galanouli, Murphy and Gardner, 2004). In their investigation of teachers' perceptions of the effectiveness of information technology, Galanouli et al., (2004) asserted that assessment of both information technology pedagogical effectiveness and efficiency of its training programs from the perspective of the in-service teachers proved to be a valuable approach to foster teachers' positive attitudes towards school computerization.

3. Students' inadequate information technology basic skills

Although this barrier is treated separately, it is highly relevant to the preceding one about the lack of efficiency of information technology teacher training programs. Not just teachers are the only ones in schools who are less technically trained to use information technologies in instruction, but students as well as those who most of the time get no information technology training at all. Overall, the maximum information technology training students can get is during two weekly computer classes in very crowded computer labs. Coupled with lack of home or out of school computer use, students' inadequate information technology basic skills in schools represents a really serious barrier to the effective information technology integration in Jordanian schools.

A large number of the study respondents, 47 out of 61 (77%), reported that, overall, the Jordanian school students were still not information technology oriented. Repeated messages expressed by many interviewees showed that:

Thousands of Jordanian school students still lack the basic computer literacy skills; many school students still can not handle the keyboarding skills easily; using the keyboard to do word processing represents a frustrating experience for them; many school students spend most of their computer home time playing action games.

More examples of responses perceived as inhibiting factors leading to students' inadequacy of information technology skills include the following:

Due to computer maintenance problems, computer classes are taught in regular classrooms rather than computer labs; for different reasons- technical, administrative, or else, computer classes are sometimes taught theoretically rather than practically; the need for basic or introductory courses to train students on how to use computers continues to stand as a main priority.

Such statements coincide with the findings presented by Jawarneh and El-Hersh (2005) who maintained that even university students needed training in basic computer technical skills including word processing. The level of support provided to teachers and, consequently, students to use information technology in education effectively will directly affect the quality of its educational impact. Educational institutions that only invest in hardware and software but not in training teachers and students make a serious mistake. Jankowski (1996) maintained that similar to teachers, students like computer technologies and want to use them but need help to do so. Naturally, help in the form of one shot training session after school day is hardly the answer to students' inadequate information technology basic skills and competencies. Rather, the identified needs of the students regarding information technology use must be addressed, and training to help students obtain necessary information technology using skills must be personalized, school-based, and flexibly scheduled.

4. Insufficient time for teachers to prepare for information technology curricular integration

Developments in information technologies are characterized as frequent and ever-changing. Such a state of affairs demands careful planning by all those who are concerned with the information technology integration in education. Teachers have always been looked upon as the vanguard of the educational change. Viewed as such, many researchers have maintained that the process of information technology integration in education necessitates that teachers be provided with enough time to absorb frequent changes in technological advancements (Baker, 1995; Witfelt, 2000).

The data analysis of the participants' responses showed that 45 out of 61 (74%) were convinced that the Jordanian school teachers did not have sufficient time to prepare for information technology integration in instruction. A repeated comment made by many respondents was as follows:

Teachers spend most of their scarce out of class time performing routine school tasks; grading papers, staff meetings, watching students during recess time, supervising students' extra curricular activities ... etc.

Similarly, another comment made it clear that Jordanian school teachers had no time to prepare for full integration of information technology in actual instructional activities. Many of the respondents expressed this point succinctly:

Overall, the Jordanian school teachers suffer from the existing heavy workload imposed on them; they simply do not have time to think of something else.

Elaborating on the preceding notions, one of the respondents stated that:

I think that computerization has taken place in schools very quickly. Surely, what comes quickly can not be comprehended easily; teachers in schools want to learn and make use of technological innovations including computers, but they need time to prepare for productive implementation of such ever-changing technological innovations in instruction.

These statements were in harmony with the findings of Trotter (2001) who asserted, in his study of teachers' complaints of little time to use the Internet, that teachers reported shortage of time to be prepared for full utilization of information technology in instruction.

5. Lack of access to computers available in schools

The question of access to information technologies by individuals concerned with the educational process is greatly associated with their integration in schools. This is emphasized by Loveless (2003) and Travers (2004) who reported that teachers' access to information technologies was viewed as one of the main factors impacting teachers' educational expectations. Such researchers also pointed out that unequal access to computers due to home and out of school computer use by teachers and students greatly impacted schools' information technology integration.

In this explorative study, 39 out of 61 respondents (64%) viewed lack of access to computers by teachers and students alike as a significant barrier to their effective integration in Jordanian schools. Interpretations presented by the respondents during the interviews for this lack of access to computers focused on the unavailability of enough computers in computer labs and lack of home or out of school use of computers. A number of repeated comments that displayed those interpretations included the following:

Not all teachers have home access to computers; not all students have personal computers; computers available in computer labs are not enough; crowded numbers of students in computer lessons; not all available computers in computer labs are always working.

Strikingly, bizarre notions were hinted to by a number of interviewees. In simple terms, some respondents stated that:

Computers in schools are sometimes not used; they are kept in locked rooms and access to them by students and teachers is not that easy; in some cases requests made by school staff other than the computer teacher are denied by the school principals.

The respondents attributed those unhelpful procedures in the process of school computerization to the school principals' worry that computers may get damaged. As school principals are the ones who usually sign the equipment delivery documents, they want to keep computers and related equipment intact.

This strange attitudinal barrier displayed by some school principals does not contribute at all to the effective information technology school integration. It is not in harmony with the calls made repeatedly to provide school staff with all forms of support including easy access to computers (Freedman, 2003; O'Mahony, 2003). Of particular interest in this regard is the notion of O'Mahony who put forward the following equation to get the information technology formula right:

access + ability = confident use

Simply speaking, O'Mahony (2003) asserts that information technology ability of school staff must go hand-in-hand with their easy access to information technology resources, consequently, leading to confident use of such resources.

6. Paucity of locally produced good quality computer-based instructional software

The lack of sufficient teacher preparation for using computers goes hand-in-hand with the lack of good quality computer-based instructional software as two major problems in today's schools (Mumtaz, 2000). Lack of sophistication in software manufacturing led to serious errors in programs. Alfred Bork, the famous computer educator, reported that in spite of assurances from computer vendors, very little good quality computer-based instructional software was available in US schools, and much of it was poor (Bork, 1985). Surprisingly, after twenty years, Sharp (2005) reported similar notions. She maintained that similar to hardware manufacturers, software developers sometimes rush out their new products while they are still unfinished, untested, and with flaws to keep up with marketplace commercial competition. She summarized the most commonly recognized reasons for poor quality computer-based software as greedy manufacturers, technical incompetence, lack of incorporating instructional design principles, and lack of teachers' and educators' involvement in the process of software development.

Interestingly, upon a thoughtful analysis of repeated comments voiced by interviewees concerning paucity of locally produced good quality computer-based instructional software in Jordanian schools, the current researchers noted that arguments made by both Bork and Sharp were echoed by many respondents. Examples of such comments were as follows:

Locally produced instructional software for all school subjects are not available; available instructional software is of poor quality, Overall, the Jordanian school teachers still lack competencies needed to produce good instructional software; only recently that school teachers are becoming members of instructional software design teams.

Naturally, the notions presented above by Bork and Sharp about the lack of good quality computer-based instructional software in the US schools were not meant to be convincing evidence to the same problem existing in Jordanian schools. The US and Jordan have different educational systems. Each system has its own particular problems. Reasons for problems encountered by each system are different; however, similar problems may be encountered by different educational systems.

Although some respondents viewed the scarcity of locally produced good quality computer-based instructional software as number one barrier in Jordanian schools, overall frequent responses repeated in the interviews concerning this issue indicated that 38 out of 61 respondents (62%) perceived it as a major barrier to the effective information technology integration in Jordanian schools. The fact that reporting it in this study as last among the most frequent perceived barriers to the effective information technology integration in Jordanian schools does not necessarily mean placing it as least important.

The cardinal role of the computer should focus on organizing and representing knowledge to provide the learner with easy access and control, rather than trying to create a model of the learner and seeking to guide his course of action through it in a mechanically fixed set of procedures. The type of software needed to achieve such a cardinal role of the computer is hypertext where the learner, through this high-level software, interacts with knowledge in an explorative rather than prescriptive approach. This inherently multi-user software enables the learners to explore a variety of suggested tracks through the instructional material, or to create new pathways for themselves and others to follow by forging new hyperlinks (Sharp, 2005).

This high-level software is still hard to locate in schools. As such, the current researchers strongly believe that until such a multi-media capability of hypertext is widely utilized, the software concern will stand for long time to come as an inhibiting factor of effective information technology integration in Jordanian schools.

Software for actual pedagogical purposes was viewed by the respondents of the present study to be lagging behind software for word processing, typing, computer literacy, power point presentations, gaming and spreadsheets. It is the belief of the current researchers that the knowledge and advancements in information technology hardware are futile if teachers do not play the role of innovators of locally produced computer-based instructional software. Based on the finding of the study in this regard, good quality locally produced instructional software is not available. Such notion was echoed by Ajlouni (2004). Software for instructional purposes seems to be controlled by commercial sources outside the educational sector. Therefore, most Jordanian teachers will rely on prepackaged ready-made software purchased from manufacturing firms whose main interest may be financial profit, and not necessarily educational merit.

Conclusions and Recommendations

It is obvious that a tremendous growth has been made in the field of computer related technologies in Jordanian schools. Computer technology is increasingly becoming an important constituent of today's Jordanian educational institutions. The number of computers purchased by the MoE may be second to those in the business sector. The current researchers recognize that the MoE and all parties concerned with the nurture and education of our youngsters are doing their best to equip schools with information technologies to meet the needs of students in the information age. However, a close look at the current state of information technologies in Jordanian schools shows that the full potential of their uses is yet to be realized. Within the context of the present study's findings which displayed a host of major barriers to effective information technology integration in Jordanian schools, the actual fulfillment of the "knowledge economy" project will not happen as long as these barriers are not managed.

The too fast approach towards the integration of information technologies in education may yield too little gain. As computers are with us to stay, the current researchers believe that their effective integration in Jordanian schools entails a slowly but surely approach rather than the other way around.

The appeal of the computer can be traced in part to its inherent pedagogical strengths. In general, participating teachers in this study expressed confidence handling information technologies, but exhibited lack of ability to use information technologies for actual pedagogical purposes. Moreover, many teachers displayed in their responses lack of insight into the possibilities for effective information technology integration in education. Overall, the available evidence obtained from the data analyzed provides support for our speculation that the use of information technologies for actual pedagogical applications in Jordan's schools is limited. As such, the researchers believe that the talk about the influence of information technologies on Jordan's educational system may be based on theoretical presumptions, and that a long way to go is still a head before reaping the actual benefits of effective information technology integration in Jordanian schools.

Based on the findings of the study, the following key recommendations could be made:

- As the future is more important than the present and as the computer is going to be a major delivery mode of instruction, careful planning for managing barriers to effective information technology integration in the Jordanian schools is critical for the sake of moving their applications forward into a more sophisticated stage. As such, the Jordanian MoE computerization efforts should focus on maximizing provision of schools with enough and appropriate information technology infrastructure, continued professional development and training of teachers and other school personnel to utilize computers related technologies in instruction, and cooperation with private sector technology corporations to produce instructional software that fits computerized school subjects and helps to accomplish their instructional objectives.
- The MoE should build regular evaluation points to assess the productivity of the information

technology projects in authentic educational applications.

- The MoE should appoint full-time technical support staff in schools to help teachers and students in the employment of information technology in their teaching-learning practices.
- The MoE should lessen the weekly teaching load of teachers to provide them with extra time needed for careful planning and preparation of information technology based instruction.
- A wider research project should be carried out across the country to provide a more comprehensive picture of the information technology integration efforts in all of the Jordanian schools. Any coherent national plan for the future of information technology integration in Jordanian schools should capitalize on such research.

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Appendix 1

Interview Schedule

1. What do you think of the integration of the information and communications technology in Jordanian schools?
2. What do you think are the most common information technology applications in Jordanian schools?
3. Who gets the greater benefits of the information technologies used in Jordanian schools?
4. To what extent are the information technologies used in actual teaching – learning situations in Jordanian schools?
5. Do you think that today's Jordanian schools can survive without information technologies?
6. With the integration of the computer in teaching your subject specialty, did you have to make any changes to curriculum planning and implementation? If yes, was it easy to make such changes?
7. In your opinion, what does the process of information technology integration in instruction demand?
8. Do you think teachers and students can use computers available in Jordanian schools whenever they want?
9. Do you think school leaders collaborate with and/or encourage all teachers and students to use computers available in Jordanian schools? If no, why?
10. What do you think of the effectiveness of teachers' professional development programs in Jordanian schools?
11. In your view, to what extent are Jordanian schools supplied with information technology hardware and information technology related software?
12. What do you think of teachers' ability to design, develop and locally produce computer-based instructional software?

13. Do you think that Jordanian teachers can teach with information technologies effectively? If no, why?
14. Do you think that students in Jordanian schools can learn with or from information technologies effectively? If no, why?
15. What else can you say about the information technology integration in Jordanian schools?

Appendix 2

Barriers to effective information technology integration in Jordanian schools as perceived by in-service teachers*

Barriers	Frequency	Percentage
1. Shortage of computers and related information technology equipment at schools	57	93%
2. Lack of efficiency of information technology teacher training programs	49	80%
3. Students' inadequate information technology basic skills	47	77%
4. Insufficiency of time for teachers to prepare for information technology curricular integration	45	74%
5. Lack of access to computers available in schools	39	64%
6. Paucity of locally produced good quality instructional software	38	62%

* Total number of in-service teachers interviewed is 61.