Barriers to Utilizing ICT for Educational Purposes in Jordan

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Abstract:

This study explores the barriers to utilizing information and communication technologies for teaching and learning in Jordan as seen by the different involve d stakeholders: students, teachers, and administrators. The paper investigates these barriers through an interpretative case study which is the Jordanian Education Initiative (JEI) and uses the technology-to-performance chain model (TPC) as a conceptual research framework. Fifteen barriers were identified based on this qualitative research; twelve of them can be directly attributed to utilization factors proposed by the TPC model which were also viewed as barrier factors (expected consequences and affect toward use, habit, social norms, and facilitating condition); significant number of identified barriers can be related to "facilitating conditions" which puts more responsibility on the ministry of education to offer more resources and opportunities to facilitate the process of integrating technology into education in Jordan . Despite the notion that these barriers will be always present, the paper calls for more institutional support for the JEI and more technical training for the teachers.

Key Words: ICT in education, Barriers, Utilization, Technology-to-Performance Chain Model, Jordan Education Initiative

1. Introduction

Implementing ICTs is becoming a mainstream in education and is believed to empower both teachers and students by making the educational process more interactive. According to Pelgrum (2001) “It seems that the current belief is that ICT is not only the backbone of the Information Society, but also an important catalyst and tool for inducing educational reforms that change our students into productive knowledge workers”. Despite this belief, there have been notable complaints that the growth of ICTs has not been accompanied by an equal growth in technology integration in classrooms (Belland, 2009).

The tendency toward using ICT in education has entailed more pressure on Jordan to increase its effort to achieve this mission. Although these efforts have started a bit late but they resulted in the launching of the Jordan Education Initiative (JEI), This initiative started in 2003 as a public/private partnership involving the government of Jordan, NGOs, as well as local and international companies (like Cisco System) under the auspices of the World Economic Forum‘s Global Education (GEI). According a UNESCO report (2009) “The programme trained over 3,000 teachers in ICT skills using six e-curricula as tools to enrich the national curriculum…The programme disseminates best practices among teachers and encourages the creation of communities of practice.” According to the CEO of the JEI, Mr. Haif Bannayen who was interviewed as part of this study, “The idea was to leverage public- private partnerships to accelerate educational reforms in Jordan by creating an educational model that can be installed and introduced to public schools; that model is replicable in the sense that it can be rolled it out in Jordan and can be also beneficial on the regional level” Mr. Bannayan adds that “based on certain standards, we adopted 100 public schools (50% boys, 50% girls), they are representative sample of the educational system and introduced to all of them an educational model that is combinations of hardware, software, and a lot of professional development and change management emphasis.” Furthermore, Mr. Bannayan stresses the importance of looking at the JEI as electronic government initiative that is subjected to same similar barriers that face the implementation of any e-government project “e-government is all about making the life of citizens, businesses, and community easier and it is about gaining access to services , and if you look at students gaining access to technology and doing assignments online and communicating with the teachers , then yes we can look at this initiative as an e-government initiative”.

Research Question & Objectives: Understanding the advantages of using ICT for teaching and learning and taking the JEI as a case study, the author is motivated to explore the barriers that impede the realization of those ICT advantages which can be critical for students learning in Jordan. The main research question in this paper is: **What are the barriers to utilizing ICT for educational purposes in Jordan?** The author is planning to answer this question by exploring the barriers as perceived by the different stakeholders involved in the educational process in Jordan: students, teachers, and administrators. The reason behind taking this stakeholder approach is that the aforementioned stakeholders have different roles regarding the use of ICT in education and as a result, they face different problems and barriers. And thus, the stakeholder approach will allow us to get a more detailed rich picture of the barriers. However, the goal of

this paper is neither to carry out an analysis divided on all stakeholders nor to compare the perceived barriers according to each group of stakeholders. The goal of this paper is to identify every single barrier to the uptake of ICT in education whether it is faced by students, teachers, or administrators. To gain better understanding of the research question, I think it would be essential to define the following central concepts:

The word "**barrier**" can be defined as "any condition that makes it difficult to make progress or to achieve an objective" (WordNet Website). Seffrin et al (2008) define barrier as "… an event or Condition that hinders the adoption decision". This paper aims to identify the conditions that hinder achieving the objective of integrating technology in education or hinder the individuals' adoption of ICT-based education.

Utilization (based on Goodhue and Thomson, 1995) "is the behavior of employing technology in completing tasks". In the case of using technology to perform specific defined task like the technology integration in education; "utilization should be conceptualized as the binary condition of use or no-use". Thus, the antecedents of utilization like social norms and facilitating conditions, etc. would influence the individuals' decision to use or not use the technology. Since the utilization factors could lead the individual to not use the technology in performing a task; we would argue these utilization factors could be also viewed as barrier factors.

ICT in education or "educational technology" is simply centered on the application of technology in teaching or education but it could be also much more than that (Cavanaugh, 2002). Ely (1995) defines educational technology as" the systematic design and use of hardware and software to achieve specific objectives

In order to operationalize the research questions, the following dimensions or objectives will be addressed based on the antecedents of utilization proposed Goodhue and Thomson (1995):

- Which barriers can be associated or referred to the "expected consequences of use" and "affect toward use"?
- Which barriers can be associated or referred to the "Habit" as barrier factor?
- Which barriers can be associated or referred to the "social norms"?
- Which barriers can be associated or referred to the "Facilitating conditions"?

These antecedents of utilization will be further explained and defined when we introduce the conceptual framework of this paper.

The paper starts with proposing a conceptual framework; the methodology is then introduced and followed by presenting the results; the paper ends with discussing the results and providing conclusions and possible implications of the Study. Due to space and time constraints, it has been decided to focus the study only on the secondary education.

Abbreviations: ICT, Information and communication technologies; JEI, Jordan Education Initiative; TPC, Technology-to-Performance Chain model; The Ministry, the ministry of education in Jordan.

2. Literature Review

2.1 Related Research & Significance of Study

A considerable amount of research efforts focused on the barriers to the uptake of technology in classrooms already exists. These efforts resulted in number of review studies including (Bosley & Moon, 2003; Fabry &Higgs, 1997; Mumtaz, 2000). However, research into the ICT barriers in the Arabic countries seems limited and scarce; the author has faced difficulty finding many articles addressing barriers to ICT utilization in the Arabic countries. The purpose of this study is to extend the existing research by exploring the barriers to utilizing ICT for educational purposes in Jordan.

The identified articles related to Arabic countries (see **Appendix A**) indicate that the ICT barriers are evident and obvious and that there are some common barriers that exist: Lack of ICT skills, lack of infrastructure, lack of time , lack of institutional support, lack of available technical staff, lack of training , and difficulty of ICT integration into technology. It can be noted from these articles that researchers have addressed ICT barriers in different educational levels. For example, Al-Senaidi et al (2008) found out that the lack of institutional support and the lack of time are the major hurdles to ICT utilization in Omani higher education, Ihmeideh (2003) found out that the lack of instructional software, funds, ICT skills, and time are major barriers to ICT utilization in Jordanian pre-school settings. One more notable thing about these Arabic studies that they mostly employ quantitative methods and that they focus on the barriers as perceived by teachers. Only two works focus on administrators (Ihmeideh, 2003; Suiliman et al, 2008) and none of these articles were found to focus on the barriers as perceived by students. This qualitative study contributes to the existing Arabic literature by exploring the ICT barriers as perceived by all involved stakeholders: Administrators, teachers, and students.

This paper is related to earlier research in the sense it utilizes an ICT adoption model to address the subject which is widely used in the previous literature (Al-Senaiadi et al (2008). Furthermore, the paper will make use of previous literature by constructing some parts of the questionnaire and observation guides based on earlier research. The paper contributes to the earlier Arabic research as it could be the first paper to address the barriers to the uptake of ICT after the implementation of the JEI; most of the found Arabic articles focus on the barriers before the implementation of ICT-based education. The paper could be also the first study to use the TPC model as conceptual framework for addressing the subject under investigation.

2.2Conceptual Framework

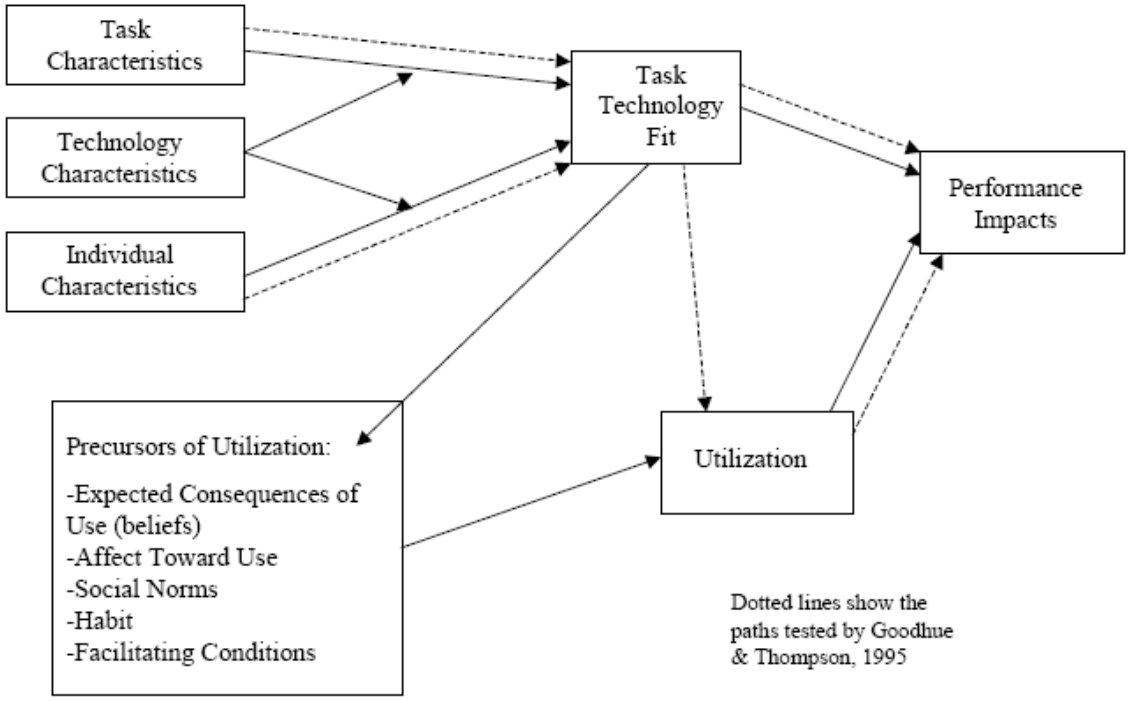
In order to structure our understanding toward the actual barriers for ICT use in education, the technology-to-performance chain (TPC) model by Goodhue and Thomson (1995) has been used as the main and central framework in the research process. The following section will provide description for the use of the TPC model

The TPC Model

The TPC model is a technology acceptance model that provides understanding of technology

utilization and its impact on performance. The model suggests there are certain factors that determine the utilization of a system; these factors can increase utilization which will ultimately increase the performance impact of the system.

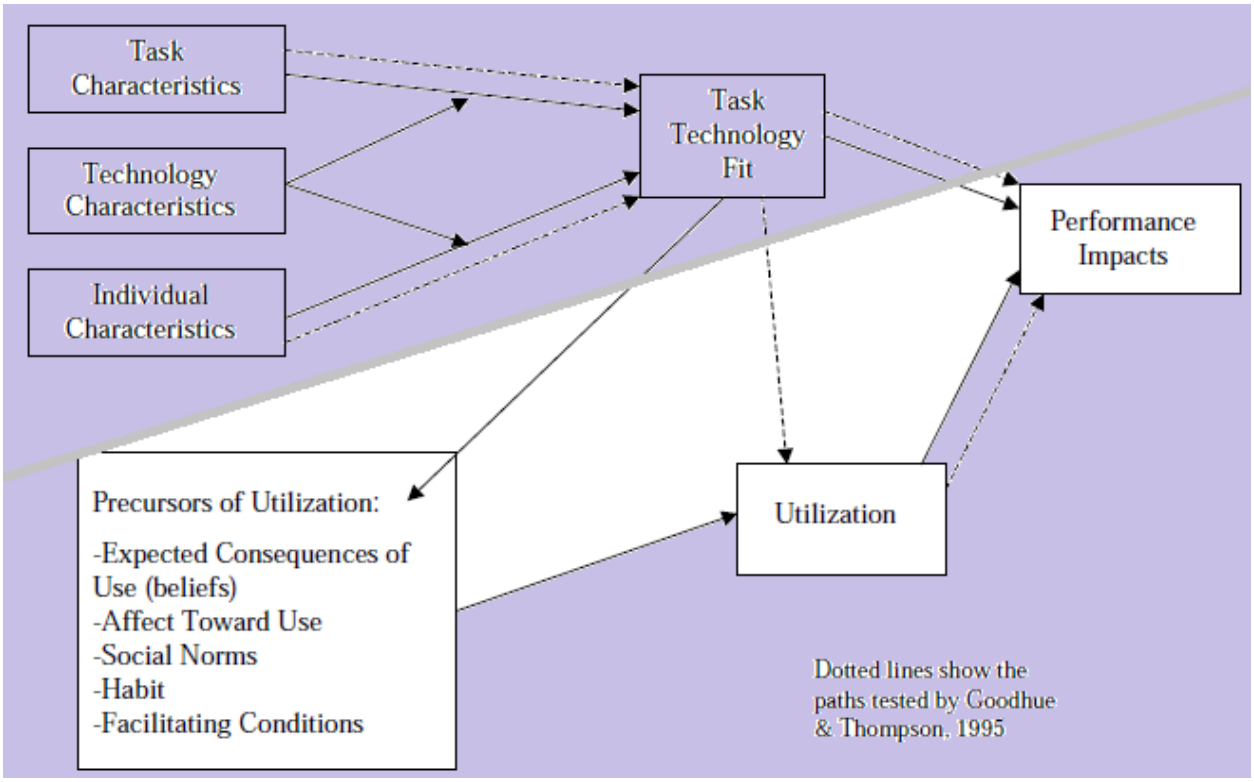
Figure 1: Goodhue and Thompson's (1995) Technology-to-Performance Chain (TPC) Model



Source: Staples, et al. (2004)

Compared to other technology acceptance models, the author finds the TPC model a suitable framework for meeting the research question. As proved by Staple, et al (2004), the TPC model has a predictive power and is useful tool for understanding the utilization of a system and its impact on task performance. As opposed to the same authors' previous TTF model (Task-Technology Fit), the TPC is more comprehensive and effective in the sense that it combines both utilization and task-technology fit. Irick (2008) supports the TPC by indicating that relying strictly on TTF doesn't give adequate attentions to the fact that systems must be utilized before they can have an impact on performance. Since the main research question is concerned with barriers to ICT utilization, the TPC model is simplified to focus more on the utilization part and its determinants- see figure 2- **the white area represents the scope of analysis.**

Figure 2: TPC simplified by focusing more on the utilization part



The following will provide description of the reduced TPC model and its usage in the research process:

The five precursors of utilization of interest in this paper are: expected consequences of use, affect (attitude) toward use, social norms, habit, and facilitating conditions. The TPC model suggests that these factors are positively associated with utilization. It should be noted that "utilization" has been defined earlier in the paper.

The expected consequences of use refer to the beliefs of whether using the system or technology would be beneficial or not. The TPC model suggests that increased consequences of use should lead to increased utilization of the technology. According to McGill and Hobbs (2006), the term was introduced by Triandis (197) as influence to behavior.

The attitude toward use refers to the amount of affect and feelings for or against some behavior (McGill and Hobbs, 2006). The TPC model suggests that the positive feelings toward the use of ICT in education should lead to increased utilization. In this paper, we will combine the two factors of expected consequences of use and affect toward as one single dimension of analyzing the findings where they refer to the beliefs and feelings about the consequences of using ICT in classrooms.

Habit can be defined as "…the non-deliberate, automatically inculcated response that individuals may bring towards the behavior of IT usage" (Limayem et al, 2001). Basing their

work on the notion of habit by Triandis (1980); Limayem et al (2001) argue that habit can be more influential than intentions in predicting the individuals' utilization of IT "… as a particular behavior becomes more routinized, habit becomes more dominant and intention should no longer have as much effect"

Social norms or "Subjective norms" address the individuals' belief that relevant others want them to perform a given behavior and their motivation to comply with such desires (Fishbein and AJzen, 1980; referred by Davis, 1991). According to the TPC model, we would expect that weak social pressure from the administration would lead to teachers' decreased utilization of ICT in classrooms.

Facilitating conditions (termed by Triandis) reflects the resources and opportunities that facilitate or inhibit the behavioral act from occurring (Limayem et al, 2001).

Performance Impact Refers to the accomplishment of a portfolio of tasks by an individual (Goodhue and Thompson, 1995). The TPC model suggests that increased utilization leads to better performance. However, performance impact will not be the focus of this paper. The focus will be on the barriers to the uptake of technology in relation to the antecedents of utilization.

The TPC model has two roles in this paper. First, the items of the questionnaire and observation guides will be largely based on the five precursors of utilization suggested by the TPC model. Second, the findings of the study will be analyzed measured against these precursors of utilizations. As these precursors of utilization can be treated as barriers factors, we will identify which found barriers can be explained and associated with each of these utilization factors.

3. Methodology

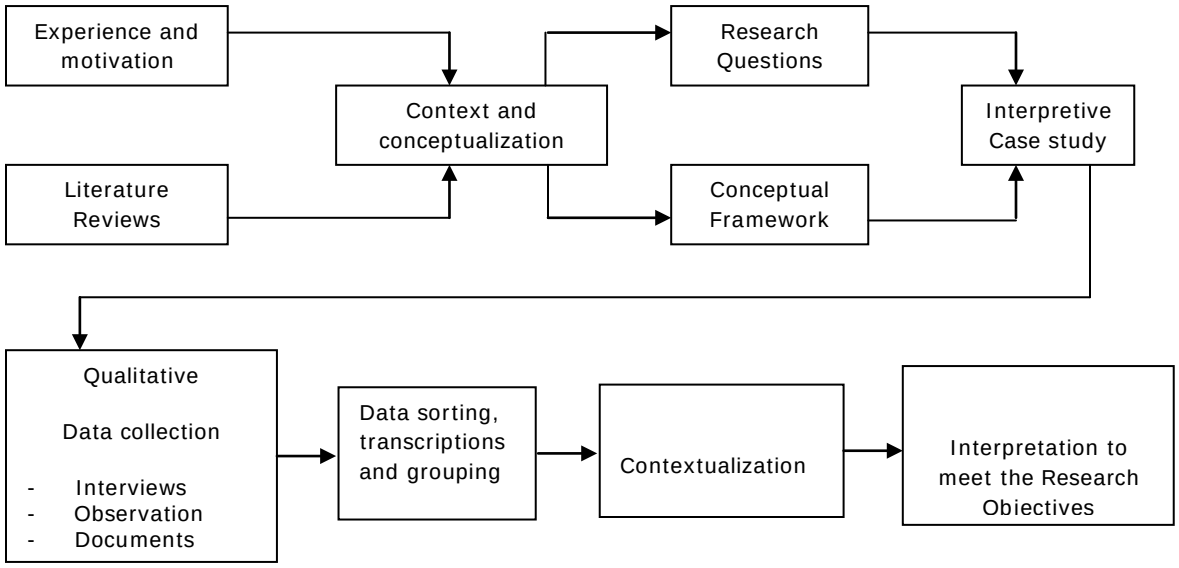
The aim of this research is to understand and find out the challenges that face the implementation of ICTs in public education in Jordan. This understanding will be achieved through direct interaction with major stakeholders who are affected by the process or have interest in the use of ICT in education. This would include, but is not limited to: educational public managers, high school teachers at public schools, high school students attending public schools. Accordingly, qualitative research based on the interpretative stance has been adopted.

The choice of the qualitative research approach is justified because it is compatible with the aim of achieving understanding the barriers to utilizing ICT in education as seen by the educational practitioners. The findings from qualitative research give rich description of a social phenomenon (i.e using ICT in education) as expressed by the words and the meanings constructed by the engaged people (Hull, 1997; Miles & Huberman, 1994). Moreover; the qualitative approach is a preferable method in social sciences and in the case of analyzing complex phenomena because understanding such complexity cannot be achieved by using numbers or statistics.

As the motivation of the study demands getting rich insights of a contemporary single instance (i.e using ICT in Jordan' public schools) of an organization and its complex relationship between

users and the system, choosing the case study method (Oates,2006, pp 141-143) would be a suitable method within the qualitative research approach. The Jordan Education Initiative (JEI) described earlier is the case study of this paper. The guidelines of Walsham (1995, pp76), show that this paper has been prepared by collecting data through an iterative process, analyzing the contexts by expanding or modifying an initial theory (TPC) and reaching interpretations to meet the research objectives (**See figure 3**).

Figure 3: Flow diagram of the Research Process, based on Oates (2006) and Walsham (1995)



Data Collection

The following part has been described in accordance to the requirement cited by Walsham (1995 pp 79) for carrying out an interpretive case study. According to Yin (1989, referred by Walsham, 1995 pp 78), there have been six sources of the evidences of a case study. These are: documents, archival records, interviews, direct and participant observations and physical artifacts. Therefore this paper has used multiple sources, which in particular are:

- Semi-structured interviews. (Main method)-
- Observations: Arranged with the JEI
- Document studies: JEI reports, UNESCO reports… (Secondary data)

In order to conduct the interviews and the class observations, it has been arranged with JEI administration to choose two discovery schools that the initiative supports: Shefa'a Bint Awf Secondary School for Girls and Salah Al-Deen Secondary School for Boys . It can argued that the two schools, though conveniently chosen, were adequately representative to all the discovery schools that are supported by the JEI as they have certain gender differences but have

homogeneity in the sense that they are provided by the same educational model that is implemented in all the discovery schools.

Observations:

One ICT-based classroom has been observed in each school. Prior to this, an observation guide has been used and developed (see the **Appendix B**) based partially on the conceptual research framework (TPC model). Some parts of the observation guide were based on Pelgrum (2001). The use of observation in a qualitative study helps to provide a "rich insights into social settings" (Oates, 2006, pp 214). Under this approach the author was aware about the issue of a "sense of detachment" which demands that "you do not forget your research purpose and do not lose your researchers' independent way of settings things" (Oates, 2006, pp 211).

Interviews:

The interview method gives the researcher rich details about the subject under study and it also allows the exploration of complex issues more deeply (Rubin and Rubin, 2005). Formal interviews (Oates, 2006, pp 188) were carried out during March 2010. Prior to this, a semi-structured questionnaire was used (see the **Appendix C**) where most of the items were associated with the components of the conceptual framework. For maintaining a level of validity, the list of items in the questionnaire related to the TPC were designed based on two published scientific papers by McGill & Hobbs (2007) and Staples (2004). The interview guide also involved questions about common barriers based on Schoepp (2004)

Initially, the CEO of the JEI allowed himself to state that he believed that there was a clear picture about the initiative, its goals, and programs. After that, it has been arranged with the selected school to conduct multiple interviews. Eleven individuals have been interviewed (two principals, five teachers, and four students). Conducting many interviews helps the researcher to correct any mistakes that might happen in one interview (Charmaz, 2002). The interviews have taken two forms: individual interviews with the CEO of the JEI and with the school principals and group interviews with the students first, then with the teachers. The group interactions within the form of semi-structured interviews have provided the author with more insights about the subject. Although the interviewees were conveniently (non-randomly) sampled (Oates, 2006) which is the norm in the qualitative research, the interviewees were adequately representative to the total population. For example, the chosen teachers teach different subjects, have different educational backgrounds, some of them are in their early twenties and some others in their late forties. Despite this heterogeneity, the sample has homogeneity in the sense that all interviewed people are involved in the process of using ICT in education as students, teachers, or educational administrators. Furthermore, the author has chosen one student and one teacher who do not a personal computer but had to participate equally in the learning process. The intention behind this selection of the informants was just to find any peculiarities, if any. The following table provides more information about the observations and the selected sample in order to further validate its appropriateness and heterogeneity.

Table 1: Study Sample & Observations

School	Class observed	Used ICT	Interviewed people	# of interviewed people & Gender
Shefa'a Bint Awf Secondary School for Girls	Grade 9 Science (Biology)	Interactive Keyboard, Sunflower Science software, online curriculum (e-content)	The Principal Three teachers (teaches Math, Biology, Chemistry) Two Students(from grade 9)	Six individuals (All females)
Salah Al-Deen Secondary School For Boys	Grade 11 (Arabic)	Smart interactive keyboard, online curriculum (e-content)	The Principal Two Teachers(Arabic, Geology) Two Students (from grade 11)	Five individuals (All males)

In order to capture the discussion (Oates 2006, pp. 190), each interview was recorded with two audio devices (one for backup) and notes transcribed into a notebook. The data was later transcribed to bring the interviews alive and aligned with the informal notes and comments (Oates, 2006, pp 193). The Arabic transcripts were translated to English and were reviewed by high school English teacher to increase the validity and reduce any bias. In addition to the interviews and observation, different documents were provided by the JEI administration as a second resource of data. Related governmental and international documents and websites have been also researched.

Data analysis

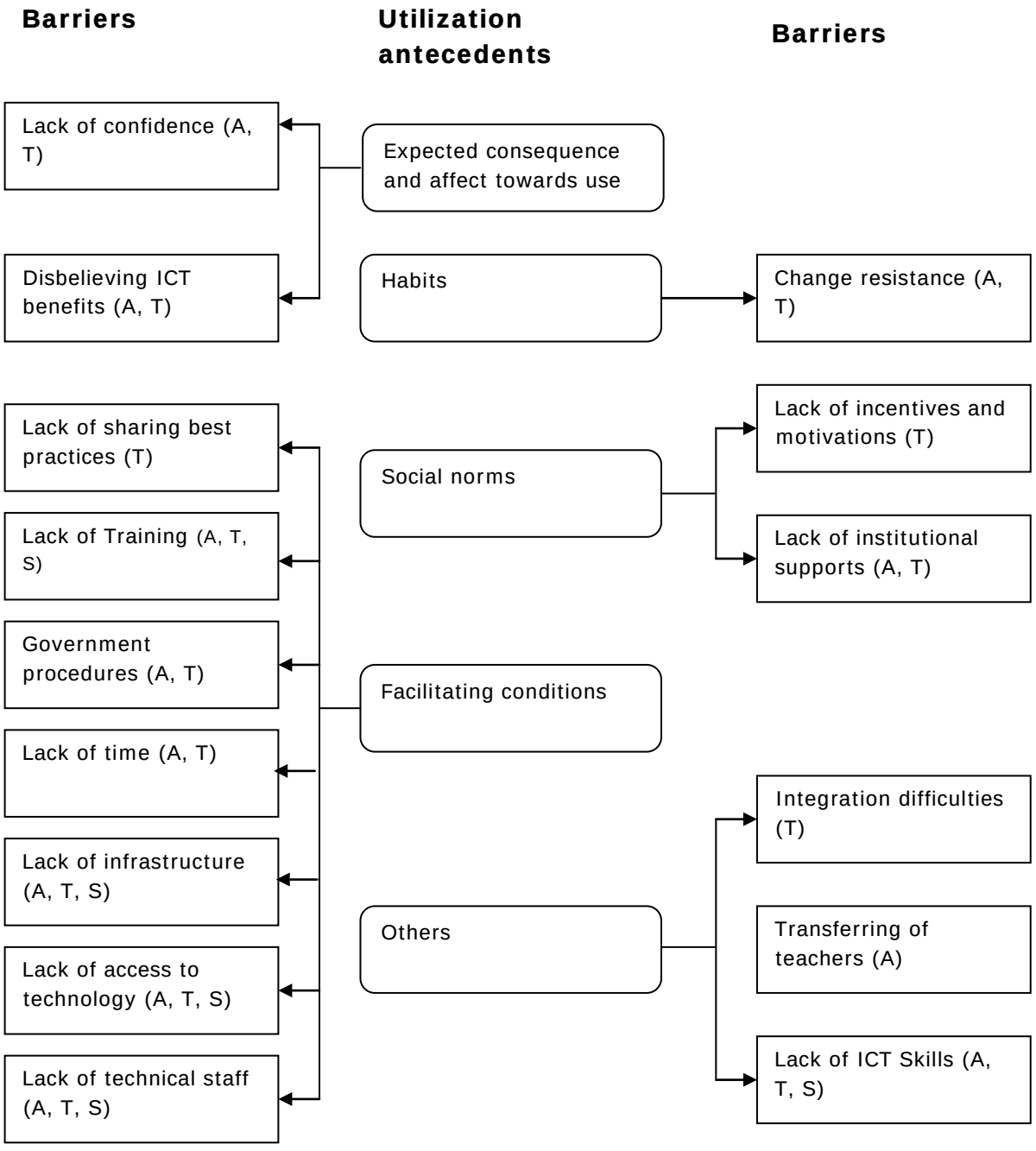
According to Oates (2006, pp 267), "there are no hard and fast rules about how to do qualitative data analysis". However in this paper, the data analysis was carried out consistent to the research objectives in particular and the research question as whole in mind. For doing such, an iterative approach was followed. The collected data from the various sources were segmented into the three themes (Oates, 2006, pp268) on sorting: non-relevant data was excluded from the analysis; general descriptive information was taken into account for contextualization and more particularly for writing the background. The later segment was grouped and analyzed according to the research objectives and components of the conceptual framework. First, barriers according to each group of stakeholder were identified. Second, the found barriers were analyzed to see which ones can be related to the antecedent of utilization (social norms, habit ...Etc) as indicated in the research question operationalization. Though a kind of deductive approach was followed, the author was aware enough to overlook the other themes in the data (Oates, 2006, pp 269).

Ethical issues: The author has maintained a strong sense of ethical responsibilities in terms of collecting data, analyzing the facts and producing the findings. Required citations have been provided throughout the paper. Most importantly, the author behaves with the highest integrity prior to and during the recording of interviews (Oates, 2006, pp 60). The informants were later promised the ability to provide the feedback as a complete paper in due course of time.

4. Results

Figure (4) below provides a list of all barriers that were mentioned during the interviews, by the involved stakeholders, or noticed during the observation. The figure shows which group of stakeholders face the identified barrier; the figure also shows to which antecedent of utilization each barrier can be associated. The results were originally presented in a tabular format (see **appendix D**)

Figure (4): Identified barriers & Utilizations factors



* Note: A- Administrators, T – Teachers, S – Students.

Most of these barriers were captured during the interviews; observation was used as a second method to affirm some of these barriers and also to indicate that certain barriers don't exist like the software incompatibility with the culture or the problem that software is not in the language of instruction.

The close relationships between many of the identified barriers make it difficult to group them. According to Al-Senaidi (2008) "any factors influencing one barrier are likely to influence several other barriers." For example, teacher confidence is directly affected by levels of personal access to ICT, levels of available technical support and the amount of training available, all of which can be seen as barriers to ICT themselves (Ertmer, 1999)". Based on that, it has been decided to view each of the 15 barriers as a single barrier that directly affects the process of technology integration. Due to the limited space, individual descriptions of each barrier can't be provided, so it has been decided to classify the barriers according to the antecedents of utilization:

1) Barriers related to the "expected consequences of use & Affect toward use"
2) Barriers related to "habit"
3) Barriers related to "Social norms"
4) Barriers related to "facilitating conditions"
5) Barriers that cannot be associated directly with antecedents of utilization.

4.1 Barriers related to the "expected consequences of use & Affect toward use"

This category includes the barriers that can be associated with negative beliefs and feelings about using ICT in education; there are two barriers that belong to this category: Disbelief in ICT benefits and Lack of confidence. It can be noticed that these barriers are faced by administrators and teachers (not students); according to a school principal "some teachers feel hesitant to use ICT in the classroom and some others refuse it use it as they don't believe it will be beneficial for their teaching style"

4.2 Barriers related to "Habit"

As indicated by Limayem et al (2001) "… as a particular behavior becomes more routinized, habit becomes more dominant and intention should no longer have as much effect". Teachers have been using the chalk and talk method for years and now it would be difficult to change this teaching style. According to the CEO of the JEI, the resistance to change could be one of the major challenges that face the success of the initiative "When we first started the initiative, some teachers refuse to use ICT and some others asked to be moved out of the discovery schools"

4.3 Barriers related to "Social norms"

As explained earlier, social norms describe how relevant others can influence individuals to behave in a certain way. The first barrier that belongs to this category is the lack of institutional support; it can be argued that there is a common feeling among teachers and principals that the ministry of education doesn't provide institutional support for the process of utilizing ICT in education. For example, some teachers have complained that when supervisors from the ministry come to supervise classrooms and evaluate teachers, they are only concerned to see whether the

teacher has finished the curriculum and not about the use of technology or how it is being employed. Overall, there seems to be a trend among teachers in thinking that the ministry does not have clear policy regarding the use of ICT in schools. Due to the limited time, the author was hesitant to push this issue further.

One more barrier that can be associated with social norms is the lack of incentives and motivations. During the interviews, some teachers who are using ICT in their teacher complained that don't receive enough appreciation or motivation from the principal or sometimes the students for doing this extra effort.

4.4 Barriers related to "Facilitating Conditions"

Facilitating conditions refer to the resources and opportunities that can facilitate or hinder the use of ICT in education. Some of these barriers are related to financial issues; the government does not have enough funds to provide the schools with sufficient number of computers, internet access, or technical staff. On the personal level, many teachers and students cannot afford to have a personal computer. According to one teacher, "I do not have enough time to prepare for ICT-based classes because I don't have computer of my own and I also feel hesitant to give students ICT-based assignments because I know many of them can't have access to computers outside school."

The infrastructure doesn't seem a serious issue within the JEI schools because the initiative is supported by many local and global partners. However, according to the CEO of the JEI "the infrastructure issue will be main barrier to deploying the JEI ICT-based model all over the schools in Jordan.'

Other barriers that are not related to financial reasons include:
The lack of sharing of best practices: teachers complained that seminar or conferences for sharing the best practices were never held.

Lack of effective training: teachers usually receive training on using computer application but they rarely receive training on how to us ICT in teaching.

Lack of time: teachers have many classes per day, and they don't have time to prepare for ICT-based classes during the school time.

Government Procedures: According to a school principal "For example, computers are bought and placed in the schools but they are not installed yet because a committee from the ministry has to come and receive them … a process which may take months. Same thing applies when the schools want to get rid of obsolete computers or when they ask for maintenance." The CEO of the JEI looks at this issue as a main challenge: "I don't know if it is the procedures or the implementation of these procedures but definitely there is something that should be improved there."

4.5 Barriers that cannot be associated directly with antecedents of utilization.

This category includes the following barriers:

Lack of ICT skills: this barrier is a common barrier among all the groups of stakeholders.

Difficulty of integrating technology into education: some teachers have good ICT skills but they can't employ this knowledge in teaching.

Transferring teachers: a critical issue faced by the school principals is "transferring teachers," especially the trained ones. Whether the transferring is coming from the ministry or based on a personal request from the teacher, it has a negative impact on the process of ICT utilization. According to a school principal: "After spending a lot of efforts on training some teachers on the use of technology, some of them just leave …. The training opportunities are not many."

Although the aforementioned barriers cannot be associated directly with the utilization factors, they can be somehow related to these factors. For example, the lack of ICT skills can be related to the lack of technology access (facilitating condition barrier); the difficulty of integrating ICT into education can be related to the lack of training (facilitating condition barrier). Transferring teachers on the other hand, can be seen as a form of the lack of institutional support (social norm barrier).

5. Discussion & Conclusion

The study explored the perceived barriers to utilizing ICT for educational purposes in Jordan as seen by the different involved stakeholders. The results showed that barriers are evident which leads to the under-utilization of ICT in education. Fifteen barriers were identified; twelve of them were identified and directly explained by the TPC model which indicates the suitability of using such model in addressing the barriers to the uptake of technology in education. This suitability also suggests that the utilization factors proposed by the TPC model can be also viewed and treated as barrier factors.

The results lead to the argument that the barriers to the uptake of technology in education will be always present. Although the JEI discovery schools are adequately -equipped with ICT infrastructure compared to the rest of public schools in Jordan; barriers to utilizing ICT in the JEI schools are still evident. This means that even if all Jordanian schools were fully equipped with ICT infrastructure, there will always be some teachers who resist the change or disbelieve in ICT benefits. This argument is supported by Cuban (2001): "We found that access to equipment and software seldom led to widespread teacher and student use. Most teachers were occasional users or nonusers."

All the results indicate the need to focus more on teachers and their pedagogical beliefs or the "final frontier in our quest for technology integration" as described by Ertmer (2005). It can noticed from the results' figure that the most problems are centered around teachers (14 out of 15) ; students have the least number of problems (only 4) and are always ready, even some of the barriers identified by administrators are also related to the teachers. According to Ertmer (2005), "although the conditions for successful technology integration finally appear to be in place, including ready access to technology, increased training for teachers, and a favorable policy environment, high-level technology use is still surprisingly low. This suggests that

additional barriers, specifically related to teachers' pedagogical beliefs, may be at work."

It can be noticed from the results' figure that significant number of barriers is related to the lack of facilitating conditions; the only four barriers faced by students are related to "facilitating conditions". Since the ministry of education is the responsible for providing the best means to enhance public education in Jordan; the ministry should take bigger role in allocating more resources and opportunities to facilities the process of integrating technology into education. It is true that ministry cannot do much regarding the barriers are related to financial reasons; but the ministry should still be able to facilitate the process by offering occasions for sharing the best practices, providing more training to teachers, and by controlling the issue of "transferring teachers"

Important implications of this study include the need to invite more local and global to support the JEI to spread out its model all over Jordan, the need to provide more technical training for teachers, and finally the need for more institutional support by the ministry of education. As it could be the first study that addresses educational technology in Jordan and the first one take the JEI as a case study; the findings of this study can add value to researchers and decision- makers. The findings could be also applicable to countries that share similar socio-economic characteristics with Jordan especially that similar initiatives to the JEI have started in neighboring countries like Palestine education Initiative (2005) and Egypt education Initiative (2006).

6. Limitation of the Study

The main limitation to the study is that the findings are only applicable to the 100 JEI discovery schools. As for the rest of the schools that are not part of the JEI, one finding could be that there is almost no use of ICT in these schools (the majority of schools in Jordan). But it is expected to find similar findings or the same barriers if the JEI is rolled out in Jordan. It is suggested that the findings of this study can be further validated by using larger heterogeneous sample by involving an element of quantitative approach to be more able to generalize the findings and identify the major barriers among the identified ones.

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Appendix A: Empirical evidences of barriers to ICT utilization in Arabic countries' education.

Author	Method	Level of Education & Country	Findings with focus on barriers
Al-Senaidi et al (2009)	Survey developed based on Western Literature Sample: Faculty members	Higher Education (Oman)	-Five barriers were found: Lack of computing equipment , lack of institutional support, disbelief in ICT benefits , lack of personal confidence, lack of time -Lack of institutional support and lack of time are the major hurdles
Ihmeideh (2003)	Interviews Sample: Teachers and Principals	Pre-School (Jordan)	-Major barriers are the lack of software, funds, and time and technology skills. -most pre-school teachers were aware of the value of using technology for learning and teaching, whereas principals were not certain about its Benefits for children.
Saleh (2008)	Survey Sample: Faculty members	Higher education (Lebanon)	-computer self efficacy is a major factor to determine the of technology in education -low computer self efficacy reflects lack of confidence or lack of ICT skills -the need for administrative support and faculty training.
Albirini (2006)	Survey Sample: high school teachers	Secondary education (Syria)	-Teachers are not certain about the computability of ICT with the existing curriculum. -barriers include: Lack of time, lack of ICT skills, lack of ICT infrastructure, and Low ICT Access.
Al-Rabaani (2008)	Survey Sample: Social studies teachers	All general education levels -higher education is not included (Oman)	-teachers lack of computer skills -difficulty of integrating technology into education -the need for more institutional support and technical training for teachers.
Alwani & Soomro (2010)	Survey Sample: Science teachers	All general education levels (Saudi Arabia)	Significant barriers in the domains of: resources and infrastructure, staff development, policy and support, and personal beliefs.

Schoepp (2005)	Survey Sample: Faculty members	Higher education (United Arab Emirates)	1. Faculty are unsure as to how to effectively integrate technology 2. The current reward structure does not adequately recognize those utilizing technology 3. There are no program standards as to what is expected for teaching with technology 4. There is a lack of sufficient technology training 5. There is a lack of technical support regarding the technology 6. Faculty do not have sufficient time to integrate technology 7. There is a lack of support from administration 8. Faculty lack basic technology skills.
Suliman et al (2008)	Structured Interviews & document studies Sample : Administrators and instructors	Higher education (Sudan)	Barriers: Lack of skilled technical staff, staff retention, lack of funding, lack of ICT infrastructure, lack of educational ICT products, lack of coordinated ICT policy, lack of ICT skills
Almekhlafi & Almeqdadi (2010)	Survey & focus group interviews Sample: garden 6-9 teachers	Middle school (grade 6-9) (United Arab Emirates)	Barriers: "technical problems, large number of students, lack of professional development training, lack of motivation and financial support, and negative teacher and parent attitudes toward the impact of technology on teaching and learning"
Jawarneh et al (2007)	Survey Sample : vocational education teachers	Secondary Vocational education (Jordan)	Barriers: Lack of ICT skills, lack of Infrastructure, difficulty of integrating ICT into education, lack of high quality instructional software, language barriers (low English skills)

Appendix (B): Observation' Guide

1- What are available ICT tools in the classroom? (**Facilitating conditions)**
2- What kind of ICT tools are used by the teacher? How it is used in teaching? **(facilitating conditions)**
3- Does the teacher have the ability to use the ICT? How well? **(Expected consequences & Affect toward use)**
4- Does the used software seem easy to use? Do students know how to use it? **(Pelgrum 2001, p173)**
5- Is the used software compatible with Jordanian culture? **(Pelgrum 2001, p173)**
6- Is the used software in the language of instruction? **(Pelgrum 2001, p173)**
7- Does the teacher ask or motivate the students to use the ICT tools during the class? **(Social norms)**
8- Does the online curriculum include ICT-based assignments?
9- Does the teacher give the students ICT-based assignments? **(Social norms)**
10- Any other observations?

Appendix (C): Interviews' Questions

- The interviews were all semi-structured; the questions of each interview slightly vary depending on whether the informant is a student, teacher, or an administrator. The following presents some question from the teachers' interviews
- The questions of the interviews were solely based on the TPC model and common barriers from the existing literature.

a- **General Questions** (consequences of use, Affect toward system use. And Habit)
   1- Could you please introduce yourself and your educational background?
   2- How do you perceive the use of ICTs in education? What do think the advantages of using ICTs in education are?
   3- Were ICTs implemented in your previous education?
   4- Do you prefer the use of ICTs in education or you in favor of the traditional ways of teaching? Why? Do you think the use of ICTs in education will diminish the use of traditional methods overtime?
   5- Do you think the use of ICT improve the students' learning and performance or just make the process more interesting?

b- Social Norms
   1- Do your colleagues believe it is important to use ICT in your teaching?
   2- Does the principal motivate you to use ICT in your teaching?
   3- Do parents respect the teachers who use ICT in their teaching?
   4- Does the ministry motivate teachers to use ICT in their teaching?

c- Infrastructure & Facilitating Conditions
   1- What are the available ICT infrastructure tools?
   2- Do you have enough number of computers and ICT tools?

3- Is there available technical or supervisory staff?
4- What kind of training is available for teachers? How frequent? Is it effective?

d- Curriculum & Software

1- Is the software compatible with the curriculum?
2- Is the software culturally compatible? In the language of instruction?
3- Is it easy to use & learn the software? Do you enjoy using it?

e- Barriers to adopting ICT (core question)

1- What are the main barriers to adopting ICT for teaching and learning in your opinion?
2- What are main reasons behind the teachers' adoption problems?

f- Common barriers (based on Schoepp ,2004)

Which of the following problems do you think is applicable to the use of ICT in Jordan? "lack of computers, lack of quality software, lack of time, technical problems, teacher attitudes towards computers, poor funding, lack of teacher confidence, resistance to change, poor administrative support, lack of computer skill, poor fit with the curriculum, lack of incentives, scheduling difficulties, poor training opportunities, and lack of vision as to how to integrate."

Appendix D: Results presented in a tabular format.

Barrier	Administrators	Teachers	Students	Antecedent of Utilization
Lack of confidence	Yes	Yes	----------	Expected consequences & Affect toward use
Disbelief in ICT benefits	Yes	Yes	_____	Expected consequences & Affect toward use
Resistant to change	Yes	Yes	_____	Habit
Lack of institutional support	Yes	Yes	_____	Social Norms
Lack of Incentives & motivations	----------	Yes	----------	Social Norms
Lack of sharing best practices	_____	Yes	_____	Facilitating Conditions
Lack of Sufficient/ effective Training	Yes	Yes	Yes	Facilitating Conditions
Government Procedures	Yes	Yes	_____	Facilitating Conditions
Lack of time	Yes	Yes	----------	Facilitating Conditions
Lack of infrastructure	Yes	Yes	Yes	Facilitating Conditions
Lack of access to technology	Yes	Yes	Yes	Facilitating Conditions
Lack of available technical staff	Yes	Yes	----------	Facilitating Conditions
Lack of ICT skills	Yes	Yes	Yes	_____
Difficulty of integrating into education	_____	Yes	----------	_____
Transferring teachers	Yes	----------	----------	_____