

## **The challenges facing the integration of ICT in teaching in Saudi secondary schools**

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### **ABSTRACT**

A study was conducted the information and communications technology component (ICT) of the King Abdullah Public Education Development project (the Project) — part of sweeping educational reforms in Saudi Arabia at four schools in two cities. This study presents two significant shortcomings key players encountered: A lack of training and a lack of working equipment. The results also show a lack of a basic understanding among both students and teachers of how the equipment functions; a lack of mastery of ICT teaching techniques—and a lack of teacher training to bridge the gap; a lack of mastery of electronic equipment; and problems with repairs — or the timeliness of them. The findings suggest expanding decision-making authority to key players from all levels will result in the program functioning more effectively. Likewise, planning and implementation ought to involve managers, principals, and teachers and should lead to improved problem solving and even in preventing ICT problems before they occur). Initiating and maintaining two-way communication and establishing a steering committee that also includes members from all levels would give a voice to those most affected by the Project and would enable them to play a greater role in providing timely solutions.

**Keywords:** Key players; information and communications technology; ICT; King Abdullah Public Education Development project; King Abdullah project; Tatweer; lack of understanding; bottom-up communication; IT maintenance; ICT training.

### **INTRODUCTION**

Studies have reported on the importance of using modern facilities to improve teaching in Saudi schools (Alkahtani, 2009a; Oyaid, 2009; Al-Buraidi, 2006;Alkahtani,2015b;Alkahtani,2016c). These studies make it clear that ICTequipment is necessary for teachers' for day-to-day tasks (reprographics for example) is either not available, or the equipment is inadequate. Both Abatain (2001) and Alshowaye (2002) reported on access in different parts of Saudi Arabia to, and the facilities for, information and communications technology (ICT) was subpar. They found some schools were poorly equipped to deliver ICT, including operating in “rented houses,” facilities which had not been built to function as schools.

A number of issues arise regarding the integration of ICTequipmen into school programs, including the need to provide appropriate training, especially for teachers, before the program starts and as required on an on-going basis (Wright and Macrow, 2006). This training needs to focus on the operation of theICT equipment and on the curriculum in terms of content and delivery methods.

There is also the matter of the ICT equipment. First, it must be available, and second, it must be in good working order. Easy access to technical support for equipment maintenance is essential in supporting both teachers and students. ICT equipment that functions effectively and which is well maintained cannot help but facilitate the shift from the transmission model of learning (teacher disseminates information but usually there is no further dialogue or discussion) to one of “inquiry learning.” Resolving ICT issues will not by itself result in a change from the transmission

to the inquiry model—ICT availability and support alone does not comprise the sole difference (Ihmeideh, 2010)—but it can support the inquiry model equally as well as the transmission model.

## LITERATURE REVIEW

### Integration of ICT Equipment into the Classroom

The educational change currently under way in Saudi Arabia and in many other countries is driven by competition in economic development, and typically involves the adoption of computer technology as a package, along with teaching techniques that encourage independent thinking and creativity. This is partly because independent research lies at the heart of the new curriculum, and students need the Internet in order to carry out this research. In many countries that have only fairly recently achieved universal literacy, including in Saudi Arabia, it is rare for schools to have libraries of books in which students can look up information. Rather than buy such libraries, countries often prefer to take students directly to Internet for research, which is more widely used in contemporary government and corporate work (Pfeifer et al., 2005; Pennington, 2013; Bridges, 1986 cited in Brisson-Banks, 2010; Fielding and Moss, 2011, Alkahtani, 2016c).

ICT is also believed to enhance work and education in other ways. It can be used to deliver lessons with interesting and enjoyable real-world examples and stimulating visual and audio illustrations from an extremely wide range of sources. In addition, ICT offers well-known benefits such as efficient new ways to compose documents and organize and store information. Email helps teachers and students communicate outside of class, holding online tutorials or submitting or returning homework, as well as allowing teachers and students to share their ideas with teachers and students in other schools. Dedicated software can be used for students with special needs. ICT is generally welcomed in schools and other institutions as a core 21<sup>st</sup>-century skill. Consequently, computers are widely used and computer skills are often considered to be necessary tickets into the world of institutional jobs (Hawkridge, 1989; Wishart and Blease, 1999; Smerdon et al., 2000; Downes et al., 2001; Watson, 2001; Cradler et al., 2002; Granger et al., 2002; Wasserman and Millgram, 2005; Baines, 2005; Alkahtani, 2009a; Al-Saif, 2006; Oyaid, 2009; John, online, Alkahtani, 2016c).

On the other hand, some researchers have warned that computers are among the types of equipment that may easily be used for surveillance, in order to tighten control over or manipulate students' work or ideas. Computer surveillance may also be especially difficult to detect if teachers or students are not told about it. Also, students may become habituated to constant surveillance, especially if they experience it as benign. It is not that computers necessarily promote more autocratic, rather than more democratic, educational structures, and therefore should not be used in the schools. But because they have that potential, like other useful technologies, they must be used warily (Monahan and Torres, 2010; Schostak, 2014, Alkahtani, 2016).

In spite of the widespread reports of the benefits of computers in transforming teaching and independent thinking, it is often reported that a majority of teachers, especially at the secondary level, do not take advantage of computer access to change their teaching methods. Teachers across many regions and countries have been found to be more likely to adopt ICT for preparing class hand-outs, preparing lessons, keeping records and sending emails (which are indeed all functions that improve teacher efficiency) than they are to put computers into the hands of students for them to do independent research and class presentations (Gregoire et al., 1996, cited in John, online; Becker, 1999; Cradler et al., 2002; Alshowaye, 2002; Kozma, 2003; Demetriadis et al., 2003; Bebell et al., 2004; Alkahtani, 2016). Some of this might be due to

difficulties that teachers experience in switching to the new teaching methods that accompany computer use. Computer use is most effective in company with collaborative teaching and learning and tends to alter the balance of power and knowledge between teachers and students, developments that might not always be welcome (John, online; Cradler et al., 2002). However, most studies have suggested that the main factors holding back computer integration are not ingrained habits and attitudes (Marcinkiewicz and Regstad, 1996; Ertmer, 1999; Czerniak et al., 1999; Preston, 1999; Norton et al., 2000; Williams et al. 2000; Mumtaz, 2000; Franklin et al., 2001; Downes et al., 2001; Al-Ghamdi, 2001; Granger et al., 2002; Mulkeen, 2003; Demetriadis et al., 2003; Scrimshaw, 2004; Al-Ammari, 2004; Ensminger et al., 2004; Al-Khateeb, 2007; Alkahtani, 2016). Rather, the main factors are the absence of three practical logistical management strategies:

- A strategy of making available computers, high-quality educational software, and electronic equipment such as Smart Boards, all in good repair, and school scheduling of rooms and times to make computer use readily available. Studies generally agree that availability of the needed equipment is essential to the successful adoption of computers in curricula and is also a major reason why their adoption is often not completely successful. Computers and computer-based equipment are expensive and also prone to crash if not properly maintained.
- Availability of adequate ICT training for teachers before they begin to use computers in classwork, and continuing after that as needed. Making personal computers available to all teachers gives them opportunities to learn computer skills through trial and error or through online lessons and also encourages them to use computers for their own professional and personal needs. School policies that encourage informal help and collaboration in computer use among teachers also spread knowledge and raise confidence in using computers. Especially among teachers who are newcomers to ICT, the time required to plan ICT-based lessons may be greater than the time needed to plan lessons without it, and thus schools should adjust their schedules to give teachers more time.
- The degree of encouragement and support from the principal and other teachers who take the lead in trying to raise the levels of ICT use and of enthusiasm for it. Teachers' attitudes toward computer use may be influenced by previous attitudes; by concepts of professionalism; by the attitudes of the principal, of other teachers and of parents; and by school and national policies (Alkahtani, 2016c).

These factors were mentioned as difficulties following research on the introduction of ICT into Saudi schools prior to the King Abdullah Project for the Development of Public Education. Studies by Abatain (2001) and Alshowaye (2002) reported on (Alkahtani,2016c)ICT provision and facilities in schools in different parts of Saudi Arabia at the beginning of the new millennium. They found that some schools were poorly equipped to deliver ICT, not least because some still operated in "rented houses" (i.e. in buildings that were not purpose-built to serve as schools). Equally important were shortages of computer equipment. Both studies emphasized the heavy workloads of teachers as they struggled to integrate computers into the curriculum, and the poor training opportunities for teachers to develop the necessary ICT skills. The ICT training programs were described as too theoretical and as focused on computer programming, rather than on developing basic computer literacy skills, which would have helped students and staff use computers as information sources and work tools.

Writing in the newspaper *Alriyadh*, Alauthman (2008) reported that there was still an excessive reliance on the use of traditional teaching methods in the King Abdullah Project schools, despite

the fact that modern methods could be more efficient, reduce the burden on teachers and improve student academic performance. He went on to say, "Today, teachers are encouraged to integrate technology into their personal and professional performance in order to complement the subject matter and to facilitate the teaching process." As Albright (1999, cited in Al-Rajih, 2008, p. 61) notes:

The knowledge explosion has required teachers to increase the effectiveness and efficiency of their teaching and learning, accomplishing more learning in less time; and this has been done through the use of ICT. Teachers have found much to commend in ICT as an educational tool. First, it is a remarkable source of information for research and for class assignments. Second, technology offers the means for interpersonal communication to broaden teachers' experience through interactive collaboration with others around the globe.

Alkahtani (2009a) found that two issues seemed of particular concern to teachers: A lack of:

- Modern equipment and facilities in classrooms
- Availability and/or relevance of in-service training.

For teachers who are beginner computer users, planning ICT-based lessons may take significantly longer than planning lessons that don't use computers. The recommendation is to adjust school schedules to give teachers more time. Making computers easily available to all teachers could give them opportunities to learn computer skills through trial and error or through online lessons. It may encourage teachers to use computers for their professional and personal needs, such as recordkeeping, producing class handouts or using email (Jones, on line; Granger et al., 2002). Such non-teaching uses of computers often precede success at integrating the new technology into the equally new teaching methods (Becker, 1999; Smerdon et al., 2000; Alshowaye, 2002; Kozma, 2003; Bebell et al., 2004; Alkahtani, 2016c).

A study of ICT in schools in Hong Kong revealed another country introducing ICT and a student-centered curriculum and encountering problems similar to those reported earlier in the King Abdullah Project, they had any similarities due to the similar tactics they both had undergone Leung et al. (2005) identified a number of factors that stood in the way of teachers trying to use ICT in their teaching. These included shortages of school computers, of computer-based equipment, of software, of computers in the home, and of classroom space. Students and teachers were also trying to understand and master the collaborative, independent-thinking curriculum, which increased workloads and other demands on teachers. Another factor causing stress to teachers was that there were too many teachers for the decreasing numbers of students; teachers were said to be frightened not only by the impact of the new technology and of the new curriculum on the whole school network, but also by a policy of school closures. The few teachers who were trying to start integrating ICT tended to "ignore the core tasks to closely facilitate students' learning" (Leung et al., 2005, p. 4).

In the end, the pressure of the impending reduction in teaching staff numbers was effective in motivating the reforms in time for the announced deadline of 2009.

There was a call for government and teachers' organizations to act together to develop the necessary measures, both short-term and medium-term. This was important to restore teacher self-confidence and the teaching profession's public professional image" (Leung et al., 2005,p.4)

Teachers, whether working with good facilities or less good ones, “were influenced by the government, school and media and became aware of the advantages of incorporating ICT into teaching. With support from the school authorities, teachers were willing to squeeze in the time to learn to incorporate ICT into their teaching” (Leung et al., p. 4). This solution seems to have combined elements of a transformational campaign, with a threat of negative results for teachers who were not able to meet the deadline.

Howie (2010) reported a very different solution to the scarcity of ICT resources in Chile. The Chilean government rationed computers and computer-related resources by making them available to the schools that were best able to make use of them—which seem to have been the schools in least need of help. This policy did offer a solution for the country’s extreme shortage of equipment, even if it would run counter to the egalitarian values of some other countries. The Chilean strategy was to insist “that any school wanting to be part of the project and wanting to receive equipment and training had to submit a detailed proposal as to what they were going to do with the ICT” (Howie, 2010, p. 520). The philosophy of this approach was that ICT was not a prize to be handed out, but rather something that was earned. Each school then took responsibility for how the change was planned and run in that school. Howie (2010) compared the Chilean approach with that in South Africa, and argued that the Chilean approach held “a number of lessons for the South African policymakers and other developing countries” (p. 507). In South Africa, “schools received equipment whether they wanted it or not, and as a result, some laboratories or equipment were either underutilized or never utilized” (Howie, 2010).

A study by Ali et al. (2009, online) noted conditions that contributed to the successful integration of ICT into three Malaysian “Smart Schools” and problems that arose during the integration process. The main problems experienced by the participating teachers were related to time, course content and technical issues. The time factor was found to cause the greatest problems to teachers in all three schools: They did not have enough free time for lesson preparation, which required the use of the internet to gather information, although the more ICT-skilled teachers needed less time for lesson preparation. In addition, they had to cover for absent colleagues, as well as undertaking many other non-teaching tasks. All teachers believed that a one-hour lesson was too short, because students took 5 or 10 minutes to arrive for their lesson, 5 minutes to settle and another 5 to get the computers running. Any technical problems might delay the start of the lesson by a further 5 to 10 minutes, or longer, even though technicians were on call at the schools. These difficulties are similar to problems found in schools in many countries in which ICT is being introduced.

## **METHODS**

### **Research methods**

In the research, I employed two types of instruments: the interview and the open ended questionnaire. I began by undertaking some informal interviews with the principal, the teachers and the students in a local school. This was to help generate ideas about their experience of working with the program. Later in the study the researcher conducted semi-structured interviews with other principals, teachers and students to build up a fuller picture of how work on the project was progressing. As regards the use of open ended questionnaires, I developed two of them, one for teachers and one for students.

### ***The interview***

Powney and Watts (1984) define an interview as “a conversation between two or more people where one or more of the participants takes the responsibility for reporting the substance of what

is said" (cited in Verma and Mallick, 1999, p. 122). Barbour and Schostak (2005, p. 41) argue, "Implicit in our images of interviews are a number of key concepts listed below that fundamentally impact on their utility as methods to be employed by researchers and these may introduce aspects of bias":

- The "messiness" of encounters with others
- The "performances" of those engaged in communication
- The level of "commitment" to being engaged in communication
- "Truth"
- "Reality"
- "Suspicion"
- The "hidden agendas" at play, and
- The tactics and strategies employed to "unearth" information

In the research the researcher used the interview to learn more about the research problem, so that the interview would be suitable for the study purposes. Denscombe commended the use of interviews: "When the researcher needs to gain insights into things like people's opinions, feelings, emotions and experiences, then interviews will almost certainly provide a more suitable method—a method that is attuned to the intricacy of the subject matter" (Denscombe, 2007, p. 174). However, he also advised "the interviewer might see some incongruity between answers given by the same interviewee and be able to probe the matter. Or the interviewer might note a disparity between a given answer and some other factor" (Denscombe, 2007, p. 170).

Wilkinson (2000, p. 47) identifies purposes for which the interview is used: when seeking in-depth information; when the issues addressed might be sensitive; and/or when the topics under study might profit from wider exploration (Alkahtani, 2016c).

By using interviews, the researcher could understand the feelings and opinions of the interviewees in more depth than I could have done from just studying survey responses or even responses to open-ended items, because the dialogue allowed me to follow up on their statements immediately, and they on mine. With so many of the teachers' and students' reactions not being entirely easy to understand, interviews were important simply to orient me as to issues that should be explored. My interviews were semi-structured, that is, I set the initial focus of each interview by asking certain questions, but the participants were free to answer at length and to bring up issues I might not otherwise have expected to explore. This interaction fell between a structured interview, in which the interviewer's questions control the discussion, and an unstructured interview, in which completely free conversation takes place (Robson, 2002).

Semi-structured interviews gave me the opportunity to push for what I most wanted to know, but also to take advantage of unexpected topics that were useful to the research. Robson (2002) suggests entering a semi-structured interview with the following preparation: "(1) Introductory comment; (2) List of topic headings and possible questions to ask about each; (3) Set of prompts associated with these topics and questions; (4) Closing comments" (p. 238). This was roughly how I planned my interviews. At the beginning of each interview, I explained that its purpose was to find out about the students' or teachers' experiences with the new teaching program, and that this was a preliminary exercise to help me find out about the sorts of issues raised by participants in the program. The attitudes and concerns that appeared to be of most importance to the interviewees were then followed up in the questionnaires.

I did not use interviews as extensively as I had first considered doing, partly because of the time that would have been required and partly because of the difficulty of making arrangements, especially in boys' schools, where women do not ordinarily enter. However, my experience as a

teacher in Saudi schools enabled me to extract the maximum information from the interviews that I conducted.

Denscombe (2007) discusses several major drawbacks to using interviews: (1) interviewing large groups is time-consuming versus distributing surveys, particularly if travel time or complicated arrangements are required (to ensure the group size was manageable there was a case limit); (2) to identify major themes, completed interviews need to be pondered exhaustively using grounded theory techniques; and (3) the interview might seem invasive and be unsettling to a subject, especially when involving cross-cultural communication (I understood the participants' culture and worked within this context). Barbour and Schostak (2005) also mention the issue of "hidden agendas" and "performances" by people involved in conversations, and the general "messiness of encounters with others" (p. 41). But while these interview behavior patterns might interfere with understanding, they may also be present in questionnaire responses, where they can be more difficult for researchers to spot(Alkahtani,2016c).

### ***Open-Ended Questionnaire***

The open-ended questionnaire, as Cohen et al. (2005) explain, enable respondents to "reply in their own terms and give their own opinions" (p. 328). So the inclusion of this study of a set of open-ended questions was conducted in order that respondents, both students and teachers, feel more comfortable writing freely about their experiences in the program. The student questionnaire had six questions to prompt them; the teachers' questionnaire had three. The questions functioned somewhat like interviews, opening up experiences, motivations, and viewpoints that might not have been broached in closed-end survey questions given face-to-face. The open-ended questionnaires were administered via hard copy(Alkahtani,2016c). This instrument was chosen because it is more time efficient and cost-effective than personal interviews. The researcher also hoped using this instrument would result in more candid responses. For example, members of a one gender may be more likely to raise matters in an impersonal/neutral format vis-à-vis discussing them with an interviewer who is member of another. Many of the benefits of semi-structured interviews played out in this research and much information was gleaned. On the other hand, one advantage of face-to-face interviews is forfeited in closed-ended survey questions: The interviewer cannot immediately follow up on an unexpected or new issue.

### **Sampling techniques**

In the study, the researcher adopted purposeful sampling and used various strategies during the selection process. Purposeful sampling is the technique best used for sampling "identification" and the process of picking out information whereby resources are limited (Palinkas, et al., 2013). According to the literature, this is a necessity in purposeful sampling due to the difficulties when studying large scale programmes. Mixed methods are known to enhance and "strengthen" the data, in addition to clarifying how the research is to be discussed. Finally, this also helps to improve study's meaning (Palinkas, et al., 2013, Aarons, et al, 2011); as already described.

The study is based on purposeful sampling which is used in qualitative methodologies for selecting participants for study Palinkas, et al., (2013) define "Purposeful Random Sampling" as "electing for interviews a random sample of providers to describe Experiences" an interviewee who is willing to participate in the research. The two cities and 4 schools were randomly selected from the list of schools enrolled in the program.

The individual's ability and willingness to communicate and express an opinion is very crucial in purposeful sampling. Interviews were held with teachers and students who were willing to take

part. The survey questionnaires were undertaken by students available and willing on the days when the researcher visited there. To obtain a deeper understanding of the concerns and issues with the Project the researcher used open-end questions to elicit more detail of their perceptions. Of the two key elements of time and resources mentioned by Patton (2001), the researcher have determined time and resources as key to be addressed in this study.

### **Analysis of data from interviews and open-ended survey items**

The qualitative data were analyzed by grounded theory methods (Glaser and Strauss, 1967), which are well suited for a research situation like this, in which initially not a great deal is known about the actions, attitudes and motivations of the research subjects. As Jones and Alony (2011) say, “Grounded theory is useful in providing rigorous insight into areas that are relatively unknown by the researcher” (p. 96; see also Denscombe, 2007, p. 92). Unlike most scientific studies, grounded theory research encourages an open mind about the reasons for the patterns being studied and even about what those patterns are. Triangulation between a variety of demographic groups and data collection methods is called for in order to obtain a broad picture of what is going on.

Greckhamer and Ljungberg (2005) say that grounded theory “does not specify whether interviews, observation, archives or other data-collection methods would be the most appropriate for its purposes. Instead, it suggests and accepts a variety of data-collection methods from various sources” (p. 735). Wilson (2009) notes in (Alkahtani,2016c) “The specific procedures in a grounded theory methodology provide a rigorous yet productive means for developing a theoretical perspective from differing sources of data. Adopting a multi-faceted methodological approach in the analysis and integration of multiple sources of data provides an effective means for illustrating the experiences of the participants” (p. 15).

As proposed by Glaser and Strauss (1967), grounded theory analysis starts by “coding each incident in the data into as many categories of analysis as possible, as categories emerge or as data emerge that fit an existing category” (p. 105):

## **RESULTS**

The researcher sampling four Saudi schools, two for girls and two for boys, and taking the proportions of students vs. teachers in each school, and by including schools from an urbanized and a less urbanized city, with respect to those demographic categories in this region of the country, however, for logistical reasons, resources and time limitations The size of a sample would also affect its representativeness. Graham and Neil (1998) suggest that, “the target should be a sample large enough to provide meaningful data but not excessively time consuming and invidious” (p. 44).

The result process began by open coding to fracture the data. A variety of codes were identified. The codes were parts of the data that stood out because of their many connections with other codes and their repetition across many participants. Upon further analysis, these linked codes were grouped into categories—for example, broken-down equipment; no ongoing maintenance; repair may take months; there is no longer funding for repair and tech support; students complain that computers are not used in some classrooms. In addition, they were linked to each other under categories. Further constant comparison of the codes and categories led to fleshing out the following themes: inadequacy of training, and inadequacy of equipment maintenance.

The tentative explanations the researcher is weighing, and recording in a subsequent memo, may guide the researcher’s decisions about what types of data to explore next. If it happens that some



observations noted in the memo are repeated in data from a number of participants, assuming they are also important to the research questions, they may be classified as minor themes. Some minor themes will seem especially close to each other; that is, they will all seem to be pointing to a larger point that is important to the research questions. These themes may be bundled together into larger themes. For instance, “The whiteboards have no maintenance and have broken down many times” might be joined with a number of other themes into two larger themes: “Lack of maintenance and repair of equipment” and “Some equipment broke down extremely frequently.”

### **Inadequate equipment maintenance**

One of the major reasons for the unavailability of equipment was that the schools usually could not afford to repair out-of-commission equipment immediately. Teachers were perhaps most affected by this, but many students, teachers and principals seemed aware of the problem.

#### **a. Students**

Students were aware of the difficulties in arranging maintenance and repair of electronic equipment, but probably not quite as aware as the teachers. Asked about maintenance problems, eleven participants in a student interview emphasized that their school faced problems, four said they sometimes faced issues, one student didn't know and one student (from a school with technical support) denied having any problems.

#### **b. Teachers**

Equipment maintenance was regarded as a chronic problem and was probably mentioned more often by the teachers than any other weakness of the Project. In the teacher interview, the largest number (seven out of eleven) said that the greatest challenges facing teachers were training and maintenance. In the principal/teacher interview group, fourteen out of sixteen participants believed that lack of maintenance was the most important factor hindering successful use of computers in their schools and classes.

Teachers showed initiative and cooperation in sharing equipment and finding extra-school sources of equipment. Every participant in the teacher interview group shared teaching materials, such as the Smart Board or other tools, with another colleague. A mathematics teacher used a traditional blackboard. As she explained:

*At the beginning of the Project, we were using the Smart Board, and because it continually broke down we brought in the normal board to have an alternative. Sometimes the two are used together, with one student doing exercises on the normal board and another on the Smart Board.*

#### **c. Principals**

Three out of the five principals stated that the main problem facing the school was the lack of maintenance (principal interview group).

A principal in City 1 explained:

*We face many problems when the devices are out of order, as their repair may be late and sometimes we bear amounts beyond the budget to purchase or repair a device. Also, there is no periodic maintenance by a specialist, but only the support in-charge, who makes only small repairs, inventories the devices, and submits the list to the project in*

*our city. Also, the bathrooms are rarely maintained and at some locations there is water leakage that damages or completely stops the devices.*

As a principal in City 2 noted:

Poor communication of the computer with internet-inefficient appliances makes the computer time-consuming and slow, due to the succession of students working with it. The continuing need for the illuminations projector and the slowness of the computer (provided by Mdiom Company) hinders daily study. There are also problems with the interactive board that the technical support engineer cannot solve.

### **Lack of resources**

Interviews and questionnaires occasionally suggested that the resources available for the Project were limited. The refusal of the Project to continue paying for technical support, maintenance and repair of equipment was striking, because this was a necessary and critical component. The Project did not replace or add to equipment. School buildings had leaks. Science laboratories and their equipment and materials were not consistently maintained.

#### **a. Students**

In the open-ended questionnaire, a science major reported, "Leaks in some school buildings were dangerous for the electronic equipment, broken air conditioning was not good for the equipment and chemistry lab materials were out of date and were replaced by students out of their own pockets."

#### **b. Teachers**

Teachers gave many accounts of equipment crashing and the failure of the Project to repair or replace it quickly and there were also accounts of school buildings not being maintained.

### **Failure to take the initiative**

This theme arose entirely from a single principal.

In the principal interview group, Principal 1 criticized other principals and classroom teachers because many of them had not studied the Project before trying to apply it and convincing others of its worth and working with them to make changes. Principal 1 believed in the Project, was something of a natural leader, and solved a number of the Project's most vexing difficulties locally, without spending the Project's money. She solved these problems independently by educating herself about the Project and studying change management online; she then communicated with students, teachers, other principals, parents and local community leaders, convincing them of the Project's value. She exchanged ideas and communicated with principals and education managers beyond her town, including internationally. She utilized the Internet, education newsletters and local journals as a communication tool. In the process, she convinced many people of the value of the Project, including other principals and teachers who had read about the Project.

Principal 1 arranged for an international software expert to educate the students, teachers and parents of her school on maintaining and repairing computers. The expert also maintained computers and monitored their use in the classrooms. Principal 1 also arranged for year-round training in the Project's teaching techniques for teachers and mothers of her pupils, and shared

the training facility with another school. By so doing, she saved the Ministry of Education (ME) funds because there were no additional costs.

The Principal 1 was firmly of the view that the Project needed “serious consideration” by the ME, and that a steering committee was required, led by the national Project director, and comprised of people from different backgrounds, including parents and students. The committee should work with Project schools to explore the Project’s strengths and weaknesses, proposing appropriate solutions where necessary.

It was important to “spread the ethos of the project to the local community, I mean, to all the institutions related to the fields of education, creativity and development”. Furthermore, “Project schools and their principals should communicate with international education bodies and parties on modern methods of development and change.” (Alkahtani.2016c)

## **DISCUSSION**

### **Lack of resources**

Judging from the results obtained from the research fieldwork, the issue that stood out in the view of the Saudi secondary school teachers it sampled these is Lack of resources as (Marcinkiewicz and Regstad, 1996; Ertmer, 1999; Czerniak et al., 1999; Preston, 1999; Norton et al., 2000; Williams et al. 2000; Mumtaz, 2000; Franklin et al., 2001; Downes et al., 2001; Al-Ghamdi, 2001; Granger et al., 2002; Mulkeen, 2003; Demetriadis et al., 2003; Scrimshaw, 2004; Al-Ammari, 2004; Ensminger et al., 2004; Al-Khateeb, 2007) stated; they recommended the ICT facility should be in good condition to make it easy to apply it at school. The findings of this research in broad terms tend to confirm what I found from a Malaysian study that if the ICT devices have technical problem it will shorten the time of learning. (Ali, et al., 2009)

I also considered doctoral studies on Saudi Arabian schools including those by Alafnan (2000), Alshowaye (2002) and Aboulfaraj (2004). The Saudi studies offered a view of Saudi secondary schools that had limited facilities.

Students, teachers and principals mentioned that because of the scarcity of repair and maintenance services, equipment was likely to be unavailable for long periods after crashes. A major reason for this was said to be because the Project was no longer paying for repairs, as it had initially. Consequently, schools had to wait until they had saved enough funds for these unbudgeted expenses. There were several causes for the frequency of breakdowns, and old equipment may have been especially prone to crashing. Additionally, students sometimes played with equipment aside from the teachers’ purview. There was poor communication between computers and other equipment, and computers did not always connect to the Internet. On top of that, teachers might have been reluctant to use the equipment because it often worked poorly or because they had not learned how to avoid crashes.

The most common suggestions were to find more technical repair experts or more funds to pay them. In addition to these general suggestions, a number of ideas have already been tried or are being suggested to address the maintenance problem:

- Continue to closely monitor students’ use of the computers, restricting use to during class or study periods.
- In response to the shortage of functioning equipment, teachers were already sharing equipment and finding ways to procure more outside of the Project;

- Offer simple equipment repair classes for students and teachers;
- Hire one highly computer-literate person at each school; and
- Revisit implementing a standing repair contract for all the schools even though historically it would be a strain on the budget.

### **Failure to Take the Initiative**

With respect to their role in the conversation about the malfunctioning of equipment and lack of resources with which to repair them, giving teachers an avenue to discuss the issue with middle and upper management empowers teachers and encourages them to think more independently. Additionally, discussion with middle and lower management facilitates upper management's understanding from a bottom-up perspective. Consequently, middle management (such as principals) has an important role to play in keeping two-way communication open (Weick and Quinn, 1999; Burnes, 2004). (Becker, 1999; Smerdon et al., 2000; Alshowaye, 2002; Kozma, 2003; Bebell et al., 2004).

Facilitating open dialog encourages teachers and lower-level employees by stimulating ideas and provides an initiative to implement them. It may also result in providing more resources for teachers' projects and, of course, keeps management up-to-date (Kanter, 1985; Kotter, 1995; Mohanty and Yadav, 1996; Schein, 2010; Weick and Quinn, 1999; Smith, 1991; Dannemiller and Norlin, 2001; Burnes, 2004; Brisson-Banks, 2010; Neumann, nd). Communication and discussion with parents and community leaders may result in additional ideas and offers of resources.

## **CONCLUSION AND RECOMMENDATIONS**

This research studied the ways in which Saudi principals, teachers, and students responded or are responding to the challenges of implementing the ICT component of the sweeping reforms to education by the King Abdullah Project being trialed in their schools.

By using mixed approaches, quantitative and qualitative, were used to collect data from 200 students, 50 teachers and 4 head teachers. The study uses descriptive analysis, which is used for quantitative data and using grounded theory techniques (qualitative) approaches for analysis.

Here is an example of the process of grounded theory analysis used in this research. The analysis began by open coding to fracture the data. A variety of codes were identified. The codes were parts of the data that stood out because of their many connections with other codes and their repetition across many participants. Upon further analysis, these linked codes were grouped into categories—for example, broken-down equipment; no ongoing maintenance; repair may take months; there is no longer funding for repair and tech support; students complain that computers are not used in some classrooms. In addition, they were linked to each other under categories. Further constant comparison of the codes and categories led to fleshing out the following themes: inadequacy of training, and inadequacy of equipment maintenance.

The tentative explanations the researcher is weighing, and recording in a subsequent memo, may guide the researcher's decisions about what types of data to explore next. If it happens that some observations noted in the memo are repeated in data from a number of participants, assuming they are also important to the research questions, they may be classified as minor themes. Some minor themes will seem especially close to each other; that is, they will all seem to be pointing to a larger point that is important to the research questions. These themes may be bundled together into larger themes. For instance, "The whiteboards have no maintenance and have broken down

many times” might be joined with a number of other themes into two larger themes: “Lack of maintenance and repair of equipment” and “Some equipment broke down extremely frequently.” This led to the two themes: A lack resources, which explained the lack of funding for equipment repair, for example. A second theme was the failure of most teachers and principals to take the initiative in promoting the Project and in overcoming at the local level any obstacles they encountered. This concern would seem a more serious weakness when comparing these responses to those of a proactive, charismatic principal who seemed to be building the Project almost single-handedly. The point of this theme is that this principal's initiative and creativity might need to be widely imitated by the participants to overcome serious problems.

Computers and smart boards, the core equipment of the curriculum, were more difficult to learn than the other equipment. But much more serious was the lack of equipment repair, or even technical support, which may have been due to lack of funds or other resources. About a quarter of the teachers were not using each of these two items, perhaps to avoid breakdowns in mid-class or perhaps because they were not sure how to use them or for other reasons. Internet access, essential to the new curriculum, was difficult sometimes, even when computers were working. This was partly due to computers and other equipment not communicating well with each other, which again may have been due in part to lack of resources. The best hope seemed to be to develop local resources of tech support, including repair classes for teachers and students and, also, hiring more ICT-literate teachers. However, it was important for heads, teachers and students to discuss these problems at length with Project managers, because lack of communication during the planning phase of the Project may have led to some of the problems. Also, discussion might well lead to more solutions.

Perhaps the most important lesson from this research is, based on extended discussions with principals, teachers and students, the Project should be redesigned before it is rolled out to other trials, or to the KSA. Another takeaway is the trail presents an opportunity to significantly improve the quality of education in Saudi schools. Principals, teachers and students have intimate knowledge of the challenges of the Project and the culture of their schools. They have a vested interest in eliminating impediments to the success of the Project; if they are given an active role they are more likely to be motivated to ensure its success.

This topic of particular interest to this researcher in her role as a Saudi teacher because until the recent introduction of an experimental program in 50 secondary schools, Saudi schools operated exclusively using the transmission model. It is hoped the findings of this study will:

- Be the stimulus for greater inclusion of those who are directly affected in the Saudi education system;
- Lead to qualitative improvements in the education offered to Saudi youth;
- Help inform the ME about the experiences of the principals, teachers and students trialing the Project;
- Encourage researchers to study the experiences of other schools across the Kingdom not included in the present study which focused only on four schools in two cities.

Thus, it may be quite possible that even a serious lack of resources could be manageable, with sufficient communication and discussion throughout the educational system. (Alkahtani.2016c)

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## Appendix 1

### THE OPEN ENDED QUESTIONNAIRE

#### Students:

- 1- Are you male or female? **M** or **F**
- 2-Do you have a computer at home? Did you use a computer at home before working with the programme in school?
- 3-What do you *not* enjoy about the programme?
- 4-Are you pleased with your progress on the programme?
- 5-How easy is it, in your opinion to use the ICT equipment? Have *you* had any problems with them?
- 6-How does working with the programme compare with traditional learning? 8-Which do you prefer and **WHY**? Do/did you find you need much help to work with the programme?

#### Teachers:

- 1-Are you male or female? **M** or **F**
- 2-Do you have a computer at home? Did you use a computer at home before working with the programme in school?
- 3-How long have you been working with the programme?
- 4-How would you assess using the ICT equipment that you were given in the use of the programme?
- 5-Do the students find it easy to use the ICT equipment?

#### Headteachers:

- 1-Are you male or female? **M** or **F**
- 2-Do you have a computer at home? Did you use a computer at home before working with the programme in school?
- 3-How long have you been working with the programme?
- 4-How would you assess ICT equipment that you were given in the use of the programme?
- 5-What challenges has the introduction of the programme presented: (a) you? (b) your school? (c) your teachers?
- 6-How satisfied are you now with the programme, from the point of view of raising education standards?
- 7-How helpful is using the ICT equipment?

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