

The Challenges Faced During the Implementation of Smart Schools in Oman



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Abstract Teaching today relies a great deal on IT resources and there are many schools opting to digitize they curriculum i.e. change the traditional style to what has recently been coined as “Smart School” style, in which ICT plays a significant role. The Smart School initiative seeks to enhance education in a smarter and more innovative way using ICT. The purpose of this study is (1) to explore the challenges faced during the implementation of smart schools from the perspectives/viewpoints of the service provider, teachers and school IT administrators; and (2) to provide a set of recommendations to minimize such challenges. In order to achieve the research objectives two case studies were conducted among schools that had already started implementing the process of becoming smart schools. Both case studies included a set of interviews with schoolteachers, the people in charge of the proposed project, school IT administrators and a service provider. In addition, there were sets of classroom observations conducted in the respective schools. Study results and the examination of data analysis revealed that there are many challenges faced by the perspective parties and these challenges are discussed in some detail. The researchers then provided a set of recommendations to minimize, or indeed to overcome the challenges encountered in becoming a Smart School in Oman.

Keywords Smart school · Information and communication technology · Technology adoption · Implementation · Qualitative · Observation · Oman

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1 Introduction

Over the past few years the traditional learning model has been considered an instructional tool in which students need to be loaded with information without a deeper understanding of such information. According to this approach the role of the teacher is mainly to dispense the knowledge, whereas the role of the student is to receive and repeat the received information [1, 2]. This method emphasizes individual work; as less collaborative students get few opportunities to practice within groups. Such a learning approach can be described as one-way communication between the teacher and students, and limits the interactive learning environment of both teachers and students. Nowadays, due to the massive technological growth, the environment is getting smarter about offering new opportunities to people. Technology has been integrated into our lives progressively, and it is proliferating in different domains such as lifestyle, health, education, communication, economics, social skills etc. [3].

Education is one of the areas that has been greatly impacted by the emerging technology, which has changed the way people learn, work and communicate. Information and Communication Technology (ICT) explores the concepts of communication and technology together by exchanging information rapidly through the use of technological devices. The next generation suggests that Information Technology (IT) and Communication Technology cannot work in silos any more. Gaining knowledge of ICT is crucial for organizations in order to improve their business processes, productivity, efficiency and competitiveness [4–6]. It has been expanding rapidly and spreading into educational institutions as an integral part of education [7] and it is now considered to be an indispensable tool for successful educational reform. However, ICT is not only a successful element in this, but is also a contributor in shaping student-centered learning environments, which is crucial for better education [4]. Therefore, educational institutions have to take advantage of technological services by adopting the new model for education called Smart Schools, by utilizing the relevant ICT infrastructure.

The Smart School initiative is intended to integrate ICT into education [8], as it is considered to be a key component in facilitating enhanced technology, by creating what is called student-centered educational environment [9]. The idea is to improve the quality of teaching and learning processes by introducing new methods of teaching through ICT [10]. Oman is considered to be one of the developing countries that has started to embrace ICT in different government sectors as a step towards moving towards a strategy of e-government (and e-society) in Oman. The e-government initiative is directed by His Majesty and aims to enhance and digitalize government services for its citizens and residents [11]. The e-education initiative is one of the tasks in the e-government transformation plan. E-education aims to utilize ICT to support the academic domain and promote learning for both teachers and students in Oman [12]. One of the leading telecommunications companies in Oman has created a digital education bundle in partnership with Education as a Service (EaaS) leaders. This telecommunications company created this package in order to complement the government efforts towards endorsing Oman's entry into the digitalization

era. Only a few schools in Oman have started moving towards their transformation into smart schools. However, the transition from traditional educational approach to the advanced Smart School educational system is not an easy or smooth process. It involves a drastic change in the educational culture and attitudes of both teachers and students, who are the direct stakeholders of this program. Thus, this paper sheds light on the challenges faced during the implementation of Smart Schools in Oman, in order to provide a set of recommendations to minimize and overcome the challenges. Specifically, this study has two main questions: (1) What are the challenges that smart schools face during their implementation in Oman?; and (2) How can these challenges be overcome during the implementation of smart schools in Oman?

The rest of the paper is organized as follows: the next section provides a detailed literature review about smart schools. The third section describes the data collection methods and conceptual framework. The fourth section provides the analysis of the data collected. The fifth section offers an explanation and discussion around the research findings and results. The last section presents a conclusion to the study.

2 Literature Review

2.1 *What Is a Smart School?*

A Smart School is a new paradigm concept [13] in the educational domain and is defined as a teaching-learning institution based on technology that is designed to provide a standard teaching-learning environment in order to improve the preparation of children for the information age. Smart schools need qualified human resources and well-designed teaching and learning concepts in order to achieve a high standard in education [14]. In their paper El-Halawany and Huwail [15] define 'smart schools' as a new learning community that encourage an active thinking process to solve problems with confidence and prepare students to be ready and fully responsible in the global economy by applying the appropriate knowledge and technology. Smart schools are schools that are equipped with various ICT requirements including computers, software [16], smart boards and network facilities which can be used for interactive teaching purposes and for encouraging self-paced learning [17]. Smart schools seek to democratize education, to provide more opportunities to improve individuals' skills and abilities, to help them develop an awareness of, and give them exposure to technology, in order to prepare a well skilled workforce for the information age and prepare them for the challenges, and to stimulate student creativity skills and critical thinking. Over time smart schools will develop their professional personnel and principals, their administrative and management processes and their educational resources [14]. Smart schools attempt to transform the education system by focusing on the development of individuals using a holistic approach, thus creating high-value based education available to all those when and where they need it [18].

Omidinia et al. [14] highlight the fact that schools will require changes in their current policies, practices and procedures to transform themselves into a smart school, as it is not an easy task.

So what does ‘smart’ mean? Zhu et al. [19] present in their paper the meaning of ‘smart learner’. It is the ability to apply intelligence quickly and behave appropriately in different contexts. The use of the word ‘smart’ in educational technology means ‘the ability to achieve one’s goals and objectives in an efficient and effective manner where adaptive and innovative use of technology is needed [Spector, 2014]. The term ‘smart educational environment’ refers to an environment that facilitates learning by building on the learning experience of the learner efficiently [19]. Spector [20] highlights further that the learning environment is considered to be ‘smart’ if it achieves its desired outcomes.

2.2 ICT Adoption in Education

Information and Communication Technology (ICT) is a combination of technology and resources that have been collected together and utilized to communicate. It includes hardware, software, and media for collecting, storing, processing, transmitting and presenting the information in different forms such as text, voice and images [21]. It also includes broadcasting (television), the internet, computers (PCs), and projection devices. These different ICTs are currently used in the education sector [7]. Sarkar [21] indicates the importance of ICT’s role in education, which will keep growing in the 21st century. Obviously, this can be proved simply by the fact that it has transformed the nature of education. It certainly has the power to transmit knowledge from teachers to students, and it transforms daily teaching practices [22].

UNESCO, at the World summit on the information society (WSIS) conducted in Switzerland in 2003, stated that ICT should be used to improve education systems because it encourages the creation of new learning methods and it helps to drive innovations and training. Furthermore, the summit emphasized ICT as being a key enabler in delivering developing countries into the age of information and knowledge [23]. It enables people to benefit fully and to make use of the new opportunities offered by ICT. A number of previous studies have shown that ICT is considered a powerful tool in extending educational opportunities. Cheung and Slavin [24] examine the impact of ICT on enhancing educational outcomes in mathematics in K-12 classrooms. Their meta-analysis summarizes the results from 74 qualified studies. They find that ICT impacts positively but modestly on mathematical achievement compared to conventional methods [24]. The outcome of this study is similar to the study conducted by Garcia and Pacheco. A case study was conducted for sixty students in third grade to study the effectiveness of using computer simulation tools on mathematics. Based on the researcher’s exploratory study, the results indicated that computational tools improve students’ engagement and collaboration when integrated with traditional teaching methods, and it enabled children to build on their own knowledge [25].

Integrating ICT in education has witnessed a transformation in existing learning activities into a student-centered education and self-directed learning. Fu [7] states that students' skills in building new knowledge become more accessible and students become more capable of using information and data from a variety of sources through ICT integration. Livingstone [26] further illustrated the same concept by citing some cases. Students can search online for homework without having to go to the library to get the book, and students can also 'ask for expert opinions' besides asking advice from parents.

2.3 *Worldwide Smart School Initiatives*

Smart learning needs to prepare the workforce, and to train them to work effectively and with competence, in order to meet the immense demands of the 21st century [19]. Many countries have taken the opportunity of transforming their schools into smart schools, leveraging the power of ICT in education and focusing on smart learning. Malaysia is one of the leading countries regarding smart schools, this initiative having become operational in 1999. With the advancement of ICT, the Smart school project in Malaysia aims to achieve the Malaysian National Philosophy of Education to foster learners' knowledge and produce children able to solve problems and to be more responsible [18]. In 2004 a smart school was launched in Iran following the Malaysian approach of integrating ICT into their schools [16]. New York recognized the importance of integrating technology into their schools to enhance teaching and learning practices and to develop a knowledgeable workforce in order to compete worldwide. In 2014 two billion dollars was allocated to prepare New York State schools with educational tools and to promote students to master the skills of the 21st century economy, and they proposed seven key changes in order to have a successful smart school [27]. The United Arab Emirates (UAE) initiated a Smart Learning Program (SLP) in 2012. This program aims to enrich learner-centric education supported by the latest technology such as interactive smart boards, tablets and high speed 4G networks. Also, teachers are equipped with laptops and offer them with specialized training programs to ensure the success of the program. Their learning environment empowers students to become proactively engaged and interactive in the learning process [28].

The Utah State Office of Education in the United States (US) initiated a Smart School Technology Project in three schools for the academic year 2012–2013. Students at GVES School are adept at using the iTV, iPod and various apps. In one of the schools, classrooms are supported with Apple iTV and HDTV attached to iTV. Students are also supported with iPods and various educational apps. For administrators, faculty and staffs are supported with iPods, MacBook and Pro laptops. Professional development projects are also provided to them [29].

2.4 Benefits of Smart Schools and Integration of ICT in Education

Engaging and leveraging technology in education enhanced the educational achievement of learners, teachers and schools. A lot of studies and research assert that ICT mediated education had a significant impact. According to Galil [28], by investing in a Smart Learning Program (SLP) in the United Arab Emirates (UAE), schools contributed a new learning environment and delivered high quality education not only in English Language but also in their learning process of engaging students and teachers. The study showed that smart learning methods are more motivating and interesting to students than the traditional learning activities. In the new environment the role of teacher has become less teacher-centred, enabling teachers to prepare and plan for their lessons more smoothly [28]. A case study called the Flipped Classroom Pilot Project, conducted in a middle school in north China, stresses the importance of having a smart learning environment where learners are supported by tablets for learning purposes. The present instructional environment needs to be changed. This means that new instructions will be created by teachers and taken home in the form of video-based interactive lessons. Study results indicate that students can benefit from a broad range of learning styles and their awareness of the problems they might encounter will be further promoted. Teachers' attention can be focused more on building students' knowledge and skills. Thus the school can ensure the quality of the teaching will improve [19].

The research findings of Taleb and Hassanzadeh [8] show that evolving educational technology in Iranian smart schools leads to a greater improvement in the learning and retention of mathematics than the traditional learning method. The results of this study are similar to the findings of a study conducted by Cabus et al. [30] on the effectiveness of using educational technology such as Smart boards for teaching Maths. The experiment was done for Grade seven in the Netherlands. According to the findings of this experiment, the Smart board contributed significantly in increasing the students' performance, and particularly for low performing students [30]. Utah State Office of Education reported the role that iPads played in their smart schools. The data analysis of the academic year 2012–2013 is used to generate benchmark assessment to measure students' achievements and engagement in the following years. The report shows that teachers who use iPads in their teaching will notice the difference in school management and instruction. The analysis showed a significant positive impact on improving students' learning opportunities through the use of educational technology [29].

2.5 Challenges of Implementing Smart Schools

Although it has been demonstrated that there are many benefits to implementing smart schools and adopting ICT in education, barriers and challenges have been

encountered. In their research study, Ong and Ruthven [31] conducted a study to evaluate the student outcomes in teaching science in a smart school by comparing two schools, a smart school with a traditional one. Even though the Malaysian smart school initiative is intended to prepare students in a developing economy and to enhance their scientific and technological knowledge, the study results show that student outcomes are not as expected [31]. Ming et al. [32] indicates this to be due to the lack of teacher training and professional development. Consistent results were obtained from another study conducted by Majeed and Yusoff [33], who highlight that teachers encounter a lack of access to training and professional development to improve their ICT skills. Besides not being provided with regular training, teachers are also challenged by a lack of school management support, which is not a top priority for the school, and time constraints that prevent them from exploring ICT tools [33]. In this regard Omidinia, Masrom [14] conducted a case study to identify the success factors for smart schools in Malaysia. They reported that teachers in Selangor progressed slowly during their training.

School principals are expected to be proficient in enhancing their competencies in ICT and they should act as role models for their staff in the use of ICT. Ibrahim et al. [17] analyzed much research in Malaysia and they found that teachers did not receive the required support from their school principals or heads.

The study of Ali et al. [34] about smart schools reveals that teachers were facing difficulties during the process of integrating ICT into their school. Difficulties include the time constraints, unrelated course content and technological issues such as server failure. In addition, teachers claimed that they could not prepare their lessons due to the insufficient time available to integrate ICT into these (lessons, and also, teaching time was shortened because the students took about five minutes to start their computers and more time was wasted if technical problems occurred, this study also demonstrates the absence of any school practices that involve teachers in the use of ICT in teaching. There were issues related to the accessibility of ICT equipment, teachers' willingness to change, teacher's confidence in innovation and teacher's knowledge of the use of ICT for teaching, and all these had an impact on the integration of ICT into the curriculum. Attaran et al. [16] have come to similar conclusions. According to their research interviews and observations, technical issues and wasting about twenty minutes of classroom time every lesson were also observed.

Dissertation research indicates that Southern Gulf Coast states have different challenges in equipping classrooms with interactive smart boards. Pourciau [35] in her study, identifies the challenges, which are (a) technical malfunctions, (b) lack of appropriate training and professional development, and (c) issues related to finding or create resources or materials for the smart board to use interactively with learners.

Efficiency and availability of ICT resources, and a lack of basic infrastructure and connectivity are considered to be other challenges faced during incorporating ICT into education. Obviously, without these facilitating conditions the integrated system, including web-based courseware and online management tools will not be accessible to the people concerned [32]. Fu [7] carried out a study on the challenges faced in the use of ICT in education. The researchers categorized the challenges or barriers into three groups: from a student's perspective; from a teacher's perspective;

and from an administrative and infrastructure perspective. His thorough literature review on a significant number of studies finds many challenges from a teacher's perspective, such as what the teacher's view is on the benefits of ICT use in the classroom is uncertain, and teachers' lack of clear ideas on how integrating ICT will affect students' learning. Furthermore, Kler [36] identifies resistance to change and having a negative attitude as one of the barriers from the teacher perspective. This is due to teachers' strong feelings and beliefs about their conventional teaching method. Hence, this resistance hampers the integration of ICT into education. However, Fu [7] further indicates that teachers' positive attitudes towards ICT are critical and act as a predictor of the degree of success achieved in integrating technologies.

A recent study was conducted by Kadhim [37] to measure the readiness of Iraqi schools for being transformed into smart schools by embracing ICT in schools. The study used a mixed quantitative and qualitative approach using teachers and staff from secondary schools of the General Directorate of Education in Babylon. The results reveal that transforming traditional schools to smart schools is not useful due to various challenges such as a lack of ICT and network infrastructure (Internet connection, local area network); teachers lack ICT competence to use software and communication tools; there is a lack of technical support, inadequate educational budgets allotted and lack of a proper comprehensive plan to standardize different educational projects to have smart Iraqi schools [37].

In addition to this research, in their paper, Khan et al. [38] discover what is hindering the integration of ICT into education in Bangladesh, an example of another developing country. Lack of ICT-supported infrastructure, lack of equipment resources, high cost, the absence of a proper plan and vision, teachers' acceptance, attitudes and beliefs towards the use of ICT and teachers' lack of skill and knowledge are some of the barriers. Definitely, developing and integrating ICT into the curriculum and learning environment is time-consuming.

3 Research Methodology

This study aims to explore the challenges the school and service provider faced during the implementation of an ICT bundle to transform schools into smart schools and to give some recommendations about overcoming the challenges encountered. The researchers applied the inductive approach to building theory from the data gathered through observations, interviews and intuitive understanding [39]. The purpose of an inductive approach is to gain a better understanding of the nature of the problem, with an emphasis on why an event occurs rather than describing what happens [40]. Therefore, the researchers used the inductive approach to build an understanding of the meaning of the challenges faced during the implementation of smart schools in Oman. They also explored the issues facing schools after implementing the Smart School Initiative. An exploratory study was also conducted which aimed to gain knowledge of the participant's perceptions, views about the challenges of integrating

an ICT curriculum into smart schools. The output from the exploratory study was used as the initial data to build a research conceptual framework.

This research uses qualitative case study strategy. Saunders et al. [40] highlight the difference between qualitative and quantitative study design. ‘Qualitative’ refers to non-numerical data and ‘quantitative’ refers to numerical data. Furthermore, Kumar [41] argues that qualitative study design is more suitable if the research intends to explore, understand and simplify a group of people’s concerns about their beliefs and experience. A case study is mainly one of the study designs in qualitative research. However, it can also be used in quantitative research [41]. A case study helps to give a richer understanding of the studied research context by collecting data through multiple techniques or sources such as interviews, observations and documentary analyses [40].

This research uses the multi-method case approach in both schools. Methods include face-to-face semi-structured interviews with the person in charge of the Smart School Project in both schools and with the project manager from a service provider of a reputed telecom company. According to Hyland [42] interviews offer an interactive way of gathering information in order to understand people’s experience and attitudes and it provides a greater flexibility for explanation. Semi-structured interviews are conducted to gain an essential insight into the research context and are useful in exploring the research questions and objectives in more depth by asking additional questions, as opposed to structured interviews [40], which are more rigid. The research was carried out using in-depth face-to-face interviews with selected teachers in order to provide a deep understanding and seek a wide viewpoint on the difficulties experienced in integrating ICT in each of the two schools. This technique helps to promote researchers’ understanding and to explore the interviewees experience and opinions in regard to the challenges they faced [43].

3.1 Classroom Observation Protocol

In addition to the research conducted in the classroom, non-participant observations with teachers and students were also carried out in order to evaluate the use of ICT in teaching and to identify the challenges faced during the class. Kumar [41] defines ‘non-participant observation’ as a state where the observer behaves like a passive listener, watching a particular situation without involving themselves in the group activities and without taking notes and drawing conclusions on the observed object.

After collecting all the information from the above-mentioned methods, the researchers conducted an analysis of all the data collected during the interviews and observation in order to draw conclusions and give recommendations to overcome the challenges. This information is recorded using a tape recorder and taking notes, and is also obtained from the minutes of the meetings.

3.2 Research Conceptual Framework

An intensive literature review was carried out to understand the concept of smart schools and the challenges faced during their implementation in Oman, and particularly regarding the adoption of ICT in education. An exploratory study was also conducted to explore the challenges, from the school side and from the service provider, in the implementation of smart schools. Based on these investigations a research conceptual framework is built as shown in Fig. 1.

4 Data Analysis

Different methods were used in this research project. In the qualitative approach a researcher can look for data in terms of “patterns, themes, categories and regularities” [44] collected from the participants to elaborate their experiences and to provide a better understanding of the research studied. A thematic approach was applied during the research to sort out the responses provided by the teachers, person in charge, service provider and school IT administrators. Data sets generated by interviews and classroom observations were collected and arranged manually in accordance with the themes on different perspectives such as the teachers and person in charge, service

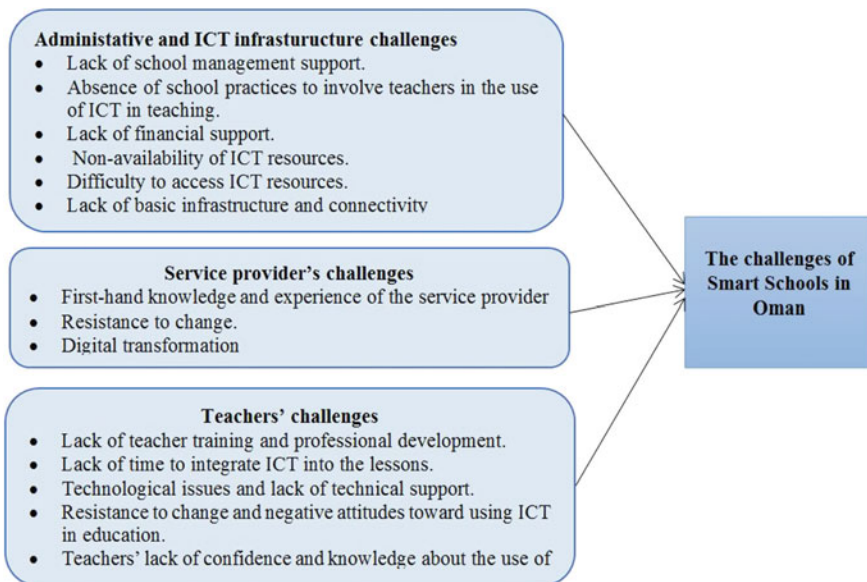


Fig. 1 Research conceptual framework

provider and school IT administrators. The researchers categorized the main themes and analyzed each one separately.

5 Results and Discussion

This section presents the analysis of the fieldwork conducted at a school that has implemented a Smart School Project and the service provider for the implementation of smart schools. The purpose was to investigate Research Question 1, namely: What challenges could the smart schools face during their implementation in Oman? The process began with interviews with the service provider project manager, the person in charge and the school IT administrators. The field work was concluded with in-depth interviews with the Science, IT, Maths and Social Studies teachers who were involved in the smart schools' project, followed by classroom observations in each of those subjects.

5.1 Understanding the Challenges of Smart Schools: Interview with the Person in Charge

The person in charge of the Smart School Project was interviewed to obtain information about the challenges of implementing the smart schools project in the school concerned. A number of detailed results are drawn from the outcome of the interview with the person in charge through four themes that reveal the aims of the interview.

Professional Training

The person in charge emphasized the importance of providing enough professional training to the teachers so that they could gain confidence and skills. She pointed out that the element of confidence and training should be linked with other competencies to use ICT. Thus, providing enough training is essential in order to increase the teachers' confidence and satisfaction in the integration of ICT into education effectively.

Technical Issues

Technical issues are another factor hindering the implementation of ICT into the curriculum. This problem is stressed by the person in charge to be one of the most important factors limiting the continued viability of ICT in the teaching and learning process, as it hinders the smooth delivery of the lesson.

Financial Support

The person in charge also stressed the importance of financial support for the smooth functioning of the smart schools. She elaborated that the integration of ICT depends on the financial capabilities of supporting its use in an effective and sustainable

manner. For instance, funds are essential to meet Smart School Project expectations, support existing IT assets and invest in new ones.

Resistance to Adopting the Use of ICT in Education

There were few instances of teachers' unwillingness to adopt technology in connection with the implementation of smart schools. Teachers' lack of knowledge and competencies in integrating ICT into education could be one of the reasons for an unwillingness to change things

5.2 Understanding the Challenges of Smart Schools: Interviews with the Service Provider and Manager of the Smart Schools Project

The service provider was interviewed to obtain information about the challenges faced from their perspective. The interview revealed three themes that investigated the service provider's perceptions and views towards challenges hindering smart school integration.

First-Hand Knowledge and Experience of the Service Provider

This is considered to be the biggest challenge faced by the service provider in the implementation of smart schools. The service provider has no prior experience in the education sector and he is quite unaware of the problems to be faced during the implementation since this project of smart schools is a new and unique one. No such service was offered by anyone before in Oman. As indicated by the interviewee, this was the challenge when they started working on the project.

Resistance to Change

Everyone finds change hard to accept. This is what the service provider encountered during the implementation of the project. The Smart School Project will require changes in the school environment, as it is considered to be one of the digitalization transition processes for the school to go through. Indeed, the service provider did experience some resistance from the teachers, and especially those who had been working using the conventional model for a very long time. Service provider and smart school manager explained this by saying:

It took some time before the teachers accepted to be given training. (Service Provider Interview: Respondent 1)

Digital Transformation

The service provider and manager of the smart school demonstrated that transformation of a school or a teaching infrastructure is considered to be a challenge because it cannot be done all of a sudden. It has to be set up for transformation. He commented that the school should introduce steps for the change one by one. It will work as a gradual process. He supported this by saying:

By putting everything digital smart boards, devices and content it will not work. (Service Provider Interview: Respondent 1)

5.3 Understanding the Challenges of Smart Schools: Interviews with IT School Administrators

The IT administrators also mentioned the challenges that they faced during the implantation of ICT in smart schools. Some of the students could not remember their confidential password and had to reset the passwords again and again. Sometimes they faced a lot of problems due to the operational failure of electronic devices.

5.4 Understanding the Challenges of Smart Schools: Interviews with Teachers

The result of this study shows the different challenges faced by the teachers of the school where the Smart School Project is implemented. The researchers discovered technical, professional and management issues. The detailed outcomes are described in the subsections below through two themes. The researchers also noticed some issues related to the students' attitude towards teachers and learning during the integration of the ICT curriculum.

Technical Issues

In-depth analysis of the teachers' interviews highlighted many issues related to the connectivity of Wi-Fi in smart schools, and there were also issues with devices' battery charging. License-related issues for the smart board device were also reported. Lack of availability of electronic devices was another issue. Some teachers pointed out the irresponsive nature of the students during the course of study. Many students were reluctant to bring their iPads regularly and some of them were not charging them properly. There were also instances of losing devices or damaging them. Upgrading or updating operating systems of software is often time-consuming and this disrupts the teaching and learning transactions.

Professional and Management Issues

The second major issue pointed out by teachers is the lack of proper training on how to integrate the technology effectively. The teachers received only basic training to use software and tools like smart boards. Some of the teachers were exposed to self-learning, and they collaborated with each other to cascade learning objectives. Most of the teachers suggested that school management should provide them with professional training. One of the Maths teachers found it difficult to use the iPad for the classes assigned to her due to workload. Furthermore, she found it difficult to

complete the syllabus using an iPad since it was too time-consuming due to technical issues. So she experienced the shortage of time to integrate ICT during the lesson delivery. An instance was also reported by one of the students who refused to use an iPad, although most of them were used to use the new technology.

Issues such as lack of professional training can hinder ICT integration into the teaching process. Most of the teachers, however, were willing to use ICT creatively in the teaching process because it expanded the students' knowledge and enabled them to become more independent.

5.5 Classrooms Observations

Classroom observations were conducted at the school in five different classes: for Science, IT, Social Studies and for two Maths classes. The observations were made without disrupting the learning environment. Two themes are drawn to summarize the results of the classroom observation.

Technical Issues

During the classroom observation one of the teachers was forced to use the white board since the smart board was not working properly due to technical issues. The researchers noticed that one student was using the teacher's iPad since his electronic device was not working due to a technical issue.

Students' Conduct and Behavior

Some of the students were not attentive towards the teacher during the lesson delivery. In particular, it was observed that a few of the students were busy with their iPads, browsing the internet while the teacher was explaining the syllabus. On the other hand, the observation indicated that most of the students tended to be more dedicated towards learning when using smart boards and using their iPads to do their assignments.

6 Conclusion

This research aimed to explore the challenges faced during the implementation of the Smart School Initiative in Oman. The research investigated the viewpoints of the service provider, teachers, person in charge and school IT administrators. The main findings that were revealed from this research are as follows:

- Results indicate that teachers integrate ICT into education with diverse degrees of effectiveness despite the challenges that impede such integration (e.g., technical, professional and managerial issues).

- Most of the people in charge highlighted the challenges of changing a traditional school into a smart school which can be categorized into professional, technical and financial levels. They also pointed out that there was a certain amount of resistance to using ICT in education. However, the school management is highly excited about converting their school into a smart school as it will be beneficial for the status of education, preparing the students for the 21st Century and helping them to become more independent.
- The results from the interviews indicate that service provider faced some challenges in implementing the smart school at the operational level due to the first-hand knowledge and experience and the parents' unwillingness to adapt to the new digital system.
- School IT administrators also encountered some challenges such as creating so many student accounts and keeping on having to reset the students' passwords every time they forgot them.
- Technical issues and the students' negative attitude are the two challenges noticed with regard to classroom observation.

After identifying the challenges that were encountered during the implementation of smart schools, the researchers recommend the following actions for the effective functioning of smart schools in Oman:

- Enhance teachers' ICT competencies and skills by providing ongoing training on how to integrate ICT into education, such as how to use smart boards, educational software and classroom management software.
- Provide teachers with sufficient time so that they can learn and plan efficiently to integrate ICT effectively into teaching and learning processes.
- Provide teachers with professional development training in classroom management.

The study faced one main limitation, which was the small sample size, i.e. two case studies of smart schools in the Muscat area, which might affect the research findings. Therefore, further studies are recommended, in which a larger sample size should be used in order to obtain a holistic picture and make it possible to generalize results regarding the challenges of implementing smart schools in Oman.

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