

**A CASE STUDY IN THE ADOPTION OF ICT IN
TEACHING AND LEARNING AT A
MALAYSIAN SMART SCHOOL**



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A CASE STUDY IN THE ADOPTION OF ICT IN TEACHING AND
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ZAENAB S. ABDUL MAJEED

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Thesis submitted in fulfillment of the requirements
for the award of the degree of Master of Humanities Technology
(Technology Enhanced Language Learning)

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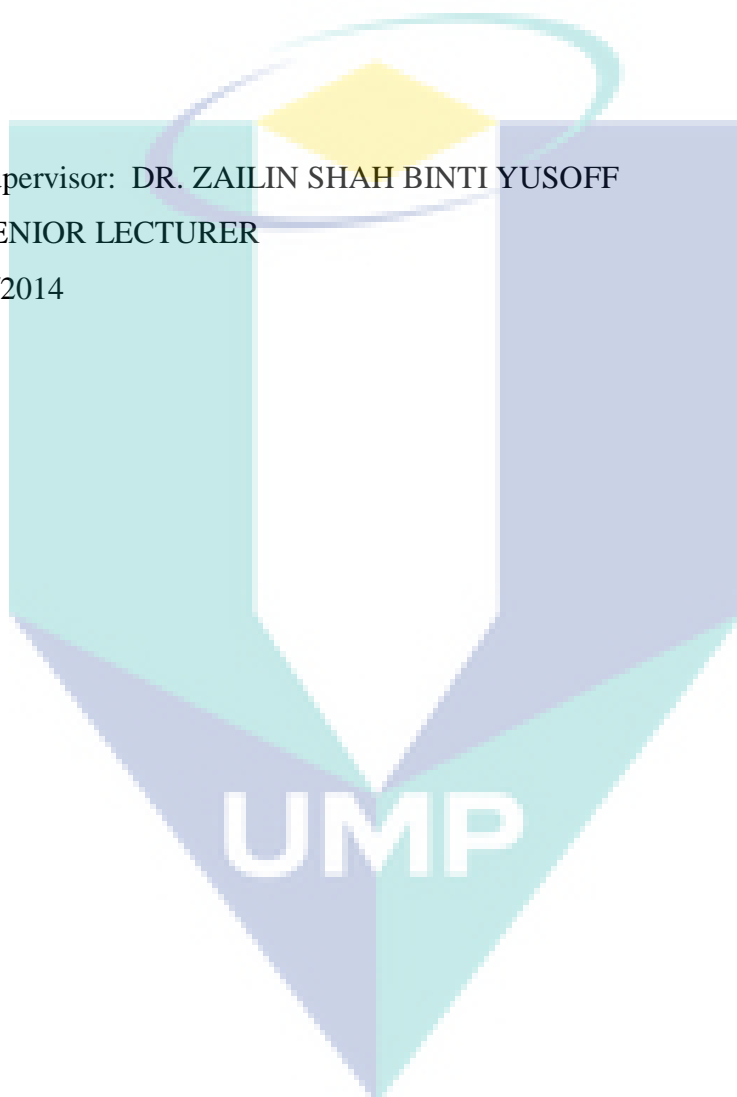
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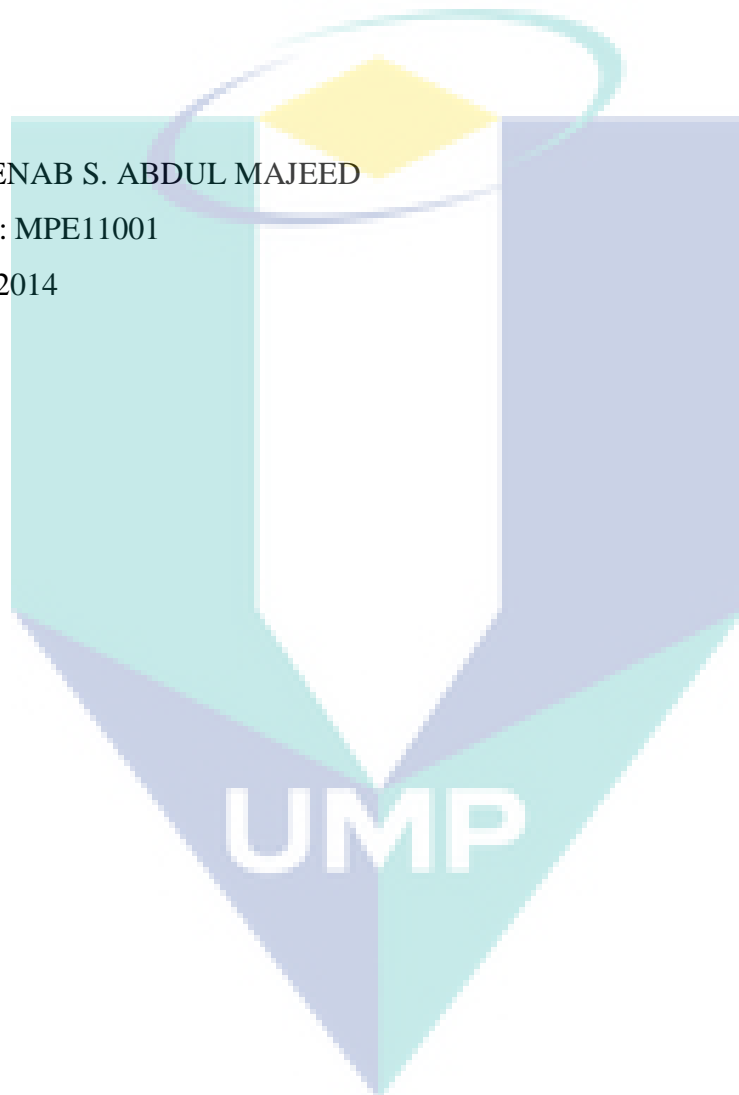
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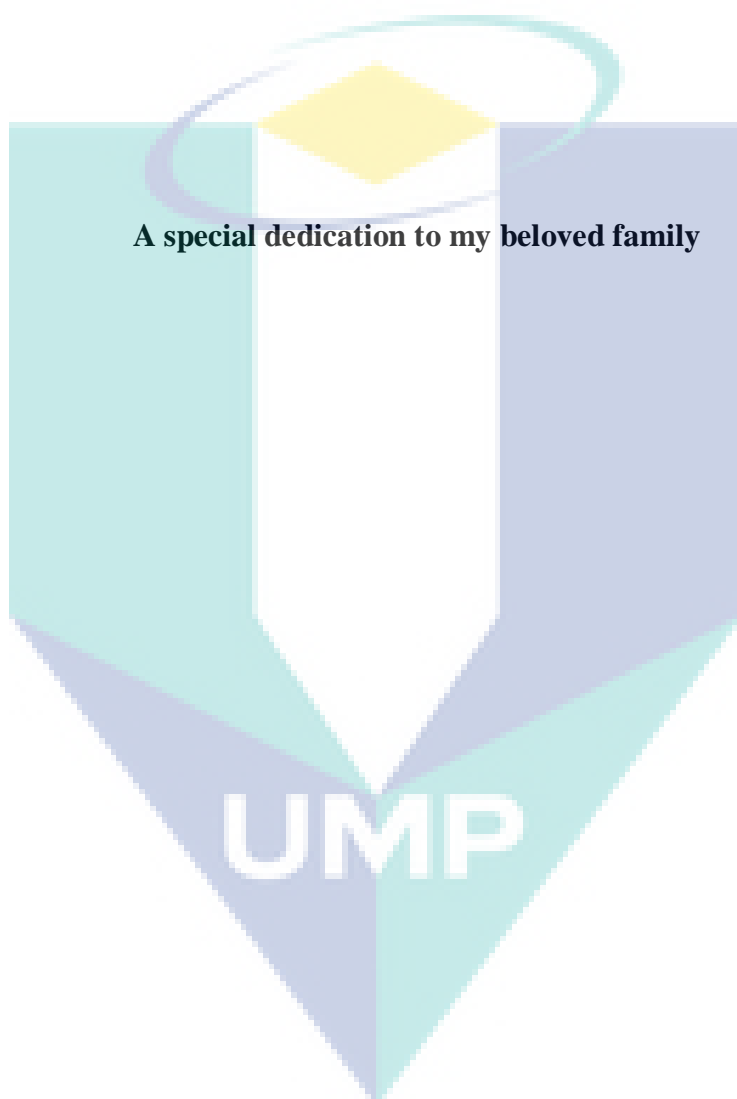
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A special dedication to my beloved family

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ACKNOWLEDGEMENTS

In the name of Allah, the Most Benevolent, the Most Merciful. First of all, I wish to record immeasurable gratitude and thankfulness to the One and The Almighty Creator, the Lord and Sustainer of the universe, and the Mankind in particular. It is only through His mercy and help that this work could be completed and it is ardently desired that this little effort be accepted by Him to be of some service to the cause of humanity.

I would like to take this opportunity to express my eternal gratitude to my supervisor Dr. Zailin Shah Binti Yusoff for her constant guidance and encouragement. She always appreciates whatever little progress I have achieved, and continuously gives me much inspiration by sharing her precious attitude, knowledge and experience.

A special thankfulness must be conveyed to University Malaysia Pahang (UMP) for the real support of offering me a suitable environment to study; and to the staff from the Center For Modern Languages & Human Sciences. A special thanks goes to Assistant Prof Dr. Kais Raad and Associate Prof. Dr. Ahmed N. Abdalla and Dr. Liu Yao, for their invaluable comments and useful suggestions to further improve the research.

Most importantly, my beloved husband and beautiful daughters (Areej, Alak and Rayaheen) for making my study progress easily and smooth. To my parents and mother in-law for their support, encouragement and doa'a of my brothers, sisters and also my sister in-law Dr. Layla Raad for her support and sharing her experience with me. They should receive my greatest appreciation for their enormous love and confidence for always giving me their tremendous support over the years. A final note of thanks goes to all my friends for the nice moments I spent with them, providing me many amazing ideas and insights

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ABSTRACT

Over the past number of years there has been a move towards using ICT in teaching and learning in Malaysia. This study explores factors that affect secondary school teachers' adoption of ICT in the teaching and learning environment in a Malaysian smart school. A self-administered questionnaire was issued to all teaching staff (n=73). A random sample of key teachers interviews (n=10) were also used to provoke more elaborate responses on the participants' experience in using ICT for teaching and learning as well as to gain a deeper understanding of the reasons for the responses given in the questionnaire. Descriptive analysis (frequency and percentages) were performed, and non-parametric tests (binomial and chi-square tests) were conducted on the data collected from the questionnaires. The emerging themes from the interview data were recorded for analysis. The results revealed that the participants were at the Utilisation level of ICT adoption (Hooper & Rieber, 1999). Most of them have a positive attitude toward ICT adoptions; they were willing and interested to use ICT, specifically computers in the classroom. The participants used ICT tools to prepare exam materials, content, worksheets and handouts for their teaching. They also used the internet and internet-based applications for sharing ideas/ resources for teaching and learning, and communication with other teachers. In addition, the participants felt competent and confident when they used ICT in the classroom. However, it was also found that the participants felt that: (1) using ICT in teaching took up too much time, (2), the school management did not provide enough training to improve their ICT skills, and (3) even though the school management supported ICT adoption in teaching and learning but they did not put it as a priority. These factors were considered as barriers and there was a significant association ($p < .05$) between teachers' perception and barriers that teachers thought may affect ICT adoption. In conclusion, the findings indicate that the participants were positive about the adoption but several factors were barriers which that they were unable to progress from a lower level to a higher level of adoption. Recommendations include allocation of time to prepare ICT resources and lessons, further training for teachers and increase in the number of computers at the school.

ABSTRAK

Semenjak beberapa tahun yang lalu langkah ke arah menggunakan ICT di dalam pengajaran dan pembelajaran telah dipertingkatkan. Kajian ini meneroka faktor-faktor yang member kesan ke atas penerimaan guru-guru sekolah menengah terhadap. Kaedah kajian kes telah digunakan untuk menyiasat dan menentukan factor yang mempengaruhi penerimaan guru terhadap penggunaan ICT di sebuah Sekolah Bestari (Smart School) di Malaysia. Satu soalselidik telah digunakan ke atas tenaga pengajar ($n = 73$) di sekolah tersebut. Temuduga ke atas guru yang dipilih ($n = 10$) juga digunakan untuk mendapatkan jawapan yang lebih terperinci berkaitan pengalaman dalam menggunakan ICT untuk pengajaran dan pembelajaran dan juga untuk mendapatkan pemahaman yang lebih mendalam tentang jawapan yang diberikan di dalam soal selidik. Analisis deskriptif; kekerapan dan peratusan dikira, serta ujian bukan parametric; ujian binomial dan chi-square juga dijalankan ke atas data yang diperolehi daripada soal selidik. Tema-tema yang muncul daripada data temubual telah dirakam untuk dianalisis. Keputusan mendedahkan bahawa sample kajian adalah pada peringkat Utilisation (Hooper & Rieber, 1999) dalam penggunaan ICT mereka ICT walaupun kebanyakannya mempunyai sikap yang positif terhadap penggunaan ICT. Mereka bersedia dan berminat untuk menggunakan ICT, terutamanya penggunaan komputer di dalam kelas. Para peserta menggunakan alat ICT untuk menyediakan bahan-bahan peperiksaan, kandungan, lembaran kerja dan edaran untuk mengajar pengajaran. Mereka juga menggunakan internet dan aplikasi berasaskan internet untuk berkongsi pendapat / sumber untuk pengajaran dan pembelajaran, dan berkomunikasi dengan guru-guru lain berkaitan matapelajaran. Selain itu, para sampel kajian merasakan mereka kompeten dan yakin menggunakan ICT di dalam bilik darjah. Walau bagaimanapun, kajian juga mendapati bahawa para peserta merasakan bahawa: (1), menggunakan ICT di dalam pengajaran mengambil terlalu banyak masa, (2), pengurusan sekolah tidak menyediakan latihan yang cukup untuk meningkatkan kemahiran ICT guru di sekolah tersebut dan (3), walaupun pengurusan sekolah menyokong penggunaan ICT di dalam pengajaran dan pembelajaran, mereka tidak meletakkan ia sebagai satu keutamaan. Faktor-faktor ini dianggap sebagai halangan dan terdapat hubungan yang bererti ($p < .05$) antara persepsi dan halangan tersebut. Kesimpulannya, beberapa faktor halangan telah membuatkan mereka tidak dapat maju dari tahap rendah ke tahap yang lebih tinggi dalam penggunaan ICT. Cadangan dari kajian ini termasuk peruntukan masa diberikan untuk guru menyediakan bahan pengajaran dan pembelajaran berasaskan ICT, latihan lanjut untuk guru dan peningkatan bilangan komputer di sekolah tersebut.

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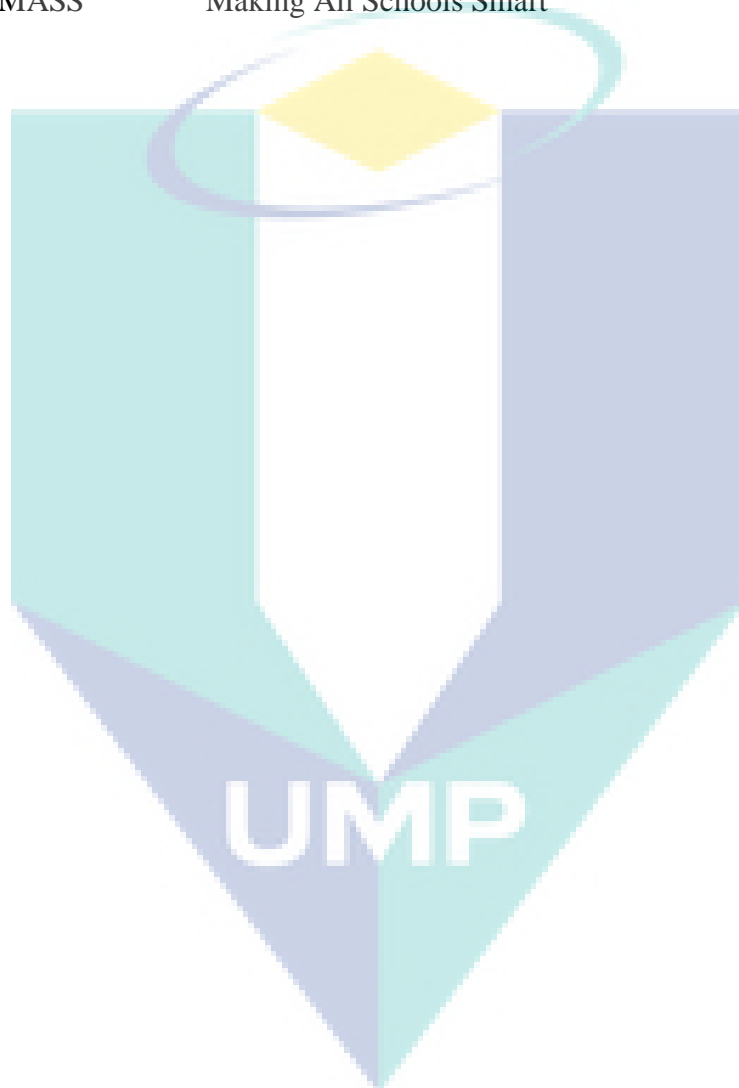
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LIST OF ABBREVIATIONS

ICT	Information Communication and Technology
MOE	Ministry of Education
MSC	Multimedia Super Corridor
MASS	Making All Schools Smart



CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

The rapid growth in Information Communication and Technologies (ICT) has brought remarkable changes in the twenty-first century, as well as affected the demands of modern societies. ICT has become increasingly important in our daily lives and in our educational system. Consequently, there is a growing demand on educational institutions to use ICT to teach the skills and knowledge students need for the 21st century (Gülbahar, 2007). It is assumed that the integration of ICT into education has a significant potential to revolutionise an outmoded educational system (Albirini, 2006). Realising the emerging importance of ICT at the workplace and in everyday life, today's educational institutions have tried to restructure their educational curricula and classroom facilities, in order to bridge the existing technology gap in teaching and learning (Baek et al., 2008). This restructuring process requires effective adoption of technologies into an existing environment in order to provide learners with knowledge of specific subject areas, as well as to promote meaningful learning and to enhance professional productivity (Tomei, 2005). In addition, the investigation on ICT for educational purposes is also significant. Thus, it is essential that studies are conducted to investigate the factors contributing to effective integration of ICT in teaching and learning and learn from successful integration of ICT in education.

Essentially, this chapter provides an overview of what motivates the researcher to carry out the study. It begins with a brief background of where this study was conducted, followed by the statement of problem, research objectives, research

questions, definition of terms, and significance of the study and limitations of the study.

1.2 BACKGROUND OF STUDY

Technology can have a reciprocal relationship with teaching. The emergence of new technologies pushes educators to understand and leverage these technologies for classroom use. Simultaneously, the on-the-ground implementation of these technologies in the classroom can depend on how these technologies are utilised (Latio, 2010). One such technology implemented for teaching and learning is the use of ICT in classrooms. Information and Communication Technology (ICT) is an umbrella term that applies to a range of digital communication devices and applications such as 'digital television, radio, internet, network hardware and software, video conferencing, and distance learning tools' (Kumar, 2008: p. 556). Lever-Duffy et al. (2005), however, report that some 'educators may take a narrower view' and are likely to 'confine ICT primarily to computers, computer peripherals and related software used for teaching and learning' (p. 4 -5).

In terms of integrating technology in teaching and learning, Malaysia has embarked on several technology initiatives to spearhead the utilisation of ICT particularly at the turn of the 21st century. The initiatives were brought forth with the aim of motivating rapid economic growth and development. With the vision of becoming a developed nation by the year 2020, Malaysian Ministry of Education (MOE) implemented several ICT programmes in schools nationwide in an attempt to bring technology into the classrooms. This was started with programmes such as the Computer Literacy Pilot Project, Computer in Education, Computer Aided Instruction and Learning, National Educational Network, Munsyi Network and Smart Schools (Rosnaini & Mohd, 2009)

In line with the objectives of Vision 2020 and the aims of the National Philosophy of Education to foster the development of a workforce prepared to meet the challenges of the 21st century, the Malaysian Smart School Project was launched in July 1997 (Rosnaini & Mohd, 2009). The smart school initiative is one of the seven flagship

applications that are part of the Malaysian Multimedia Super Corridor (MSC) project. This initiative began with the launch of a pilot project with a group of 88 schools in 1999. The schools served as the nucleus for the eventual nationwide Smart School concepts, materials, skills and technologies (Bakar & Mohamed, 2008). The introduction of the Smart School Project saw a change in the educational system; from conventional learning and examination-oriented culture to an electronic learning system or e-learning. In this context, the Malaysian Smart School is defined as a learning institution that has been systematically reinvented in terms of its teaching and learning practices as well as school management in order to prepare Malaysian children for the information age and fulfil vision 2020 (The Malaysian Smart School Flagship Application Blueprint, 1997).

To guarantee the success of the proposed conceptual model of teaching and learning, these Smart Schools required effective and efficient management of the resources as well as the teaching and learning processes. The schools were provided with learning materials which included interactive coursewares and printed materials for Mathematics, Science, English and *Bahasa Melayu*. These enabled students to practice self-paced, self-accessed and self-directed learning (Light, 2011). In addition, teachers, including trainee teachers and related personnel were trained for the smart school expansion. Educator preparation and Development programmes for new and practicing teachers, administrators, curriculum developers, ICT coordinators, counselors and librarians were also provided (Baek et al., 2008). Training is important for the implementation because in the future the personnel will not only function as providers of information but also as facilitators of teaching utilising ICT. Other efforts included upgrading the ICT infrastructure in the schools, enhancing the teaching and learning materials through courseware development for the subjects involved in the programme and disseminating existing courseware to all schools (Light, 2011).

As a result of the adoption of ICT in the education system, the need for knowledgeable teachers who knew how to use ICT tools effectively became a pressing issue (Mayrath et al., 2010). Preparing future teachers who could integrate effective use of ICT in their curriculum remained a challenging goal for teacher trainee programmes (Afshari et al., 2009). This was because teaching with new and emerging ICT was a complex task and could be intimidating and frustrating for teachers (Almekhlafi &

Almeqdadi, 2010). In a study conducted by Hooper and Rieber, (1999) five phases of teachers' adoption of ICT were identified which were: familiarisation, utilisation, integration, reorientation, and evolution (p. 252) (see pgs. 13-15). What the researchers concluded in the study was that most teachers never proceeded to the utilisation stage. This was due to the fact that teachers became content with their technology use at their current level and did not put much effort into consistently increasing their skills. Therefore, the utilisation stage was not adequately achieved or mastered by most teachers, regardless of their familiarity with technology outside of teaching and learning.

Consequently, it could be said that technology use at the utilisation level is common in education and teachers often thought that they had achieved the integration stage but in actual fact they had not passed utilisation (Brinkerhoff, 2006). This form of technology use is considered low level technology use which included basic computer usage for such things as emailing, creating Word documents and worksheets, taking attendance, and other common tasks that simplify the day to day task of the teacher. Use of technology at this level did not directly impact the learner (Hooper & Rieber, 1999) and definitely did not portray a good return on investment. There may clearly be juxtaposition between the objectives of ICT integration in teaching and learning with how teachers implemented technology in the classroom. In order to gain a better understanding of the factors surrounding this issue it is important to review the situation in greater detail. Reflecting on the issue of teacher's low level technology use, it would be beneficial to investigate at which level are Smart Schools' teachers' use of technology for the purpose of teaching and learning. In addition, these findings may consequently reflect on the factors affecting the adoption of ICT.

1.3 PROBLEM STATEMENT

Andoh (2012) highlighted in his study that although ICT is viewed as a golden key in facilitating technology-enhanced, student-centred teaching and learning environments, the current level of ICT implementation has not yet reached a widespread audience. It was obvious that the gap between the innovative implementation objectives set down by government initiatives to encourage ICT and the actual adoption of ICT in

the classroom needed to be investigated further to gain a more informed insight into the current situation.

Although Malaysia has introduced technology into the classrooms specifically at Smart Schools, more than a decade ago, research findings have shown that teachers were not optimising on what technology has to offer. ICT usage among teachers was found to still be quite low (Robiah et al. 2003; Mohd Jasmy et al., 2003; Ashinida et al., 2004). Several factors are highlighted as barriers to teachers using ICT for teaching and learning purposes. Factors such as knowledge, training, attitude, perception, commitment (Andoh, 2012), gender, age, experience in using ICT (Angeli & Valanides, 2008), access to a computer, ICT training experience and support (Almekhlafi & Almeqdadi, 2010), confidence level in using technology, access to facilities, courses and training attended that lacked focus on pedagogical skills and teachers' reluctance to change their teaching practice (Ministry Of Education, 2001) were frequently cited and associated as barriers to successful ICT adoption in schools. However, there is little related research which has been conducted with regards to these factors Malaysian Smart Schools. Even though it is a nationwide initiative garnering a huge budget from the taxpayers' money more than a decade ago to support government plan and conduct researches (UNESCO, 2002).

The researcher proposed that by investigating teachers' use of ICT and identifying factors that contributed towards teachers' use of ICT in the classroom, the barriers that might affect on ICT adoption in teaching and learning in Malaysian Smart Schools might provide some insights as to what extent the usage of ICT in teaching and learning has been embraced in a smart school. Conclusions and recommendations can then be put forth to facilitate enhancement or improvement of the adoption. While it appears that a number of research studies have been undertaken exploring the different aspects of ICT use in secondary schools there is very limited data available relating to Malaysian Smart Schools. For these reasons the researcher concluded that this area warrants further investigation.

1.4 RESEARCH OBJECTIVES

The objectives of this study are:

- 1.4.1** To investigate the availability of ICT tools and teachers` adoption of ICT in teaching and learning at a Malaysian Smart School.
- 1.4.2** To identify factors affecting adoption of ICT use and the relationship with perception of ICT adoption in teaching and learning.

1.5 RESEARCH QUESTIONS

The following research questions are formulated based on the objectives above:

- 1.5.1** What are the ICT tools available at the school and to what extent do the teachers use ICT in teaching and learning?
- 1.5.2** What are the teachers` perceptions towards the adoption of ICT in teaching and learning?
- 1.5.3** What are the factors that contribute to the teachers` use of ICT in teaching and learning?
- 1.5.4** Is there an association between teachers` perception of ICT adoption and factors that contribute to the use of ICT in teaching and learning?

1.6 DEFINITION OF TERMS

Definition of terms used in the study is to assure a common understanding of the meaning for all terms used throughout the study.

- 1.6.1** ICT: Information and Communication Technologies which refers to the broad uses of technology in schools (Abuhmaih, 2011). In this research the term ICT will be applied to any computer-based technologies, whether networked or stand-alone, including both hardware and software, which can be used for teaching and learning purposes.

1.6.2 ICT adoption: Is referred in recent years, with the fast growing of rising technologies, the integration of ICT has progressively attracted the attention of teachers. A simple combination of hardware and software will not make integration naturally. Other studies view ICT adoption as teachers using ICT in the classroom or schools using ICT for administrative purposes (Washington State, 2005).

1.6.3 Teaching and learning: Teaching is undertaking certain tasks or activities with the intention of which is to induce learning (Embedded Learning Academy, 2008).

1.7 SIGNIFICANCE OF THE STUDY

This study will provide knowledge to the teachers and those who are interested in the use of ICT in teaching and learning and it will help to improve the level of ICT integration in Malaysian Smart School specifically. Teachers and policy makers can utilise the results of this study when implementing the policies pertaining to adoption of ICT in secondary schools. Specifically, it can help them decide if they will get any significant return on their investment from ICT infrastructure. This study can also benefit teacher trainers by providing insights on the needs of teachers using ICT and tailor training on how ICT can be used efficiently and effectively in teaching and learning. Additionally, this study will act to provide awareness and a reference to teachers who are interested in using ICT in their teaching and learning on the factors that may influence their adoption of technology.

It is also hoped that the study will provide information on the use of ICT in secondary schools. The study will equally serve as a document for school management and authoritative bodies to plan for successful adoption of ICT for educational purposes. Consequently, it can stimulate future relevant research, enhancement as well as improvement programmes.

1.8 SCOPE OF THE STUDY

The school chosen for this research is one of the smart schools in Kuantan, Pahang. The school was one of 88 smart schools in Malaysia which was chosen to

become a smart school in the year 2000. The data is collected through the administration of questionnaire and interviews with teachers and school administration of the school. There are 73 participants for the questionnaire and 10 participants for the interview. The study mainly focused on the teachers' utilisation of ICT at the school, the tools that have been used by the teachers, also the research focused on teachers' perceptions toward the ICT adoption, the factors affecting on ICT integration and finally to find out if there was association between the teachers' perception of ICT adoption and the factors that contribute to use of ICT in teaching and learning.

1.9 LIMITATION OF THE STUDY

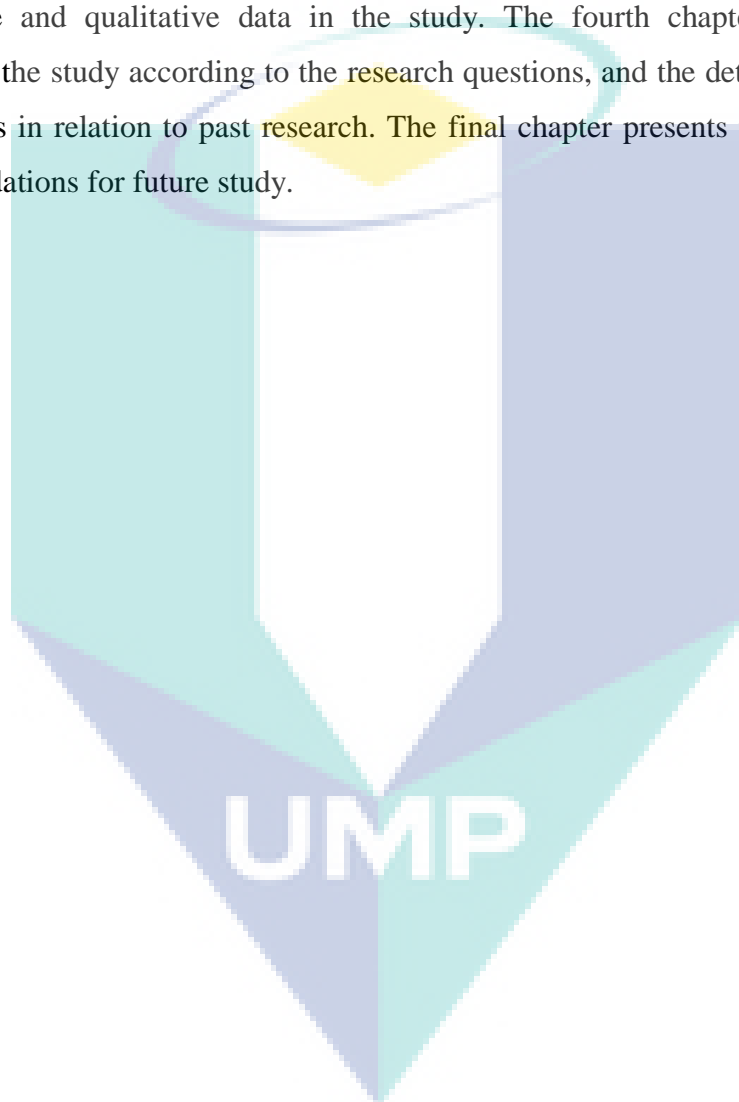
There are two major limitations that are derived from this study. The first limitation is the small sample size which makes generalisation to the broader community not viable. However, since this case study is aimed at analytical rather than statistical generalization, the in-depth description in the report is sufficient at explaining the uniqueness of this case for readers to make analytical generalisations (Yin, 2009).

Second, the gatekeeper gave limited access to the researcher during the data collection process. Therefore, the researcher was not able to randomly select participants because the gatekeepers were the ones who selected them. However, case study research design allows for this. The rigour, or trustworthiness, of a study may be established if the reader is able to audit the actions and developments of the researcher through an audit trail. It addresses the issue of whether there is consistency between the participants' views and the researcher's representation of them. A research study may be shown to be dependable by producing evidence of a decision trail at each stage of the research process, according to Koch (2006).

1.10 THESIS ORGANIZATION

The first chapter provided an overview of the study which include information on the background of the study and statement of the problem, research objectives and questions, as well as the significance and limitation of the study. The second chapter

which is the literature review discusses the relevant literature related to the study such as: ICT in education and the framework of ICT integration in schools. It also looks at teachers' attitude towards ICT, and the factors contributing to teachers' use of ICT in the classroom. The third chapter introduces the implemented methodology, specifically; it presents the research design, description of the reliability and validity, the context, the participants, the data collection instruments and analysis procedures used for both quantitative and qualitative data in the study. The fourth chapter presents salient findings of the study according to the research questions, and the detailed discussion of the findings in relation to past research. The final chapter presents the conclusion and recommendations for future study.



CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

There is no doubt that the use of ICT in education is increasing (Adedeji, 2010). In the past number of years a number of countries have experienced investment in school ICT facilities. For example, the government of Malaysia launched the Multimedia Super Corridor Project (MSC Malaysia) which set out to develop Malaysia as part of global information and communication technology (ICT) industry (Bakar & Mohamed, 2008). The aim was to transform Malaysia into a knowledge based society. The investment in ICT has been broadly welcomed by educators but the large investment for this provision of resources has led researchers to investigate how ICT is being integrated into the classroom and to examine the factors affecting ICT use by teachers. This chapter will highlight relevant literature on the place of ICT in education and factors influencing adoption of ICT in teaching and learning.

2.2 ICT IN EDUCATION

The growth of the knowledge society and the pervasiveness of technology represent not only a major challenge but also opportunity for education (Liu, 2010). Lim and Chai (2008) report on the positive pedagogical opportunities of incorporating the World Wide Web into the classroom as a source for up-to-date information while also encouraging independent thinking as well as learning amongst learners. Lawless and Pellegrino (2007) also observe the huge potential of ICT in supporting and enhancing home schooling. Jang (2006) in turn comments on the opportunity presented by the technology for collaborative online learning. Specifically in encouraging discussion and

sharing of resources which be beneficial to both the teacher and student to improve ICT adoption. Zailin (2010) concur that ICT, in particular student involvement in online communities through the use of wikis and blogs can be successful in encouraging students who are reluctant to participate in normal classroom discussions. This active online involvement has been reported to improve students` writing skills (Chen & Chen, 2008; Zailin, 2010). Thus, the studies show that the benefits of using ICT in education provide abundance of resources, support home schooling, encourage students to participate, sharing of sources and ideas and improves writing skills.

Investment in ICT has led many researchers to investigate how ICT is being integrated into the classroom and to examine factors affecting ICT use by teachers (Gorder, 2008). Another area of research is the rationale for using computers; a constant question in the minds of many educationists is what is the need for adopting ICT in teaching and learning (Park et al., 2009). The more traditional behaviorist teachers tend to question the validity of using ICT demanding that the benefits of the technology to be clearly identified and quantified before they consider changing their teaching and learning environment (Balanskat et al., 2007). In contrast, some teachers believe that ICT skills are valuable life skills to create a digitally literate society. The pedagogical rationale for using ICT is focused on enhancing teaching and learning and ICT should be incorporated into teaching and learning (Askar et al., 2006). This is due to the fact that ICT has the potential to make a significant contribution to both students` and teachers` overall development through motivating and promoting higher-order thinking, creating new and exciting opportunities as well as helping to create independent creative thinkers (Afshari et al., 2009). Therefore, it is believed that the integration of ICT in teaching and learning brings great benefits to teachers and the students.

However, an essential flaw in the body of research is that the researchers differ in their methods for measuring ICT use with many reporting figures based on the actual number of teachers using computers in their classrooms whilst other studies report on the amount of time spent on computers and the number of different computer applications used (Baek et al., 2008). The lack of continuity between different studies makes it difficult to make direct comparisons between research even though they do

help in identifying the factors affecting ICT use in secondary schools. This warrants further investigation.

2.3 FRAMEWORK FOR ICT ADOPTION IN TEACHING AND LEARNING

The Organisation for Economic Co-operation and Development (Liu, 2010) reported that ICT was not envisaged as part of the school curriculum but has arisen from external ICT developments and the perceived need for ICT to be incorporated into the teaching and learning environment. For this reason it has been difficult for researchers to assess ICT adoption in schools (Brinkerhoff, 2006). The difficulty arises when researchers have different ways of defining adoption or integration (Bauer & Kenton, 2005). Gülbahar (2007) refers to ICT adoption as having computer hardware or software while other studies view it as teachers using ICT in the classroom or schools using ICT for administrative purposes. Eteokleous (2008) describes adoption as the decisions that individuals make each time they consider taking up an innovation. Similarly, Pac (2008) defines adoption as the decision of an individual to make use of an innovation as the best course of action available. Pac (2008) argues that the process of adoption starting with initial hearing about an innovation to final adoption. For the purpose of this study, Pac definition of adoption is used, to illustrate the status quo of the smart school in this study.

At another level is the definition of ICT integration. (Bustos et al, 2009) link ICT integration with the concept of wholeness, when all elements of the system are connected together to become a whole. For instance, the two important elements of teaching and learning which are content and pedagogy must be integrated when technology is used in a lesson. However, if students are only offered a series of websites or ICT tools (e.g. CD ROMs, multimedia, etc) without other learning activities then the teacher is not integrating ICT into teaching and is not tackling the pedagogical issues. Similarly, (Wozney et al, 2006) described ICT integration as the means of using any ICT tool (Internet, e-learning technologies, CD ROMs, etc) to assist teaching and learning. However, these definitions are in isolation of the teaching and learning application and context. A more comprehensive framework is needed to explain the level of ICT adoption in teaching and learning.

Tondeur et al. (2008) undertook an extensive study of the educational use of computers in a secondary school and sought to clarify how best to measure adoption through developing a measurement for assessing ICT use in education. ICT uses are then identified into three levels:

1. Basic computer skills, for example starting up a computer and related equipment such as printer or scanner
2. Computers as an information tool, for example conducting online search
3. Computers as a learning tool for education.

Hooper and Rieber (1999) further elaborated on this and suggested five phases of teachers' use of ICT (as shown in Figure 2.1 and Table 2.1)

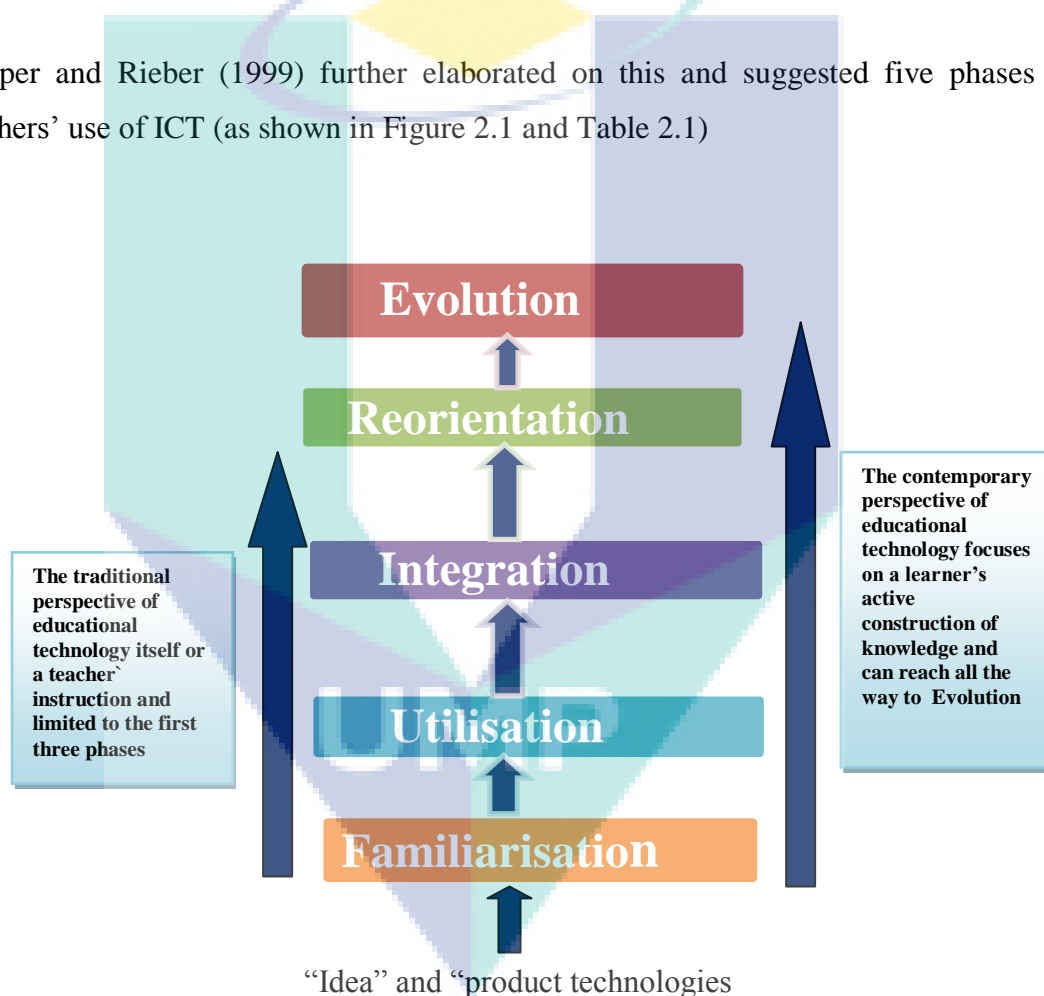


Figure 2.1: Five phases of teachers' use of ICT (Hooper & Rieber, 1999)

The five phases of teachers' use of ICT are: Familiarisation, Utilisation, Integration, Reorientation, and Evolution. They claim that full potential of any educational technology can only be realised when educators progress through all the five phases, otherwise, the technology will likely be misused or discarded. In addition, the model explains that the traditional role of technology in education is limited to the first three phases, whereas contemporary views hold the promise to reach the Evolution phase (Hooper and Rieber, 1999). Table 2.1 elaborate on the criteria for each phase in the model

Table 2.1: Summary of the five phase of teachers` use of ICT (Hooper & Rieber, 1999)

STAGE	DESCRIPTION
Familiarisation	Is concerned with one's initial exposure to and experience with a technology. A typical example of familiarization is a teacher participating in an in-service workshop covering the "how to's" of a technology, such as word processing, spreadsheets, assertive discipline, cooperative learning, motivational strategies, etc. In this phase, the teacher simply becomes acquainted with a technology. Once the workshop ends, so too does the teacher's experience and growth with the technology. All that remains is a memory of the experience. The teacher may discuss the experience and the ideas represented in the experience, even with some degree of authority, but no further action takes place. A great deal of instructional innovation begins and ends with this phase.
Utilisation	In contrast, occurs when the teacher tries out the technology or innovation in the classroom. An example is a social studies teacher who uses role-playing simulations learned in a workshop or graduate course. Obviously, teachers who reach this phase have progressed further than Familiarization, but there is the inherent danger that a teacher will become prematurely satisfied with their limited use of the technology. The attitude of "At least I gave it a try" will likely interfere with any enduring and long-term adoption

	<p>of the technology. Teachers who progress only to this phase will probably discard the technology at the first sign of trouble because they have made no commitment to it. This is probably the highest phase of adoption reached by most teachers who use contemporary educational media, including the computer. If the technology were taken away on Monday, hardly anyone would notice on Tuesday.</p>
Integration	<p>Represents the "break through" phase. This occurs when a teacher consciously decides to designate certain tasks and responsibilities to the technology, so, if the technology is suddenly removed or is unavailable, the teacher cannot proceed with the instruction as planned. The most obvious technology that has reached this phase of adoption in education is the book and its derivatives, such as worksheets and other handouts. Most teachers could not function without the support of such print- based technologies. Another example, though perhaps amusing to some, is the chalkboard. Most teachers would find it extremely difficult to teach without it. Hence, the "expendability" of the technology is the most critical attribute or characteristic of this phase (Marcinkiewicz, 1991). Although Integration is the end of the adoption model for many, it really only represents the beginning of understanding educational technology. For some teachers, the Integration phase marks the beginning of a professional "metamorphosis," but only if they progress even further in their adoption pattern.</p>
Reorientation	<p>Requires that educators reconsider and reconceptualise the purpose and function of the classroom. It is marked by many characteristics, probably the most important of which is that the focus of the classroom is now centered on a student's learning, as opposed to the teacher's instruction. A teacher who has reached the Reorientation phase does not view good teaching as the delivery of content (i.e. the teaching "acts" of explaining, managing, or motivating). Instead, the teacher's role is to establish a learning environment that supports and facilitates students as they construct and shape their own knowledge. In this phase, the learner becomes</p>

	the subject rather than the object of education.
Evolution	The final phase serves as a reminder that the educational system must continue to evolve and adapt to remain effective. There will never be a final solution or conclusion and to be searching for one means that one is missing the point. The classroom learning environment should constantly change to meet the challenge and potential provided by new understandings of how people learn. As previously discussed, this appropriate application of basic knowledge for some useful purpose is what defines educational technology and living up to this definition is the hallmark of the Evolution phase.

2.4 ICT INTEGRATION IN MALAYSIAN SCHOOLS

UNESCO (2002) report on a Malaysian government policy document known of a project education for smart school that was formulated to develop ICT and to be implemented in stages. The smart school project has five main goals which are:

1. To develop individual child covering the intellectual, physical, emotional and spiritual domain.
2. To provide opportunities for the individual to develop their special strengths of abilities.
3. To produce a thinking working force that is technically literate.
4. To provide equal access to students to learn with computers.
5. To involve parents of the children, private sector, and the community in ICT education process.

The first phase of the project was implemented in 1999 as a pilot project at 88 schools with a plan to convert all schools to smart schools. The pilot project consisted of:

1. Preparing computer materials for teaching and learning of four subjects (i.e. *Bahasa Malaysia*, English language, Science and Mathematics).

2. Preparing assessments to give accurate and comprehensive feedback of students' process in ICT enabled education.
3. Integrating management systems to improve school administration was also included (UNESCO, 2002:p.30).

To date, it would appear that schools have embraced ICT as computers, software and Internet access are available in most Malaysian secondary schools (MOE, 2001). Although the physical evidence of the presence of ICT is visible it is difficult to assess how successful schools have been in the integration of ICT. The difficulty arises out of the suggestion that schools do not have a choice in whether to adopt ICT or not (Cope & Ward, 2002). Furthermore, society expects that schools will integrate ICT regardless of curriculum restraints. In addition it has been highlighted that not all teachers are willing to incorporate ICT into their teaching and learning (Adams, 2005). This could be one of the obstacles that might affect the adoption of ICT at secondary schools in Malaysia.

In addition, insufficient access to ICT is clearly noted as an obstacle preventing successful implementation of technology (Kay, 2006). Teachers have noted that access and age of computers are a hindrance to successful integration (Doering et al., 2003). Access levels can vary greatly across sites; configurations can include from one or several computers in a classroom as well as, access to a portable laptop cart for classroom use or access to a computer lab in the building. Teachers with a single computer in the classroom claim that they experienced development of personal productivity skills such as keeping grade books, lesson planning and delivering presentations (Albirini, 2006; Ageel, 2011). Furthermore, those with access to computers during class note higher frequencies of teachers using technology (Mohamed Zaki, 2013)

2.4.1 Phases In Smart School Integration

The Malaysian Smart School flagship project which was launched in July 1997 comprised of two phases the pilot and the roll-out phases.

Phase 1- the pilot project phase (1999 – 2002): Eighty-seven, pilot schools were involved in which three models of technology, a computer laboratory model (Level B), a limited classroom model (Level B+), and a full classroom model (Level A). In the original implementation plan, the Ministry of Education will be used the findings of the pilot project to prepare a master plan to ensure that all schools in the country become smart schools in stages, by the year 2010. In the broad roll-out phase, the government of Malaysia is expected to play the role of architect and driver for the smart school project. The strategies are to prepare the guidelines and provide the basic amenities to schools according to their individual needs.

Phase 2- The Post Pilot (2002–2005) phase: The government makes sure that the objective in the mission of phase 1 was completed and improvements were made to the smart school implementation. Basically, the second wave was mainly to continue and improve the first phase. The monitoring and corrective measures were critical that negligence in addressing constraints highlighted in the various studies jeopardise the successful implementation of the smart school. The objective in this stage was consolidation of smart school principles.

Phase 3- Making All Schools Smart (2006-2010): The primary objectives in this stage were:

1. to produce a knowledge society that is critical, creative and innovative,
2. to produce technology savvy individuals,
3. to bridge the digital divide and to cultivate life-long learning based on ICT.

In this phase, the government needed to consider three factors which were installing hardware, and software as well as training the wetware.

Phase 4- Consolidate And Stabilise (2010 - 2020): This phase is currently in progress till 2020. The main objective for this stage is to consolidate and stabilise all the schools that are already the smart schools. This stage is very important because some of the school that just got the status of smart school would have their problems such as how to manage the smart school, lack of the technology equipment, and teachers lacking knowledge of using the technology.

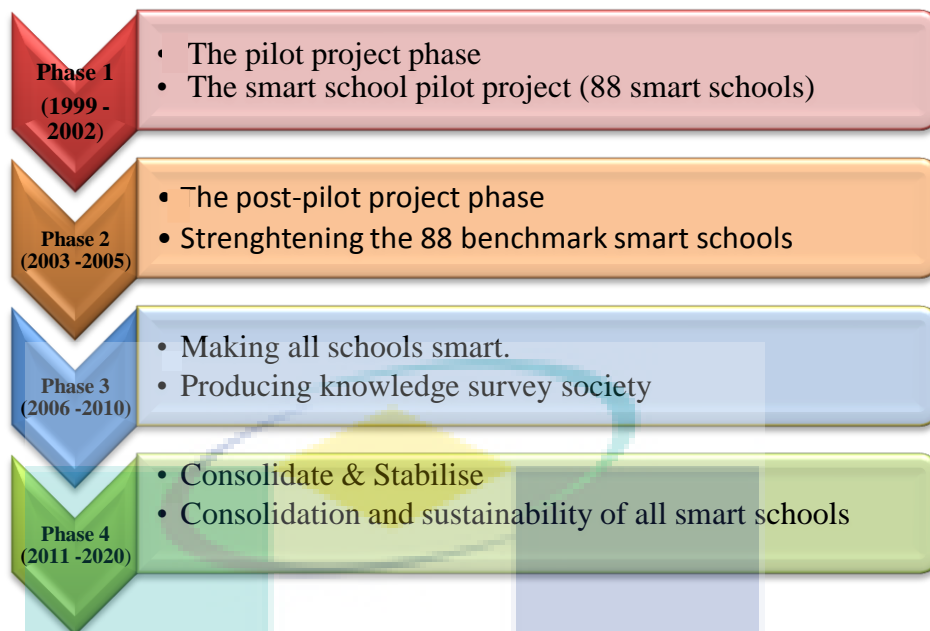


Figure 2.2: The smart school Implementation phases (Multimedia Development Corporation, 2005)

2.5 TEACHER PROFESSIONAL DEVELOPMENT IN MALAYSIA

Teachers are an important workforce for achieving the Malaysian educational aim, in enhancing the quality of education and developing the human capital of the nation. The need for professional development for teachers in Malaysia was recognised as a means to enhance the teaching profession, as early as 1995 by a special committee set up by the Ministry of Education to look into teachers' professionalism and professional development (Chen & Chen, 2008). Some of the recommendations put forward by the committee were (as cited in Mohd. Sofi Ali, 2002: p. 45):

1. Teachers should be encouraged to attend in-service courses.
2. Teachers should be encouraged to further their education.
3. Opportunities should be given to teachers for study visits overseas to study current developments in education.
4. Induction programmes should be given to teachers appointed to new posts and with new responsibilities.
5. Management courses should be provided to teachers who have been promoted to head teachers of department.

6. Staff rooms should be subject-based.
7. Teacher centres should facilitate the professional development of teachers; they should be built in strategic locations, equipped with modern technology, fully funded and adequately staffed

In line with this agenda, the government has established training centres for teachers. The teacher education division which comes under the Ministry of Education has initiated both the pre-service and in-service training for the primary and secondary school teachers (Mohamed Zaki, 2013).

The training of smart school teachers was aimed at enhancing their professional skills of facilitating learning and fostering innovation so as to optimise instruction through the integration of technology. The training provided to smart school teachers was intended to enable them to:

1. plan and develop instructional packages that fulfill the requirements of the Smart Schools curriculum;
2. facilitate and manage learner-centered instructional environments through the application of a variety of innovative and creative strategies;
3. apply and integrate technological applications such as multimedia, Internet and Digital Communications in the instructional process; and
4. manage classrooms equipped with multimedia technology facilities.

2.6 FACTORS CONTRIBUTING TO TEACHERS` ICT ADOPTION

Several factors influencing the adoption of ICT into teaching and learning have been identified by researchers. Pac (2008) identified five technological characteristics or attributes that influence the decision to adopt an innovation that are: knowledge, persuasion, decision, implementation and confirmation.

Laurillard (2007) also identified the following factors as influencing ICT adoption into teaching: user characteristics, content characteristics, technological

considerations and organisational capacity. Similarly, Balanskat et al. (2007) identified three impactful factors to ICT adoption: teacher- level, school- level and system- level.

Other researchers identified the following factors that affect teachers' integration of ICT in the classroom: organisational factors, attitudes towards technology, technological factors, individual factors and institutional factors (Clausen, 2007; Chen & Chen, 2008; Tondeur et al., 2008; Mohamed Zaki, 2013). Factors such as institutional support as well as micro factors such as teacher capability influencing the use of online learning in schools were also cited.

It would appear from the list that there are many factors that could affect a teachers' use of ICT in their teaching and learning environment (Afshari et al., 2009). The factors listed in this research include: not enough time provided to prepare for class, lack of ICT training provided and the school management do not view ICT as a priority. Many researchers have labeled the factors affecting ICT uptake as "barriers to change" (Nussbaum et al., 2009). In this study, these factors affecting ICT adoption and barriers to the implement for the smart school initiative will be identified.

2.6.1 The Role of the teacher in ICT adoption

Professional teachers are at the forefront of ICT adoption in education today. Teachers are expected to take on the challenge of integrating ICT in the teaching and learning environment. Mueller et al. (2008) stated that teachers' own pedagogical views have a very important role to play in the teachers' integration of ICT. It has been found that teachers who only use ICT do not change their teaching pedagogy dramatically. In addition, Alwani and Soomro (2010) claimed that changing teachers' pedagogical beliefs are both time consuming and complex. However, for teachers to become proficient in using ICT adequate time and resources must be provided to all teachers to develop confidence and competence in displaying ICT skills. Therefore, these issue of changing teachers' beliefs to adopt technology is a vital agenda for successful integration of ICT.

In addition, (Chen et al, 2012) reported that there are teachers who do not wish to incorporate ICT into their teaching because they are content to continue using

traditional teaching methods. Mohamed Zaki (2013) agreed with this and adds that not all teachers are willing to embrace change in the classroom and viewing ICT as an “unnecessary intrusion” (p. 67). It is suggested that for technology to be used in the classroom teachers need to be able to assess and examine what value, if any, ICT brings to the teaching and learning environment (Ageel, 2011). However, Mueller et al. (2008) believed that as teachers become more confident in using ICT they will become empowered by its potential and strive towards further ICT integration. Consequently, teachers who become skilled ICT educators will be better equipped to use ICT more effectively in their teaching. Teachers with a changed and extended role are central to the way ICT is adopted and used in the classroom (Nut, 2010).

In order for teachers to embrace the challenge of ICT adoption they must be provided with the technical and pedagogical skills to integrate ICT into the classroom (Mohamed Zaki, 2013). The need for the provision of continuous professional development of teachers` ICT skills is recommended by stating very strongly that without professional development – “effective technology integration into schools cannot succeed” (Inan & Lowther, 2010:p. 937). The use of ICT in the teaching and learning environment requires the user to have a basic understanding of the operating system and basic troubleshooting knowledge in the event of a technical issue arising (Schoepp, 2005). Research has highlighted that lack of technical knowledge is a factor that inhibits teachers` use of ICT (Chen et al, 2012). This is supported by (Bingimlas, 2009) who reported that lack of ICT technical competency as a significant factor affecting teachers` motivation to use ICT. Teachers are reluctant to use ICT where they felt that they may not possess sufficient ICT competencies.

Other factors are also identified, for example; having not enough time to learn how to use ICT, prepare ICT resources for class, discuss or share resource in subject areas with other teachers, sufficient training has not been provided, management do not view ICT as a priority, lack of confidence in using ICT and lack of technical support when using ICT in the classroom (Clausen, 2007; Chen & Chen, 2008; Tondeur et al., 2008; Lim & Chai, 2008). These could become factors which hinder teachers` uptake of ICT adoption. In this study, these factors were explored to determine whether the

content to which teacher's attitude pose as barriers to ICT adoption at the school in this study.

2.6.2 Teacher Training And Professional Development

Teachers' professional development is a key factor to successful integration of computers into classroom teaching. Several studies have revealed that whether beginner or experienced, ICT related training programmes develop teachers' competencies in computer use (Bauer & Kenton, 2005; Wozney et al., 2006; Franklin, 2007), influence teachers' attitudes towards computers (Hew & Brush, 2007; Keengwe & Onchwari, 2008) as well as assist teachers to reorganise the task using technology and how to ensure new technology tools are significant in student learning (Plair, 2008). Mueller and his colleagues (2008) indicated that training can lead to successful adoption of technology in the classroom. It is believed that teachers who integrate technology with new teaching practices gained through professional training can transform the performance of the students (Lawless & Pellegrino, 2007)

Peralta and Costa (2007) highlight the need for effective ICT professional development to assist teachers in the adoption of ICT into their teaching and learning. Similarly, Somekh (2008) stresses on the importance of providing training to teachers of all abilities at all levels so that there will not exist a 'digital divide' (p. 502) between computer literate and computer illiterate teachers. The research also suggests that if the training is not at the correct level for the teachers it has the potential to further discourage teachers from using ICT. Conversely, appropriate ICT training is found to increase teachers' confidence levels in using ICT (Redecker, 2009). Furthermore, schools where the top management supports ICT professional development and ICT leadership also reported higher levels of ICT integration in the classroom (Nut, 2010). In this study, the participants' level of computer training were explored.

Schoepp (2005) claim that in their study it is observed that teachers' personal technology skills are strong determinants of ICT integration, but did not necessarily mean that they are conditioned for effective use of technology in the classroom. Therefore, training programmes that concentrate on ICT pedagogical training instead of

just technical issues and effective technical support, help teachers apply technologies in teaching and learning. Studies have also revealed that quality professional training programmes help teachers implement technology and transform teaching practices (Diehl, 2005; Brinkerhoff, 2006). In addition, Lawless and Pellegrino (2007) claimed that if a training programme is of high quality it will have these characteristics: the period of training lasts longer, new technologies for teaching and learning are offered, educators are eagerly involved in important context activities, teamwork among colleagues is improved and has a clear vision for students' attainment. Similarly, teachers will adopt and integrate ICT into their teaching when training programmes concentrate on subject matter, values and the technology (Plair, 2008).

Research has also shown that teachers require an expert in technology to show them the way to integrate ICT to facilitate students' learning (Plair, 2008). According to Chen and Chen (2008), professional training courses must be designed to identify beliefs about successful teaching, policies for enhanced teaching and learning and syllabus design for teaching purposes. In this way, teachers who are committed to professional development activities gain knowledge of ICT integration and classroom technology organization (Wepner et al., 2006). Early training programmes for teachers who embrace educational practices and strategies to address beliefs, skills and knowledge improve teachers' awareness and insights in advance. This will be beneficial to transformations due to ICT integration in classroom activities (Levin & Wadmany, 2008).

2.6.3 The role of the school management in ICT adoption

The role of the school management in the adoption of ICT in schools should not be underestimated. Many studies have reported on the importance of management opinions and attitudes towards ICT directly affecting its use in the school (Albirini, 2006). Multimedia Development Corporation (2005) found that lack of interest and commitment by the school management in the implementation of ICT in a school has a negative impact on the implementation of ICT at the school. Similarly, Bingimlas (2009) reported that teachers' willingness to undertake ICT training is also influenced by the management's attitudes towards ICT.

Somekh (2008) stresses on the importance of schools providing training to teachers of all abilities at all levels so that there will not exist a 'digital divide' (p. 502) between computer literate and computer illiterate teachers. The schools where the top management supports ICT professional development and ICT leadership also report higher levels of ICT integration in the classroom (Nut, 2010). According to Chen and Chen (2008), professional training courses must be designed to identify beliefs about successful teaching, and syllabus design for teaching purposes. Policies for enhanced teaching and learning early training programmes for teachers that embrace educational practices and strategies to address beliefs, skills and knowledge will improve teachers' awareness and insights in advance, in relation to transformations in terms of ICT integration in classroom activities (Levin & Wadmany, 2008).

Chen et al. (2012) reports that exemplary ICT using teachers are more likely to have extensive teaching and computer training experiences organised by the school which equipped them with the skills to enhance their teaching using technology. Thus, it is clear that ICT and school management is an important issue since it is well recognised that senior managers in schools have a major impact upon classroom and curriculum practices, and that the use of ICT within schools is permeating aspects of school practice to the extent that it will impact upon the practice of all staff both teaching and non-teaching (Multimedia Development Corporation, 2006).

Similarly, Tondeur et al. (2008) report that although ICT tools such as digital media provide many opportunities for teaching and learning it is unlikely to be used by many teachers if they lack technical expertise. If teachers are expected to use digital media in the classroom they must receive the necessary training and it must be appropriate to meet the needs of the teacher and students (Collis & Jung, 2003). In investigating the factors hindering teachers' readiness and confidence in using ICT, Slaouti and Barton (2007) find that inadequate knowledge to evaluate the role of ICT in teaching and learning as well as, lack of technical skills in the use of ICT equipment and software have resulted in a lack of confidence in utilising ICT tools. This is consistent with Schrum et al. (2007) who concludes that lack of technical support to be a key inhibitor to the use of ICT in the classroom. As shown by Cowie and Jones (2005),

recurring technical faults, and the expectation of faults occurring during teaching sessions have reduced teachers' confidence and caused teachers to avoid using technology. Basically, this is due to not having the technical knowledge to troubleshoot each time a problem occurs. Therefore, training to use and troubleshoot when using ICT in the classroom is a factor that should be considered.

2.6.4 Access to ICT equipment

Many studies have shown that ICT in schools cannot be effectively adopted if teachers do not have sufficient levels of equipment, software and support (Redecker, 2009). A barrier to using ICT in the classroom is created if the resources and support needed to incorporate ICT are not readily available in the teaching and learning environment (McCombs, 2000). Zailin (2010) recommended the granting of financial support to schools to ensure that they have the necessary equipment for successful integration. Barak (2006) further revealed that the use of ICT in education would promote deep learning, and allows schools to respond better to the varying needs of the students.

Obstacles such as access to equipment, time pressures, lack of mentor and opportunities for apprenticeship of observation also have an impact on teachers' ability to use ICT (Slaouti & Barton, 2007). Further, teachers' workload and time management was found to be inhibiting the implementation of computer instruction in classroom (Hennessy et al., 2005).

2.6.5 Time constraints when using ICT in teaching and learning

Time and the lack of it is a constant issue arising from the research carried out on the factors affecting ICT use (Rutherford, 2004). Studies have identified lack of training time, lack of time to prepare resources, lack of actual class contact time and lack of time to access the full potential of ICT in the classroom as the main issues in regard to time when using ICT (Ertmer, 2005). Ofsted's (2002) reported shows that teachers working on ICT training materials outside the school hours were not interested to do so, as a result of having other priorities on their own time. Teachers' workload and

time management is found to be inhibiting the implementation of computer instruction in the classroom (Lau, 2006). Redecker (2009) reported that over-exploitation of teachers' personal time and lack of time given to training as the key problems experienced by teachers in adopting ICT in their classrooms.

Many teachers cite lack of time as one of the main constraints they face when trying to integrate ICT into their teaching and learning. Schoepp (2005) claimed that schools do not give teachers enough time to get familiar with ICT. For instance, it takes time to learn how to create a blog or wiki, design a website or create an interactive teaching resource (Liaw, 2002) This is similar to findings from studies which indicate that time and the lack of training were a constant issue arising from the research carried out on the factors affecting ICT use (Rutherford, 2004). Unfortunately, in the current busy educational environment many educators find themselves faced with little time to improve their skills in digital media before they are asked to use them in the classroom (Brinkerhoff, 2006).

As a result, over-exploitation of teachers' personal time and lack of time given to training become key problems experienced by teachers who adopt ICT in the classroom. Time factor will be explored in this study.

2.6.6 Teachers' attitude toward ICT

Attitude is key factors in whether teachers accept ICT as a teaching tool in their teaching practices. Research shows that the success of technology use in educational settings largely depend on teachers' attitudes toward technology use (Albirini, 2006; Nut, 2010). They can be considered as a major predictor of the use of new technologies in the educational settings (Albirini, 2006).

To successfully initiate and implement educational technology in school depends strongly on the teachers' support and attitudes. It is believed that if teachers perceive ICT programs as neither fulfilling their needs nor their students' needs, it is likely that they will not integrate the technology into their teaching and learning (Hew & Brush, 2007; Keengwe & Onchwari, 2008). If teachers' attitudes are positive toward

the use of educational technology then they can easily adopt and integrate ICT into their teaching and learning processes. In addition, attitude is a key factor in whether teachers accept ICT as a teaching tool in their teaching practices (Afshari et al, 2009).

2.6.7 Teachers` motivation in using ICT

Teacher motivation also plays a pivotal role in ICT use in teaching and learning environment. The Organisation for Economic Co-operation and Development (OECD, 2001) report placed serious emphasis on the importance of teacher motivation and teacher ICT use. The report identifies a number of key motivating factors that encourage teachers to engage with ICT. For example, teachers report a preference to writing using a word processor rather than pen, and preference for creating more ‘professional looking’ documents is also recorded (OECD, 2001). In addition the facilitation of collaborative teaching and learning through online technology is also recorded as a key motivator in the use of ICT by teachers (Baek et al., 2008).

Other researchers have also commented on the importance of teacher motivation in adopting ICT. Chigona and Chigona (2010) reported that if teachers are not motivated that student learning outcomes will improve as a result of adopting ICT into the teaching and learning environment they will have less incentive to incorporate ICT in lessons. Bingimlas (2009) find that many teachers in schools are not making effective use of ICT because they were not motivated to do so (OECD, 2001).

Gorder (2008) identified three main factors that influenced teacher motivation. Firstly, teachers must believe ICT can be used more effectively or at least maintain existing standards. Secondly, teachers must not view ICT as a disturbance in the classroom and finally, teachers must believe they are in control of the classroom. The study concludes that if all of these conditions are met the teacher will be encouraged and motivated to incorporate ICT into the teaching and learning environment.

2.6.8 Teachers` confidence in using ICT

There is evidence that working with ICT as part of professional development can impact on classroom practice (Windschitl & Sahl, 2002). However, sufficient training is needed to increase teachers' confidence in using ICT.

Mahani (2006) claims that teachers needed longer hours of training to be able to acquire a high level of competency and confidence in using ICT in teaching. Even though ICT is part of the curriculum in teacher training colleges teachers may not have achieved sufficient confidence when it comes to integrating it in their teaching (Thang et al., 2010). Further efforts have to be taken to ensure that teachers have the necessary level of confidence and also the competence to integrate ICT in their classrooms.

2.7 SUMMARY

ICT use in education is developing and expanding every day. The potential for ICT use in the teaching and learning environment is significant. It is clear that although many schools have openly adopted ICT into the teaching and learning environment specifically in Malaysia and invested in the ICT infrastructure there are existing factors that exist that can affect teachers' use of ICT in the classroom. The literature reviewed in this chapter has identified the rationale for using ICT in the teaching and learning environment and explored a number of factors that have been found to affect teachers' adoption of ICT in the classroom.

CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

This chapter introduces the implemented methodology of this study. It presents the research design, the rigor of the study, the context and the participants of the study, the data collection instruments and analysis procedures for both the quantitative and qualitative data from this study.

3.2 RESEARCH DESIGN

Case study research allows for the exploration and understanding of complex issues. It can be considered a robust research method particularly when a holistic, in-depth investigation is required. Recognised as a tool in many social science studies, the role of case study method in research becomes more prominent when issues in regards to education (Gulsecen & Kubat, 2006), sociology (Grassel & Schirmer, 2006) and community based problems (Johnson, 2006) are raised. One of the reasons for the recognition of case study as a research method is that researchers were becoming more concerned about the limitations of quantitative methods in providing holistic and in-depth explanations of the social and behavioural problems in question. Through case study method, a researcher is able to go beyond the quantitative statistical results and understand the behavioural conditions through the actor's perspective (Gulsecen & Kubat, 2006; Grassel & Schirmer, 2006; Johnson, 2006). By including both quantitative and qualitative data, case study helps explain both the process and outcome of a phenomenon through complete observation, reconstruction and analysis of the cases under investigation (Yin, 2009).

Furthermore, case study method enables a researcher to closely examine the data within a specific context. In most cases, a case study method selects a small geographical area or a very limited number of individuals as the subjects of study (Johansson, 2003). Case studies, in their true essence, explore and investigate contemporary real-life phenomenon through detailed contextual analysis of a limited number of events or conditions, and their relationships. Yin (1984) defined case study research method “as an empirical inquiry that investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used” (p. 23). Essentially, case study method enables a researcher to closely examine the data within a specific context. However, a limitation of case study design unlike quantitative research designs is that it does not lend itself to complex statistical analysis and generalisation (Yin, 2009).

This study utilises the case study research approach because it aims to “gain an in-depth understanding of a situation and meaning for those involved” (Merriam, 1998: p. 19). It specifically looked at the adoption of ICT tools at a Malaysian Smart School.

3.2.1 Case Study of a Malaysian smart school

In relevance to the situation being investigated which was the adoption of ICT and factors that contributed to the adoption of ICT tools, a smart school was selected as the case to be studied in this research. Smart Schools are schools selected to integrate ICT in their classrooms. There are a total of 88 Smart Schools in Malaysia. The school chosen for this study became a smart school in 2000. It was chosen as it was the only school that allowed access to the researcher.

3.2.2 Gaining Access

Gaining access is a critical part of doing research, not only because one must "get in" in order to gain information, but also because the quality of access affects what information is available to the researcher (Scott, 1965: p. 275). Access is given mainly by the gatekeeper of the case or situation being investigated, for example a school

principal (Koch, 2006). Specifically the gatekeeper is the person who has the authority to allow or deny researcher access to the research site and participants (Creswell, 1998).

For this study, the gatekeeper was the principal and assistant principal who were the administrators of the school. The permission of the school administrators and participants were obtained through the use of a written document (Appendix A).

3.3 RIGOR OF THIS STUDY

3.3.1 Audit Trail

One of the methods of ensuring triangulation is through keeping an audit trail. Several researchers recommended the development of a research audit trail. Koch (2006) suggested that a study's trustworthiness may be established if a reader is able to audit the events, influences and actions of the researcher, while Akkerman et al. (2006) suggested that audit trails represent a means of assuring quality in qualitative studies. The development of a research audit trail is in line with Seale (1999, p.158) guideline to use "reflexive methodological accounting" in demonstrating that a research study was carried out with considerable care. According to Judd and Kennedy (2001, pg. 377) "maintaining and reporting an audit trail of methodological and analytic decisions allow others to assess the significance of the research".

Audit trails document the course of development of the completed analysis. In developing an audit trail, a researcher provides an account of all research decisions and activities throughout the study. The researcher makes explicit all decisions taken about theoretical, methodological and analytic choices (Koch, 2006). The researcher examines the research process and the product of inquiry to determine the findings' trustworthiness. In order to develop a detailed audit trail, a researcher needs to maintain a log of all research activities, develop memos, maintain research journals, and document all data collection and analysis procedures throughout the study (Creswell & Miller, 2000).

The audit trail for this study was meticulously kept to document all the processes from gaining access to data analysis (Appendix B).

3.3.2 Methodological Triangulation

Methodological triangulation is a technique of data collection that demands the use of two or more methods of data collection. Cohen et al. (2007) elaborate that triangulation helps in explaining human behaviour in more detail by using both quantitative and qualitative data. Triangulation is appropriate when undertaking research which utilises different data collection methods. In this way, the researcher can be more confident of precise and reliable data collected.

This study employs methodological triangulation to ensure rigor of the study using three research instruments; questionnaires, teacher and school administrator interview, and observation to collect data.

3.4 CONTEXT OF THE STUDY

The school chosen for this research is one of the smart schools in Kuantan, Pahang. This school was established in 1994. There are one hundred and five teachers and one thousand two hundred and seventy six students in the school at the time this study was carried out. The school was selected to become a smart school during project phase in 2000. The school is located in Kuantan and was one of the earliest Malay medium schools in Malaysia. The School had 483 male students and 799 female students, making a total enrollment of 1282 students at the the time of the study was carried out. The chosen school is one of the earliest.

The school's organisation is like a pyramid. At the top of the pyramid is the principal who is in charge and have the authority to make main decisions for the school. The principal, in this study sees her role as ensuring academic success for all students, creating a climate hospitable to education, cultivating leadership in others, improving instruction apart from managing people, data and processes to foster school improvement.

At the second level there are assistants. The first one is the Senior Assistant for Administration who is in charge of ICT and technical responsibilities. The second is the Senior Assistant for Student Affairs who is specifically responsible for Form One to Form Five students. The third is the Senior Assistant for Curriculum, in charge of Form One to Form Six curriculum. The last is the Senior Assistant for Pre-University curriculum. He is in charge of monitoring the teaching processes and exams for Form 6 students.

At the third level are the Heads of Departments. There are four Heads of Departments for the Science, Humanities, Technical, and Languages departments. All the teachers in the school belong to these departments according to the subjects they teach.

At the time of this study, the school has two computer labs whereby in each computer lab there are 18 computers and tables. The operating system used is Window 7 and the school has installed, Microsoft Word, Microsoft PowerPoint and Microsoft Excel. Each computer has Internet access and one data projector, scanner and printer in each computer lab. Outside the computer labs there are four extra computers. These computers are for the general use of the students at the end of the day when they are waiting for their parents. The school principal informed the researcher that the school has a problem with the computer labs. Firstly, they do not have enough computers for each student to use during class. The students have to share computers. Usually during class, two students share one computer in the computer lab. Secondly, there are not enough computer labs to satisfy the demand of all teachers. It is hard to arrange the timetable among classes and at times two classes need to use the lab at the same time.

In terms of teaching and learning process, the teachers do not plan their own teaching when using computers. They have a special website that is set up by the ICT Head of Department for the teachers. Each teacher has a private access to the teaching plan that is already set by each subject's Head of Department for the whole year. The principal can check the teaching progress of each teacher at the end of each week, specifically to assess if the teachers are following the plan accordingly.

As for training, selected teachers are sent for training conducted by government departments when they are required to. In the training the teachers` will be taught how to use ICT in the teaching process. They will also gain vital skills that they might not have been able to learn before to stay current with new techniques. Usually, the teachers have three training courses yearly and each course`s duration is usually for two days. All the teachers and staff are required to attend the ICT training courses at whichever time convenient to them. The school also provides laptops to the more senior Science and English teachers who have more knowledge and experience in using ICT because they were the first trained when the government introduced the Science and Mathematics in English initiative. The other teachers have their own laptops but they do not bring it to class for teaching and learning purposes. A summary of the school organisation is illustrated in Figure 3.1.

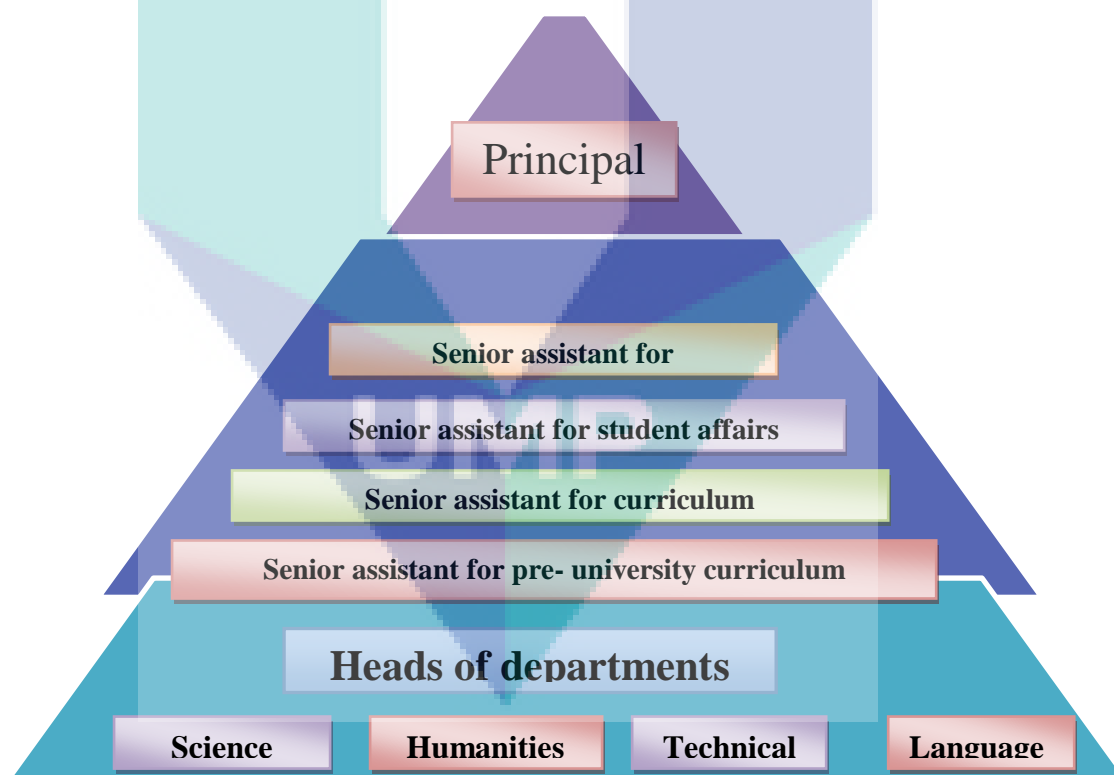


Figure 3.1: Pyramid of the school organization

3.5 PARTICIPANTS OF THE STUDY

3.5.1 Profile of Participants

The study focused on 73 teachers at the chosen smart school of whom 65 were female and 8 male teachers. The demography of the 73 participants of this study is presented in Tables 3.1-3.4. It includes the information on; age, gender, subject taught and teaching experience.

From table 3.1 most of participants in this study are female teachers 89% ($n=65$), age between 31- 40 years old were 34.2% ($n = 25$).

Table 3.1: Demography of the Participants of the Survey Questionnaire by Age Group

AGE GROUP	FEMALE	MALE	TOTAL
20-30yrs	16.5% ($n = 12$)	2.7% ($n = 2$)	19.2% ($n = 14$)
31-40yrs	34.2% ($n = 25$)	2.7% ($n = 2$)	37% ($n = 27$)
41-50yrs	28.8% ($n = 21$)	4.1% ($n = 3$)	32.9% ($n = 24$)
51-65yrs	9.6% ($n = 7$)	1.4% ($n = 1$)	11% ($n = 8$)
	89% ($n= 65$)	11% ($n= 8$)	Total =73

The participants were ask if they got any basic course about ICT before joining the school, most of participants stated that they got basic introduction course before joined the school 41.1% ($n= 30$). As shown in table 3.2

Table 3.2: Demography of the Participants of the Survey Questionnaire by Level of computer training

LEVEL OF COMPUTER TRAINING	FEMALE	MALE	TOTAL
No formal training	13.8% (n= 10)	2.7% (n= 2)	16.5% (n= 12)
Basic introduction course	34.2% (n= 25)	6.9% (n= 5)	41.1% (n= 30)
Intermediate course	24.7% (n= 18)	4.1% (n= 3)	28.8% (n= 21)
ECDL(European Computer Driving License)	9.6% (n= 7)	4.1% (n= 3)	13.9% (n= 10)
			Total =73

From Table 3.3, most of participants in this study are female teachers'89% (n= 65), their teaching experience between 11-15 years 21.9% (n = 16).

Table 3.3: Demography of the Participants of the Survey Questionnaire by Teaching Experience

EXPERIENCE	FEMALE	MALE	TOTAL
1-5yrs	19.1% (n= 14)	2.7% (n = 2)	21.9% (n= 16)
6-10yrs	16.5% (n =12)	2.7% (n = 2)	19.2% (n =14)
11-15yrs	21.9% (n= 16)	0% (n= 0)	21.9% (n = 16)
16-20yrs	15.1% (n = 11)	2.7% (n = 2)	17.8% (n = 13)
21-25yrs	8.2% (n = 6)	1.4% (n= 1)	9.6% (n = 7)
26-30yrs	5.4% (n= 4)	1.4% (n= 1)	6.8% (n = 5)
Over 30yrs	2.7% (n = 2)	0% (n= 0)	2.7% (n = 2)
			Total =73

The participants were asked about the subject they are teaching and the results shown in table 3.4, most of participants in this study are female math teachers 16.5% ($n=12$).

Table 3.4: Demography of the Participants of the Survey Questionnaire by Subject

SUBJECT	FEMALE	MALE	TOTAL
English	15.1% ($n=11$)	1.4% ($n=1$)	16.5% ($n=12$)
Math	16.5% ($n=12$)	0% ($n=0$)	16.5% ($n=12$)
Science	8.2% ($n=6$)	1.4% ($n=1$)	9.6% ($n=7$)
Religion	11% ($n=8$)	1.4% ($n=1$)	12.4% ($n=9$)
Art	2.7% ($n=2$)	1.4% ($n=1$)	4.1% ($n=3$)
History	4.1% ($n=3$)	0% ($n=0$)	4.1% ($n=3$)
Geography	1.4% ($n=1$)	0% ($n=0$)	1.4% ($n=1$)
P.E	0% ($n=0$)	0% ($n=0$)	0% ($n=0$)
BM	8.2% ($n=6$)	2.7% ($n=2$)	11% ($n=8$)
Biology	5.5% ($n=4$)	0% ($n=0$)	5.5% ($n=4$)
Music	2.7% ($n=2$)	1.4% ($n=1$)	4.1% ($n=3$)
Physics	11% ($n=8$)	0% ($n=0$)	11% ($n=8$)
Chemistry	4.1% ($n=3$)	0% ($n=0$)	4.1% ($n=3$)
Economy	9.6% ($n=7$)	1.4% ($n=1$)	11% ($n=8$)
			Total =73

3.5.2 Participants of the interview

Participants for the interview were randomly selected from a list of staff names. Ten teachers were selected by the school administrator (gatekeeper) to participate in the interview. Participants selected by gate keeper for the interviews were approached by

the researcher after the gatekeeper identified who could be interviewed. From the 10 teachers 9 were female and 1 male. They taught subjects such as English, Mathematics, Science, and History.

Table 3.5: Participants of the interview

	FEMALE	MALE
NO.	90% (<i>n</i> = 9)	10% (<i>n</i> = 1)
	Total =10	

From table 3.5, most of participants in interview are female teachers 90% (*n*= 9).

3.6 DATA COLLECTION

3.6.1 Data Collection Procedures

A copy of the questionnaire (Appendix C) with a letter (Appendix A) explaining the purpose of the study was placed in the participants` post boxes at the school. The school principal was also invited to participate in the interview to represent the school administrators.

In accordance with the norm, participation in the study was voluntary and the subjects were free to withdraw at any time without obligation. They were free to decline to answer any questions they did not wish to answer. The subjects were informed that their responses were anonymous and confidential with the promise of research results upon their request.

3.6.2 Survey Questionnaire

A survey questionnaire is used to collect quantitative data, it was fully self-developed by the researcher and the supervisor. In designing the questionnaire the researcher aims to integrate questions that would provide precise and relevant data that

would fulfill the objectives and research questions as set out in the study. The reliability of the questionnaire is calculated using SPSS version 19. The reliability is found to be at Cronbach ($\alpha = 0.735$). This shows an acceptable reliability and internal consistency (Cronk, 2012).

3.6.2.1 Types of Questions

The researcher included many different types of close-ended questions in the questionnaire; for example dichotomous, multiple response and Likert Scale questions. The researcher use dichotomous type questions to gather very specific information from the participants`. The questionnaire has two dichotomous questions to collect data on ICT usage and adoption of ICT in teaching and learning.

Multiple response questions are applied to gather data on the participants` reactions to a range of possible recommended responses. The researcher allows flexibility in the participants` responses to these questions by including an `other` response choice where respondents are invited to specify their own response to the statement. There are 10 multiple response questions in the questionnaire.

Likert Scale questions are used to measure the participants` response to a statement. The scale applied is between a five point scale ranging from `strongly disagree` to `strongly agree`. Cohen et al. (2007) advocates using these scales as they assist measurement of opinion, quantity, and quality. Four likert scale questions are used in this questionnaire to find out the participants` level of use of ICT in teaching and learning.

3.6.2.2 Contents of the Questionnaire

Section A is aimed at collecting participants` demographic information, which includes age, gender, race, teaching experience, academic qualification, computer training, and ability to utilise ICT.

The second part of the questionnaire, Section B, focuses on two distinguishable areas of teachers' computer use. It gathers data on the following:-

1. Adoption of ICT, including use of specific ICT tools and application software, amount of time spent on computers, ICT tasks undertaken, access to computers and Internet,
2. Factors that contribute to teachers' adoption of ICT in the classroom such as issues on school administrator support, ICT facilities and training for teachers.

3.6.3 Semi-Structured Interview

According to Yin (2003), "the most important source of case study information is the interview" (p. 89). The aim of an interview is to discover the thought processes of the participant (Merriam, 1998). Merriam (1998) further argue that interviews are necessary when an event cannot be directly observed. Furthermore, Rubin and Rubin (2005) pointed out that interviewing is about getting interviewees' renditions of their experience and their interpretation of the world in which they live and work. Interviewers should not enforce their aspects on interviewees. Interviews are considered by many researchers as a valuable research instrument, suggesting that they are useful for gathering qualitative data and eliciting reasons and explanations for responses (Cohen et al., 2007). Bell (2005) affirms that the use of interviews as a good instrument for following up and explaining ideas, probing and investigating motives and delving further which is not possible in a questionnaire.

Yin (2003) discusses different types of interview for example open-ended interviews, focused interviews, and structured interviews, Smith and Glass (1987) further mentioned interview types to include story-telling interviews and semi structured interviews. In this study, interviews are used to provoke elaborated responses on the participants' experience in adopting ICT for teaching and learning as well as to gain a deeper understanding of the reasons for the responses given in the questionnaire. The researcher starts out with individual face-to-face interview questions (Appendix D). However, only one teacher is interviewed in this way. Due to the gatekeepers' intervention who said that the researcher was taking too much time interviewing the

teachers, the other participants are given the interview questions in written form to fill in with the researcher present in case there were questions that the teachers want to ask about the interview questions. Even though the participants write down their responses, they provide the required in-depth data. A face-to-face interview is however successfully conducted with the principal of the school.

3.7 DATA ANALYSIS

Data from the research are quantitatively and qualitatively analysed.

3.7.1 Descriptive statistics of the survey questionnaire

The questionnaire is analysed using SPSS version 19. Descriptive statistics and inferential statistics such as frequency, binomial test, chi-square and percentages of participants' responses were sufficient to identify trends and patterns to answer the research questions in this case study (Cohen et al., 2007).

3.7.2 Binomial Test and Chi-Square Test

Binomial Test is a nonparametric statistical procedure often performed for testing the median of a distribution. It can be used for data from non-normal populations. The test is an appropriate measure for analyzing the accuracy of data, and it is useful for determining if the proportion of participants in one of two categories is different from a specified amount (Cohen et al., 2007). In this study, it is used to identify if there is a difference between the participants who answer "yes" and "no". on the questions on factors that affect ICT adoption. The statistical significance is calculated at $p < 0.05$.

Additionally, the Chi-square is a statistical test commonly used to compare observed data with data that is expected. Chi-square test serves as a similar purpose to binomial test, except that it can be used when there are more than two categories to the variable (Cohen et al., 2007). So, in this study the Chi-square test is used to identify how many participants who have positive perceptions toward ICT adoption will answer "yes" or "no" on the factors that affect ICT adoption. The Chi-square test is also used to

identify if there are significant associations between the teachers' perception and factors that affect ICT adoption ($p < 0.05$).

Positive perception will be identified by reading the mean or sum of the participants' rating to the questions in research question 2. Mean above 3 or sum above 45 indicates a positive perception, whereas mean below 3 or sum below 45 indicate a negative perception. Mean of 3 or sum 45 exactly indicate a neutral perception

3.7.3 Interviews

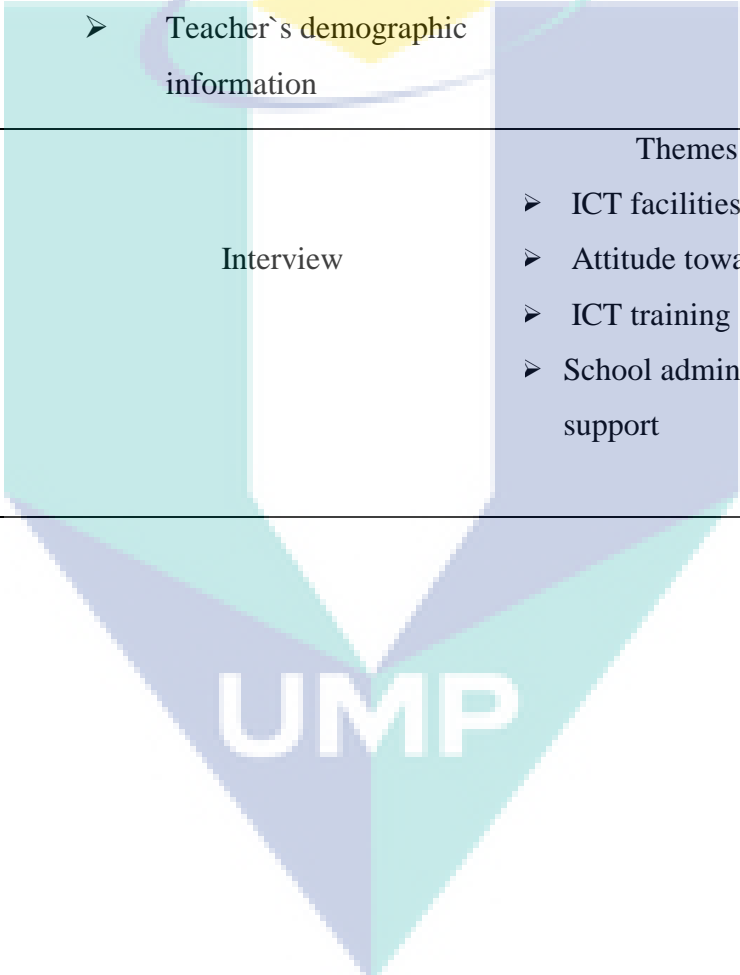
The interviews are analysed according to emergent themes, depending on the question posed, (Yin, 2003: p. 10). Themes on: ICT facilities and assistance, attitude toward ICT, ICT training and school administrators' supports are explored to set an in-depth view of the situation. 10 face to face interviews are recorded, transcribed and analysed according to the themes. While written interviews are analysed separately, again, looking at the themes descriptions, explorations and elaborations given in the interviews are reported as it is (raw data) according to emerging themes in each research question. The interview with the gatekeeper is recorded and transcribed. The questions are for examples does the gatekeeper use computer for tasks such as teaching or administration, what are the tools used, when did the school started using computer in teaching and learning, how does the gatekeeper view ICT integration level at the school, is priority given to ICT integration and what are the problems faced by the school with ICT integration.

3.8 SUMMARY

The study is designed as a case study research, which is aimed at investigating the adoption of ICT and factors affecting teachers' adoption of ICT in a smart school. The instruments used for data collection are interviews and questionnaires. The participants of the study are teachers from a smart school in Malaysia. A summary of the methodology employed in this research is illustrated in Table 3.6.

Table 3.6: Summary of Methodology

Participant	Data Collection Instrument	Data Analysis
73	Survey Questionnaire ➤ Teacher`s use and adoption of ICT ➤ Teacher`s perception in the use of ICT ➤ Teacher`s demographic information	✓ Frequency ✓ Percentage ✓ Binomial test ✓ Chi – square test
10	Interview	Themes on: ➤ ICT facilities and assistance ➤ Attitude toward ICT ➤ ICT training ➤ School administrators` support



CHAPTER 4

RESEARCH FINDINGS AND DISCUSSION

4.1 INTRODUCTION

The aim of this case study is to investigate and determine teachers' adoption of ICT and the factors affecting their use of ICT in the classroom. The main objectives set out by the researcher are to establish the use of ICT in teaching and learning at the school, specifically factors that affect the adoption of ICT in the school. The researcher explores many teachers factors and other variables to gain insight into the factors affecting ICT usage among the teachers at a Malaysian Smart School. The findings are presented in this chapter.

4.2 **RESEARCH QUESTION 1: WHAT ARE THE ICT TOOLS AVAILABLE AT THE SCHOOL AND TO WHAT EXTENT DO THE TEACHERS USE ICT IN TEACHING AND LEARNING?**

The purpose of this question was to investigate which ICT tools are available for teachers to use at the school and which ICT tools are used for the teaching and learning process. This research looks at variables such as ICT tools available to the teachers, type and frequency of tools used by the teachers in the classroom.

4.2.1 Data from the Survey Questionnaire

The data from the questionnaire include information on the ICT tools that are available and the ones used by the participants for teaching and learning.

4.2.1.1 The ICT tools that are available and used in teaching and learning

The ICT tools that are available at the school are computers, internet, printer, data projector, digital camera, digital video camera, scanner, interactive whiteboard, digital photo editing and digital video editing.

4.2.1.2 Use of ICT tools in teaching and learning

The participants identified the ICT tools that they use in the classroom. Table 4.1 indicates that the most frequently used ICT tool in the classroom is the printer while the least used is the digital video camera and digital video editing (Table 4.1)

Table 4.1: Participants use of ICT Tools in Teaching and Learning

ICT Tools	Very often	Often	Some-times	Almost never	Never
Computer	39.7% (n=29)	21.9% (n=16)	30.1% (n=22)	2.7% (n=2)	5.5% (n=4)
Printer	17.8% (n=13)	23.3% (n=17)	35.6% (n=26)	4.1% (n=3)	19.2% (n=14)
Data projector	15.1% (n= 11)	20.5% (n=15)	32.9% (n=24)	9.6% (n=7)	21.9% (n=16)
Digital camera	4.1% (n=3)	5.5% (n=4)	16.4% (n=12)	11% (n=8)	63% (n=46)
Digital video camera	1.4% (n=1)	1.4% (n=1)	11% (n=8)	15.1% (n=11)	71.2% (n=52)
Scanner	6.8% (n=5)	5.5% (n=4)	39.7% (n=29)	15.1% (n=11)	32.9% (n=24)
Interactive whiteboard	13.7% (n=10)	9.6% (n=7)	24.7% (n=18)	8.2% (n=6)	43.8% (n=32)
Digital photo editing	5.5% (n=4)	1.4% (n=1)	17.8% (n=13)	13.7% (n=10)	61.6% (n=45)
Digital video editing	1.4% (n=1)	1.4% (n=1)	11% (n=8)	15.1% (n=11)	71.2% (n=52)

Table 4.1 shows that most of the participants, 61.6% (n=45) state that they often use computer, almost half of the participants, 31.1% (n= 30) say that they often use the

printer and 35.6% ($n= 26$) of the teachers use the data projector. Another 39.7% ($n= 29$) states that they sometimes use the scanner in their teaching and learning process. Majority claim that they never use the digital video camera and digital video editing, 71.2% ($n= 52$) and 71.2% ($n= 52$) respectively.

4.2.1.3 Time allocated to use computers in school each day

One of the ICT tools which is frequently used by the participants in the classroom is the computer because for some subjects they are provided softwares to use by the ministry. There are various factors which could influence teachers use of computers in the classroom. One factor is the time allocated for teachers to access ICT technology, perhaps to prepare ICT resources and share resources as well as experiences with other teachers. Time and the lack of it is a constant issue arising from the research carried out on the factors affecting ICT use (Rutherford, 2004). Studies have identified lack of training time, lack of time to prepare resources, lack of actual class contact time and lack of time to access the full potential of ICT in the classroom as the main issues in regard to time when using ICT (Ertmer, 2005)

Most of the participants state that they have access to the computers each day. The only difference is the duration of time they have access to it because it depend on the timetable (Figure 4.1).

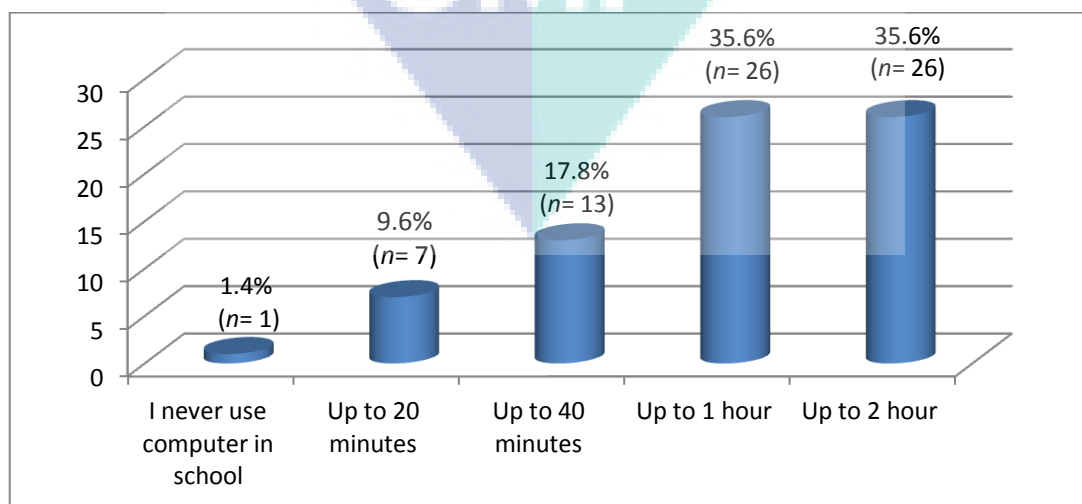


Figure 4.1: Time allocated to access computer each day

Figure 4.1 indicates that more than one third of the participants accessed computers for up to one hour a day at school, 35.6% ($n= 26$), and another 35.6% ($n= 26$) has access to it up to two hours a day. Some of the participants, only have about 40 minutes access (17.8%; $n= 13$), while (9.6%; $n= 7$) only have 20 minutes access to computers each day. The rest, 1.4% ($n= 1$), claims that he/she has never used the computers in school.

4.2.1.4 Use of computer application software in teaching and learning

In line with their frequent use of the computers in comparison to other ICT tools, the participants are asked how often they use Microsoft Office applications in their teaching. The results show that the three applications most frequently used are the Microsoft Word, Excel and PowerPoint (Table 4.2).

Table 4.2: Use of Microsoft Office applications in teaching and learning

The Applications	Very often	Often	Some-times	Almost never	Never
Microsoft Word	38.4% ($n= 28$)	35.6% ($n= 26$)	20.5% ($n= 15$)	0% ($n= 0$)	5.5% ($n= 4$)
Microsoft Excel	15.1% ($n= 11$)	38.4% ($n= 28$)	34.2% ($n= 25$)	5.5% ($n= 4$)	6.8% ($n= 5$)
Microsoft PowerPoint	34.2% ($n= 25$)	31.5% ($n= 23$)	26% ($n= 19$)	0% ($n= 0$)	8.2% ($n= 6$)

In Table 4.2 the results show that 38.4% ($n= 28$) of the participants use Microsoft Word very often, while 35.6% ($n= 26$) use it often, 20.5% ($n= 25$) sometimes and only 5.5% ($n= 4$) have never used Microsoft Word in their teaching.

The participants also claim that they use Microsoft Excel application in their teaching. Results show that 15.1% ($n= 11$) of the participants state that they very often and 38.4% ($n= 28$) often use Microsoft Excel in their teaching, 34.2% ($n=25$) use the

application sometimes, while 6.8% ($n= 5$) of the participants say that, they never use it and claim 5.5% ($n= 4$) said that they almost never use Microsoft Excel in their teaching.

Additionally, the participants use Microsoft PowerPoint, whereby most of the participants, 34.2% ($n= 25$) state that they very often use it, while 31.5% ($n= 23$) claim that they often use it, 26% ($n=19$) sometimes use it, and only 8.2% ($n= 6$) say that they have never used Microsoft PowerPoint in their teaching.

4.2.1.5 Use of internet and internet-based applications or tools in teaching and learning

The participants are asked about using internet and internet-based applications and tools in teaching and learning. Table 4.3 shows that internet and internet-based applications are most frequently used for internet surfing while they are least used for website design and computer-aided design.

Table 4.3: Use of internet and internet-based applications by participants

The Applications	Very often	Often	Some-times	Almost never	Never
Internet	20.5% ($n= 15$)	27.4% ($n= 20$)	38.4% ($n= 28$)	4.1% ($n=3$)	9.6% ($n=7$)
Email	16.4% ($n= 12$)	13.7% ($n= 10$)	41.1% ($n= 30$)	13.7% ($n= 10$)	15.1% ($n= 11$)
Website design	1.4% ($n= 1$)	0% ($n= 0$)	9.6% ($n= 7$)	19.2% ($n= 14$)	69.9% ($n= 51$)
Computer aided design	2.7% ($n= 2$)	2.7% ($n= 2$)	9.6% ($n= 7$)	16.4% ($n= 12$)	68.5% ($n= 50$)

A number of the participants, 20.5% ($n= 15$), say that they use the internet for surfing to prepare for their lessons in their teaching and learning; and 16.4% ($n= 12$) state that they use it for email. However, a majority claim that they never use the internet or internet-based applications for website design or computer aided design, 69.9% ($n= 51$) and 68.5% ($n= 50$) respectively. Basically, the use of internet and

internet based applications by participants are for teaching preparation and communication.

4.2.1.6 Use of ICT for preparation of activities or tasks for teaching and learning

The participants are asked if they use ICT tools to prepare their teaching and learning activities and tasks (Table 4.4)

Table 4.4: Use of ICT for preparation of activities or tasks for teaching and learning

Activities or Tasks	Very Often	Often	Some-times	Almost never	Never
Use of ICT to create quizzes	8.2% (n= 6)	17.8% (n= 13)	52.1% (n= 38)	4.1% (n= 3)	17.8% (n= 13)
Use of ICT for word search in teaching	9.6% (n= 7)	12.3% (n= 9)	43.8% (n= 32)	6.8% (n= 5)	27.4% (n= 20)
Usage of ICT to create PowerPoint presentation in teaching	27.4% (n= 20)	28.8% (n= 21)	32.9% (n= 24)	5.5% (n= 4)	5.5% (n= 4)
Use of ICT to download video clips for teaching	8.2% (n= 6)	13.7% (n= 10)	35.6% (n= 26)	11% (n= 8)	31.5% (n= 23)
Use ICT to prepare exam materials	49.3% (n= 36)	28.8% (n= 21)	13.7% (n= 10)	4.1% (n= 3)	4.1% (n= 3)
Use of ICT to maintain students' records in teaching	20.5% (n= 15)	37% (n= 27)	21.9% (n=16)	2.7% (n= 2)	17.8% (n= 13)
Use of ICT for completing projects in teaching	8.2% (n= 6)	15.1% (n= 11)	37% (n= 27)	13.7% (n= 10)	26% (n= 19)
Use of ICT for online translators in their teaching	5.5% (n= 4)	2.7% (n= 2)	41.1% (n= 30)	12.3% (n= 9)	38.4% (n= 28)
Use of ICT to prepare content for classes in their teaching	30.1% (n= 22)	30.1% (n= 22)	21.9% (n= 16)	6.8% (n= 5)	11% (n= 8)
Use of ICT to prepare worksheet/handouts in their teaching	39.7% (n= 29)	32.9% (n= 24)	20.5% (n= 15)	0% (n= 0)	6.8% (n= 5)

Table 4.4 illustrates clearly that the tasks in which the participants use ICT tools or application frequently is for preparing exam materials, 78.1% ($n= 57$), worksheets or handouts, 72.6% ($n= 53$), content for classes, 60.2% ($n= 44$), maintaining students` records, 57.5% ($n= 42$), and preparing PowerPoint presentations, 56.2% ($n= 41$). Additionally the participants sometimes use ICT to conduct word search for teaching purposes, 43.8% ($n= 32$). However, participants say that they use online translators, 50.7% ($n= 37$) and download video clips.42.5% ($n= 31$) the least frequently.

4.2.1.7 Use of ICT for communication and research

The participants are asked whether they use ICT to communicate with other colleagues in other schools and also with the top management of the school in regards to teaching and learning (Table 4.5)

Table 4.5: Use of ICT for communication and research

Communication activities	Very often	Often	Some-times	Almost never	Never
Use of ICT to send and receive emails for teaching.	19.2% ($n= 14$)	19.2% ($n= 14$)	41.1% ($n= 30$)	5.5% ($n= 4$)	15.1% ($n= 11$)
Use of ICT to review subject associated online resources for teaching.	23.3% ($n= 17$)	24.7% ($n= 18$)	28.8% ($n= 21$)	12.3% ($n=9$)	11% ($n= 8$)
Use of ICT for teacher-sharing ideas resources in teaching.	8.2% ($n= 6$)	20.5% ($n= 15$)	42.5% ($n= 31$)	6.8% ($n= 5$)	21.9% ($n= 16$)

One of the uses of ICT is for communication. the participants say that they use it to send and receive emails,(Table 4.5) less than half of the participants, 41.1% ($n=30$) state that they sometimes send and receive emails in regards to their teaching. Another, 19.2% ($n=14$) state often, 19.2% ($n=14$) very often, while 15.1% ($n=11$) of the participants state that they never or almost never use ICT to send and receive emails.

The participants most frequently (very often and often) use ICT to review subject associated online resources for their teaching and learning 48% ($n=35$). Almost one third of the participants sometimes use it for that purpose, 28.8% ($n=21$), and 12.3% ($n=9$) and 11% ($n=8$) of the participants say they almost never or never use it.

Another common use of ICT is to contact other teachers to share resources for teaching. Almost half of the participants, 42.5% ($n=31$) state that they sometimes use ICT for this purpose, 8.2% ($n=6$), state very often, 20.5% ($n=15$), state often, while 6.8% ($n=5$) of the participants responded that they almost never and 21.9% ($n=16$) response never use ICT to contact other teachers to share resources for teaching.

4.2.1.8 Interview Responses for RQ1: WHAT ARE THE ICT TOOLS AVAILABLE At THE SCHOOL AND TO WHAT EXTENT DO THE TEACHERS USE ICT IN TEACHING AND LEARNING?

The teachers' adoption of ICT is probed further with the question what is the main type of ICT that you utilise in school or at home. The key participants say that they utilise Microsoft PowerPoint and computer as well as the internet in the classroom. In addition, two of the key participants say that they also use ICT for social networking. Another key participant say:

Internet, Microsoft PowerPoint and Microsoft Word.

(Teacher 5, 16/4/2012, Main teachers' room)

However, most of the key participants state that they also use subject specific software, which is the CD provided by the Ministry of Education. As teacher 4 said:

Yes, we use the CD provided by KPM

(Teacher 4, 16/4/2012, Main teachers room)

4.3 **RESEARCH QUESTION 2: WHAT ARE THE TEACHERS' PERCEPTIONS TOWARDS THE ADOPTION OF ICT IN TEACHING AND LEARNING?**

The aim of this question is to investigate the teachers' perception of using ICT for teaching and learning.

4.3.1 **Teachers' attitude and motivation towards the adoption of ICT in teaching and learning.**

The participants are asked to assess their perceptions towards ICT adoption using Likert-scale questions. They are asked to respond to each statement on a scale which starts with "Strongly agree" to "Strongly disagree" (Table 4.6).

Table 4.6: Teachers' attitude towards adoption of ICT in teaching and learning

Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
I have a positive attitude towards using ICT in the classroom.	37% (<i>n</i> = 27)	56.2% (<i>n</i> = 41)	4.1% (<i>n</i> = 3)	2.7% (<i>n</i> = 2)	0% (<i>n</i> = 0)
I feel competent and confident using ICT in teaching and learning.	27.4% (<i>n</i> = 20)	54.8% (<i>n</i> = 40)	16.4% (<i>n</i> = 12)	1.4% (<i>n</i> = 1)	0% (<i>n</i> = 0)

Table 4.6 illustrates the participants' attitude towards adoption of ICT in teaching and learning. A majority, 56.2% (*n*= 41) agree with the statement that they have a positive attitude toward using ICT in teaching and learning, 37% (*n*= 27) strongly agree, 4.1% (*n*= 3) are neutral, whilst 2.7% (*n*= 2) disagree with the statement. None of the participants, however, strongly disagree. This means that most participants generally have a positive attitude towards the adoption of ICT in teaching and learning.

In terms of competency and confidence, the participants' again, show positive responses in which 54.8% ($n= 40$) of the participants answered agree, while, 27.4% ($n= 20$) of the participants strongly agree that they feel competent and confident using ICT in teaching and learning. Therefore, the majority of participants 82.2% ($n= 60$) say that they strongly agree and agree. Another 16.4% ($n= 12$) of the participants state neutrality, but 1.4% ($n= 1$) of the participants disagree. This means that most of the participants feel confident and competent in using ICT in the classroom.

4.3.2 Developments in teacher's use of ICT

In the questionnaire the participants are also asked if their use of computers have increased since commencing employment in the school. Most of the participants feel that there is a positive development in their frequency of using ICT in their teaching. (Figure 4.2)

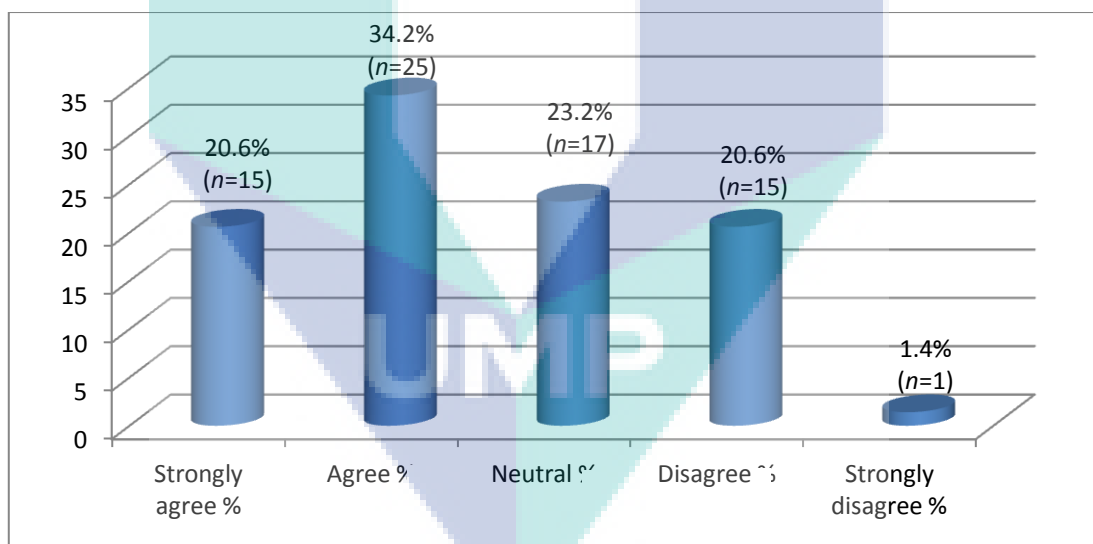


Figure 4.2: Increased use of computers since commencing employment in the school

Figure 4.2 indicates that 34.2% ($n= 25$) of the participants agree that their computer use has increased, while another 20.6% ($n= 15$) strongly agree that their use of computers has increased since commencing employment in the school. In addition, 23.2% ($n= 17$) of the participants gave neutral answers, but 20.6% ($n= 15$) of the participants strongly disagree and 1.4% ($n= 1$) strongly disagree.

Most of participants, 56.2% ($n= 41$) say that they are willing to use more ICT in their classroom, whilst 16.4% ($n= 12$) strongly agree. However, 20.5% ($n= 15$) of the participants are neutral, 5.5% ($n= 4$) of the participants disagree and the rest of the participants, 1.4% ($n=1$) strongly disagree with this statement.

4.3.3 Teachers' perception of students' attitude towards the adoption of ICT in teaching and learning

The participants are asked to evaluate if they think their students learn more when they use ICT in the classroom. Basically, the teachers feel that their students' benefit from the use of ICT in the classroom. (Figure 4.3)

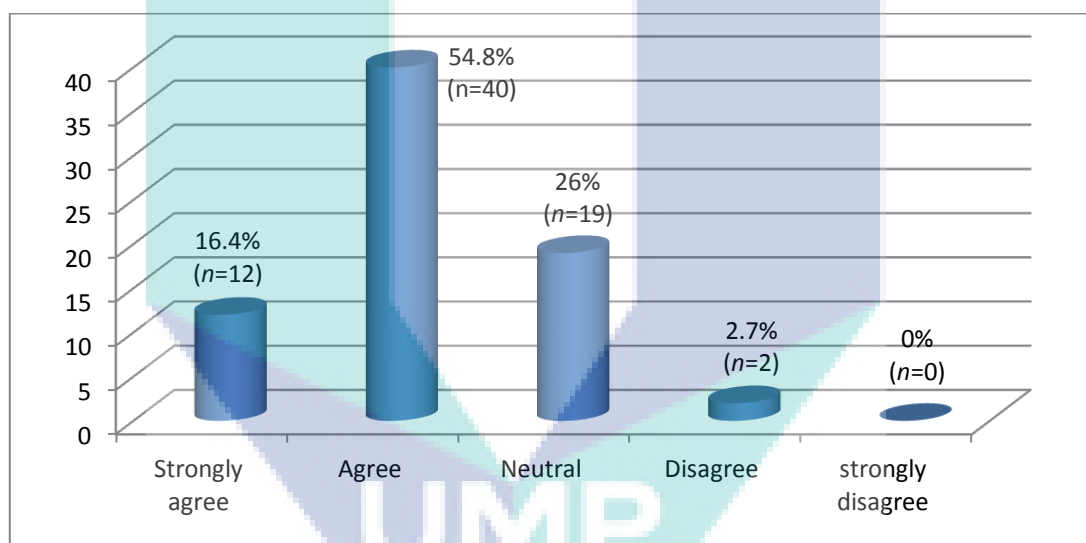


Figure 4.3: Students learnt more when ICT is used in the classroom

Figure 4.3 shows that 54.8% ($n= 40$) of the participants think that the students learn more when they use ICT in the classroom. Another 26% ($n= 19$) of the participants are neutral, while, 16.4% ($n= 12$) strongly agree. However, 2.7% ($n= 2$) of the participants disagree that is the case.

4.3.4 Teachers' perception of school management's support for the adoption of ICT in teaching and learning

The study also sought to find out the type of support the school provides for the adoption of ICT in teaching and learning, and if the school management provides all need for ICT adoption. The participants are asked if they believe that the school has good ICT facilities. The results indicate that about half only feel that the school management has provided good ICT facilities.

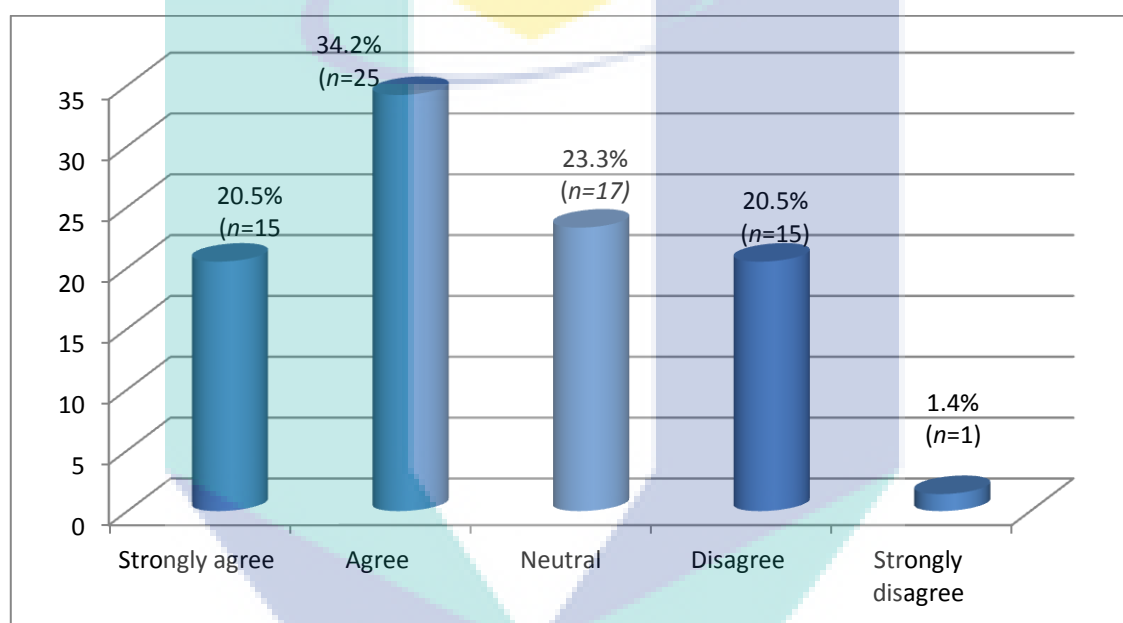


Figure 4.4: The school provides good ICT facilities

More than a quarter, 34.2% ($n=25$) of the participants agree that the school has good ICT facilities, 20.5% ($n=15$) strongly agree and another 23.3% ($n=17$) of the participants are neutral. (Figure 4.4) On the other hand, 20.5% ($n=15$) of the participants disagree and 1.4% ($n=1$) strongly disagree with this statement.

Satisfaction with the level of ICT support in the school is also investigated. In general, the participants say that it is satisfactory, 63% ($n=46$) (Figure 4.5).

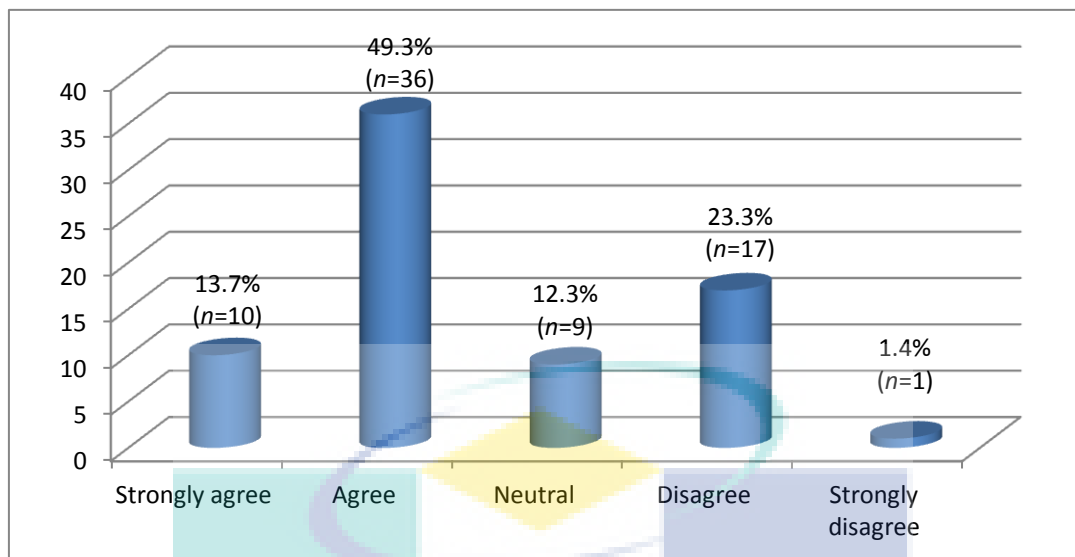


Figure 4.5: The level of ICT support at the school

Figure 4.5 shows that 49.3% ($n= 36$) of the participants agree that the level of ICT maintenance in their school is satisfactory. Another 23.3% ($n= 17$) of the participants disagree and 13.7% ($n= 10$) strongly agree. A number of participants, 12.3% ($n= 9$), give a neutral answer and 1.4% ($n=1$) strongly disagree with the statement that the level of ICT support at the school is satisfactory.

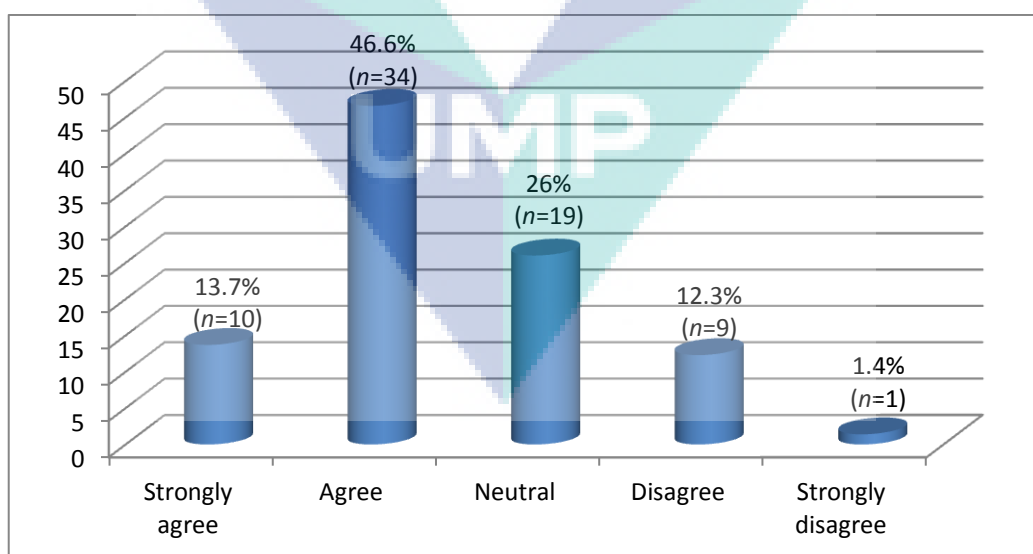


Figure 4.6: Satisfaction towards the provision of ICT at the school

Then, the participants are asked if the provision of ICT training at the school has been satisfactory. (Figure 4.6) Again, about 60% of the participants agree that it is satisfactory. Almost half of the participants agree 46.6% ($n= 34$) and 13.7% ($n= 10$) strongly agree that the provision of ICT training at the school is satisfactory. Another 12.3% ($n= 9$) of the participants disagree, 1.4% ($n= 1$) strongly disagree and 26% ($n= 19$) are neutral.

In addition, maintenance of ICT facilities is a crucial question posed to evaluate the participants' satisfaction with the maintenance of ICT equipment in the school (Figure 4.7). In general, less than half of the participants are satisfied with the maintenance of ICT equipment in the school. A number of participants, 31.5% ($n= 23$) agree and strongly agree 11% ($n= 8$) with the statement. On the other hand, 16.4% ($n= 12$) of the participants disagree 6.8% ($n= 5$) strongly disagree and 34.2% ($n= 25$), are neutral about the maintenance of ICT equipment at the school is satisfactory.

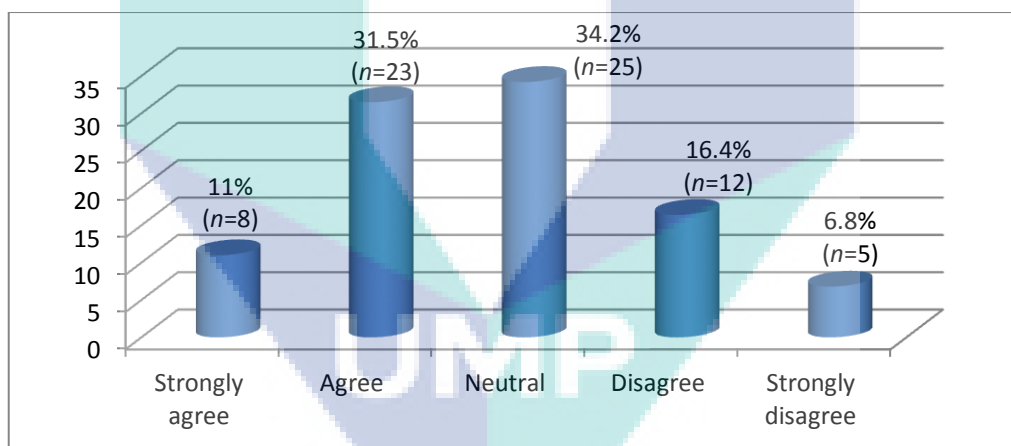


Figure 4.7: Satisfaction towards maintenance of ICT facilities

In relation to the previous question, the participants are asked about their satisfaction with the computer room reservation system at the school (Figure 4.8). About half of the participants, 52.1% ($n= 38$) agree that the computer room reservation system at the school is satisfactory. Another 30.1% ($n= 22$) of the participants give a neutral answer, 8.2% ($n= 6$) strongly agree and 9.6% ($n= 7$) of the participants disagree that the computer room reservation system at the school is satisfactory.

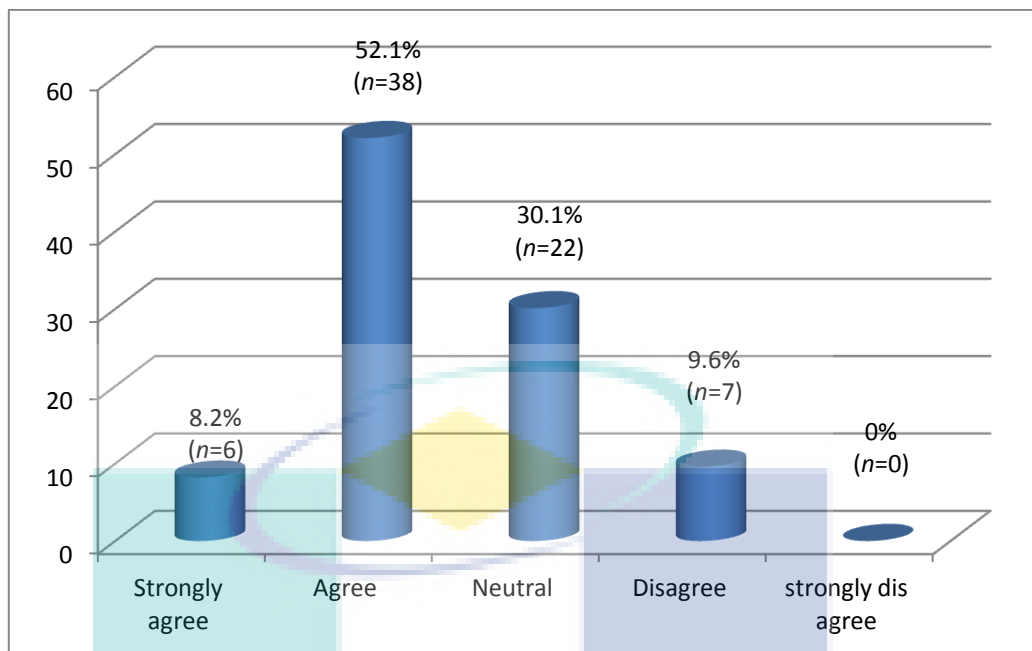


Figure 4.8: Satisfaction towards computer room reservation system at the school

In addition, most of the participants believe that the school management support teaching using ICT (Figure 4.9). A number of the participants agree with this 52.1% ($n=38$) and another 24.7% ($n=18$) strongly agree that the school management support the adoption of ICT in teaching and learning. Only 6.8% ($n=5$) of the participants disagree with the statement and 1.4% ($n=1$) have no answer.

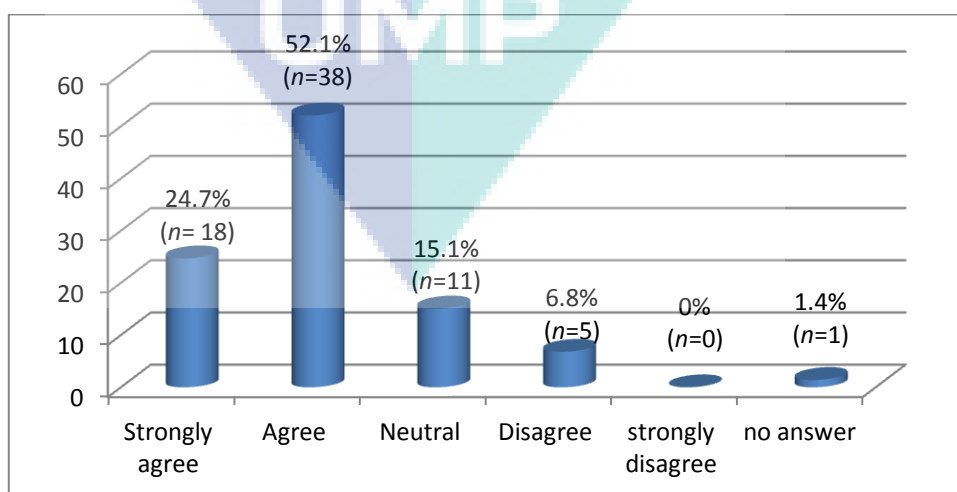


Figure 4.9: School management support teaching using ICT

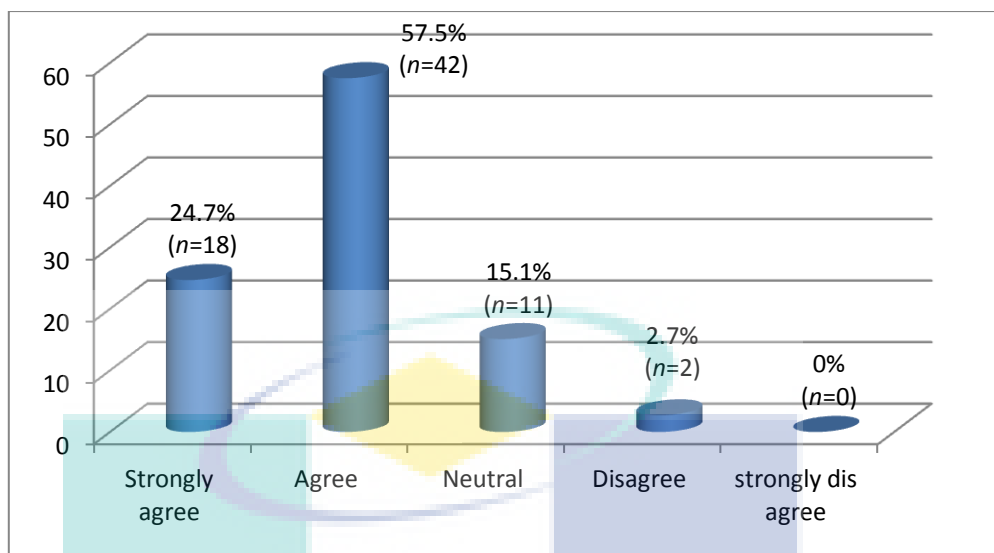


Figure 4.10: More ICT training should be provided

Finally, the participants are asked if they feel that further ICT training should be provided for teachers (Figure 4.10). A majority of the participants agree that they need further training. A total of 57.5% ($n=42$) agree and 24.7% ($n=18$) of the participants strongly agree that there is a need for further ICT training. Another, 15.1% ($n=11$) gave a neutral reply and 2.7% ($n=2$) disagree with the statement. The majority of participants agree that the teachers` needed further training.

4.3.5 Interview Responses for RQ2: WHAT ARE THE TEACHERS' PERCEPTIONS TOWARDS THE ADOPTION OF ICT IN TEACHING AND LEARNING?

Firstly, the teachers' motivation in using ICT in the classroom is explored in the interview, the key participants are asked if they feel confident using ICT in their classroom. The participants emphasize that all of them feel confident using ICT in the classroom. One of the participants states that:

Yes because [we] know that even the students can help the teacher in using the ICT equipment.

(Teacher 4, 16/4/2012, Main teachers room)

Furthermore, in the interview, most of the key participants are asked if they feel their ICT use has changed since joining the school. Six of the teachers interviewed say that their ICT use has improved. One of the participants say that:

Yes, I have been using it throughout my teaching.

(Teacher 5, 16/4/2012, Main teachers' room)

However, some of the key participants also say that their ICT use has not changed even though more ICT-based information is used in the school. Another participant claim that:

No but (even though) more ICT based information technology has been used

(Teacher 10, 20/4/2012, Main teachers' room)

It can be said that the key participants' attitude toward using ICT in the teaching and learning environment is generally positive. However, they emphasize that the teacher must have the skills to use ICT so that they can keep abreast with students who are sometimes more skilled than they are. As teacher 6 illustrates:

Yes, however one must be good. Students have more knowledge than we do.

(Teacher 6, 20/4/2012, Main teachers' room)

Thus, it is not surprising that when the key participants are asked if they would like to use more ICT in their classroom, their answers are positive.

The participants' confidence could also stem from their willingness to change and use ICT in their teaching and learning. The answers from the key participants in the interviews show that some of the key participants believe that teachers should change for their own benefit. However, the majority of the key participants do not believe that teachers should change for any reason. One of the key participants say that:

The teacher realises the importance of changing. They will change by their own way.

(Teacher 2, 16/4/2012, Main teachers' room)

When asked if there is too much emphasis put on using ICT for teaching and learning, some of the key participants believe that there is a possibility that there is too much emphasis given on using technology in teaching and learning. Three of the key participants feel that there is too much emphasis put on ICT adoption. However, as one of the teacher sums up:

The students have been exposed to technology at an early age. The teacher had to be skilful in ICT technology in order to get through to them.

(Teacher 4, 16/4/2012, Main teachers' room)

Another key participant also feel that change is inevitable:

Yes it is necessary to use ICT nowadays; you have to go with it.

(Teacher 10, 20/4/2012, Main teachers' room)

The key participants are also asked whether they believe that by using ICT in the classroom teachers will be more professional. The answers from the key participants show that half of them believe that it is true while the other half of the participants do not believe so.

The key participants are also asked whether ICT enhanced their teaching in the classroom. And most ($n= 8$) answered yes. One of the teachers said that it could be either way:

Yes and No, yes if your stuff is interesting, no if our students are not IT savvy.

(Teacher 6, 20/4/2012, Main teachers' room)

Four of the key participants in the interviews indicate that the main benefit of using ICT is that it makes it easier and simpler to explain content to the students. In addition, three of the participants agree that the main benefit is to attract students'

attention to teaching and learning. Two of the key participants said that the use of ICT saves time, and one teacher explains that ICT opens doors to various resources to accommodate students' different learning styles:

Information becomes accessible, creating opportunities to teach any type of students.

(Teacher 10, 20/4/2012, Main teachers' room)

Thus, the key participants feel that ICT allows for information to be more accessible for teachers to cater for any level of students. However, access to computers remains a main problem for the teachers. Half of the key participants say that they often have their students in the computer lab working on computers during teaching and learning while some others, do not have the same opportunity. This is due to inadequate ICT facilities at the school. This suggests that the ICT facilities of the school is insufficient to cater for all the students to use the computers at the same time. One teacher say that:

Yes, not many computers in working condition.

(Teacher 6, 20/4/2012, Main teachers' room)

However, most of the key participants answer that the school does not have good ICT facilities (computers, printer, data projectors and scanner). While more than half of participants in the questionnaire said the school has good ICT facilities. This indicated the participants in the interview reach higher level of ICT integration than the participants in the questionnaire. As one teacher states

No, I don't think so

(Teacher 1, 16/4/2012, Main teachers' room)

And another participant claims:

Enough, but without proper upgrade of software

(Teacher 10, 20/4/2012, Main teachers' room)

Interestingly, the key participants indicate that they use computers more frequently in their teaching and learning now than before due to the available ICT support at their school. One of the key participants say that:

Yes, computer prepares almost all of the teaching materials and helps us to get connected easily.

(Teacher 4, 16/4/2012, Main teachers' room)

Another participant sums up:

Yes, I do my own business- email, preparing lessons (handout) and other school work [using the computer provided]

(Teacher 7, 20/4/2012, Main teachers' room)

In addition, most of the participants believe that the school management support teaching using ICT:

The school has been provided with a lot of ICT equipment and management had motivate the teacher to fully utilize the equipment. And the school has IT technician that can be contacted easily.

(Teacher 1, 16/4/2012, Main teachers' room)

Some of the key participants say that they are provided enough ICT assistance and some feel that they do not receive enough ICT assistance. One of the participants say that:

Yes, they are highly skills teacher and ICT technician that can be contacted easily.

(Teacher 3, 16/4/2012, Main teachers' room)

In the interview, half of the key participants highlight that they would like to learn more about how to use Microsoft PowerPoint, Microsoft Excel and Photoshop.

Furthermore, some of the participants say that they would like to learn everything about ICT. However, there are teachers, who answered that they only want to learn new things. In general, what teacher 6 said sums up the teachers' enthusiasm to use ICT:

Yes, whatever it takes

(Teacher 6, 20/4/2012, Main teachers' room)

Basically participants feel that the school has provided good support for the adoption of ICT in teaching and learning. In addition, most of the participants believe that the school management supports the adoption ICT in the school.

However, Teacher 10 does highlight a request for the school management which is:

Internet access should be available in the classroom

(Teacher 10, 20/4/2012, Main teachers' room)

4.4 RESEARCH QUESTION 3: WHAT ARE THE FACTORS THAT CONTRIBUTE TO THE TEACHERS' USE OF ICT IN TEACHING AND LEARNING?

The aim of this question is to find out what are the factors that contribute to the use of ICT in teaching and learning at the school. The variables include time allocated for ICT use, training, management stance on ICT integration and access to ICT tools and applications.

4.4.1 Time allocated for ICT- related activities

Slightly more than half of the participants claim that they are not given enough time to learn to use ICT and use it for related activities (Table 4.7).

Table 4.7: Time allocated for ICT related activities

You feel that	No	Yes
Time allocated to learn to use ICT is enough.	57.5% (n= 42)	42.5% (n= 31)
Time allocated for preparing ICT resources for teaching is enough.	79.5% (n= 58)	20.5% (n= 15)
Time allocated for resource discussion and sharing is enough.	60.3% (n= 44)	39.7% (n= 29)
IT training provided is enough	68.5% (n= 50)	31.5% (n= 23)
Teachers lack confidence when using ICT.	86.3% (n= 63)	13.7% (n= 10)

From the results in Table 4.7 many of the participants feel that there is sufficient time allocated to prepare ICT resources for teaching , 79.5% (n= 58). However, most of them also feel that there is not enough time to learn to effectively use ICT, 57.5% (n= 42), share and discuss resources, 60.3% (n= 44), or be trained adequately to use ICT, 68.5% (n= 50). In spite of this, it does not affect teachers` confidence when using ICT, 86.3% (n= 63).

The participants are then asked if they face difficulties in using ICT, such as if they feel frustrated using ICT (Table 4.8).

Table 4.8: Teachers' reactions towards ICT adoption

Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
I get frustrated using ICT in the classroom.	4.1% (n= 3)	20.5% (n= 15)	23.3% (n= 17)	32.9% (n= 24)	19.2% (n= 14)
Using ICT in the classroom take up too much time.	5.5% (n= 4)	37% (n= 27)	27.4% (n= 20)	24.7% (n= 18)	5.5% (n= 4)

The responses show that 32.9% ($n= 24$) of the participants disagree that they get frustrated using ICT and 19.2% ($n= 14$), strongly disagree. On the other hand, 20.5% ($n= 15$) of the participants agree with the statement that they get frustrated using ICT in the classroom and 4.1% ($n= 3$) of the participants strongly agree. The rest of the participants, 23.3% ($n= 17$) are neutral.

Another issue investigated is participants' perception of whether using ICT takes too much of class time. Less than half of the participants, 37% ($n= 27$) agree that using ICT is time consuming, and another 5.5% ($n= 4$) strongly agree. On the other hand, 24.7% ($n= 18$) of the participants disagree with the statement, while, 5.5% ($n= 4$) of the participants strongly disagree that using ICT in the classroom takes too much time. Interestingly, 27.4% ($n= 20$) of the participants shows a neutral response to the statement.

4.4.2 School management support for ICT adoption

The question of whether the school management supports ICT adoption is also explored (Table 4.9)

Table 4.9: School management priority for ICT adoption

You feel that	No	Yes
The priority put by the management on ICT is adequate.	72.6% ($n= 53$)	27.4% ($n= 20$)
There was lack of support when using ICT in the classroom.	50.7% ($n= 37$)	49.3% ($n= 36$)

The participants think that there is lack of priority given by the management on ICT, 72.6% ($n= 53$) and possible association with lack of support given when teachers use ICT in the classroom, 50.7% ($n= 37$).

4.4.2.1 School Administrator's Interview

From the interview with the school administrator it is claimed that the school supports ICT adoption by encouraging the teachers to attend workshops to improve their level and skills. They also claim that they maintain the ICT facilities in good condition.

The administrator used ICT in the teaching and learning and for other tasks, it has been used for more than 5 years in career.

When asked if the administrator thinks that ICT adoption in teaching and learning in the school is beneficial, the participant shows a very good and positive attitude towards ICT adoption. Another question that is asked is how the administrators support the ICT adoption at the school. The participant says:

They encouraged ICT demands and like if the teachers requested to attend workshops and localized budget for the maintenance of ICT equipment.

(School administrator, 20/4/2012, principal office)

4.4.3 Research Observation

The researcher had the chance to observe 3 sessions in the computer lab after getting the permission from the school management. From first observation, the researcher found that available ICT infrastructure showed that the school provides relevant ICT tools for teaching and learning. However, in terms of adoption of ICT in the classroom, the types of ICT tools, computer application software and Internet-based applications used by the participants in their teaching and learning processes indicate that their use of ICT is still very traditional specially this school is consider as Smart school. The students were very glad when entered the lab and they were sharing the computers because there was not enough computers for all students.

4.5 **RESEARCH QUESTION 4: IS THERE ASSOCIATION BETWEEN TEACHERS' PERCEPTIONS OF ICT ADOPTION AND FACTORS THAT CONTRIBUTE TO THE USE OF ICT IN TEACHING AND LEARNING?**

The participants are asked about their perception of ICT adoption using Likert Scale questions (Research Question 2). Table 4.10 shows the summary of the mean of the participants' perception of ICT adoption. appendix E shows the mean and sum of the participants' perception of ICT adoption. To find out if there was a relation between the teachers' perceptions of ICT adoption (positive or negative perception) and how do they view the factors that contribute to the use of ICT in teaching and learning.

Table 4.10: Summary for teachers' perception of ICT adoption

Teacher perception	Positive response	Neutral	Negative response
Number of teachers	80.2% (<i>n</i> = 59)	2.7% (<i>n</i> = 2)	16.4% (<i>n</i> = 12)

The results shown in Table 4.10 indicate that 80.2% (*n*= 59) of the participants has positive responses and perception towards ICT adoption their mean answers above 3 or sum above 45. Another 16.4% (*n*= 12) has negative response and perception of ICT adoption their mean below 3 or sum 45. While the rest, 2.7% (*n*= 2) of the participants are neutral about ICT adoption their mean 3 or sum 45 exactly.

The participants are also asked about the factors that may affect the adoption of ICT, (Research Question 3). Table 4.11, shows the factors that contribute to ICT adoption and possible factors teachers consider as barriers.

Table 4.11: The barriers that affect ICT adoption

You feel that	Yes	No
Not enough time to learn how to use ICT.	57.5% (n= 42)	42.5% (n= 31)
Not enough time to prepare ICT resources for class	79.5% (n= 58)	20.5% (n= 15)
No time allocated to discuss/ share resource in subject areas	39.7% (n= 29)	60.3% (n= 44)
Sufficient ICT training has not been provided	68.5% (n= 50)	31.5% (n= 23)
Management do not view ICT as a priority	72.6% (n= 53)	27.4% (n= 20)
Lack of confidence using ICT	13.7% (n= 10)	86.3% (n= 63)
Lack of technical support using ICT in the class room	50.7% (n= 37)	49.3% (n= 36)

The majority of participants 86.3% (n=63) feel confident when they are using ICT, about the half of participants, 50.7% (n=37), state that there are lack of technical support using ICT in the classroom, while the other half 49.3% (n=36), state no. Furthermore 57.6% (n=42), of participants point out that not having enough time to learn how to use ICT, another 20.5% (n=15), states that there are not enough time to prepare ICT resources for class. While 68.5% (n=50), illustrates that there was not sufficient ICT training has been provided. Interestingly 72.6% (n=53), shows that the management do not view ICT as a priority.

4.5.1 Binomial test

Table 4.12 shows the barriers that teachers believe affect ICT adoption. A binomial test is done to identify if the difference between the two groups of participants` answers (those who answered yes and no) are significant ($p < 0.05$).

Table 4.12: Binomial test results for barriers that may affect on ICT adoption

Barrier	Answer	Category	Number of participants	<i>P</i> value
1. Not enough time to learn how to use ICT.	Yes	1	42	.242
	No	2	31	
	Total		73	
2. Not enough time to prepare ICT resources for class	Yes	1	15	.000
	No	2	58	
	Total		73	
3. No time allocated to discuss/ share resource in subject areas	Yes	1	44	.101
	No	2	29	
	Total		73	
4. Sufficient ICT training has not been provided	Yes	1	50	.002
	No	2	23	
	Total		73	
5. Management do not view ICT as a priority	Yes	1	53	.000
	No	2	20	
	Total		73	
6. Lack of confidence using ICT	Yes	1	10	.000
	No	2	63	
	Total		73	
7. Lack of technical support using ICT in the class room	Yes	1	37	1.000
	No	2	36	
	Total		73	

The results from Table 4.12 show that there is a significant difference between the participants who answer yes with those who answer no when they are asked if there is not enough time to prepare ICT resources for class, 20.5% ($n= 15$) of teachers answer “yes” and 79.5% ($n= 58$) answer “no”. ($p < 0.05$).

There is also a significant difference between the participants who answer yes, 68.5% ($n= 50$) and with those answering no, 31.5% ($n= 23$) when they are asked if not enough ICT training is provided. ($p < 0.05$). In addition a significant difference between the teachers who answer yes, 72.6% ($n= 53$) with those who answer no, 27.4% ($n= 20$) when they are asked if the school management views ICT as a priority. ($p < 0.05$) is also observed. The difference between the teachers who answer yes, 13.7% ($n= 10$) with those who answer no, 86.3% ($n= 63$) also shows a significant difference when they are asked if they lack confidence when using ICT ($p < 0.05$).

However, the difference between the teachers who answer yes with those that answer no is not significant when they are asked if there is enough time to learn how to use ICT, no time allocated to discuss or share resource in subject areas and lack of technical support using ICT in the classroom. The p value for these questions are more than $p < 0.05$.

4.5.2 Chi-square Test

A chi-square test of independence is also performed to examine the relation between teachers' perception and barriers that teachers think may affect ICT adoption.

The relation between teachers' perception and barrier of having not enough time to prepare ICT resources for class is significant, $X^2 (2, n= 71) = 25.329, p < .000$. Teachers with positive perception teachers are less likely to consider the factors as a barrier than teachers with negative perception as shown in Table 4.13.

Table 4.13: Chi-square test results for teachers' perception and the time barrier (not enough time to prepare ICT resources for class)

Crosstab			
	Yes	No	Total
Positive perception	76.3% (n= 45)	23.7% (n=14)	59
Negative perception	91.7% (n= 11)	8.3% (n=1)	12
	Observed n	Expected n	Residual
Positive perception teachers	59	59.0	.0
Negative perception teachers	12	12.0	.0
Test Statistics			
	Positive perception	Negative perception	
Chi-Square	25.329	25.329	
Df	1	1	
Asymp. Sig.	.000	.000	

The relation between teachers' perception and the barrier lack of ICT training is significant, $X^2 (2, n= 71) = 9.986, p <.01$. Furthermore 76.2% ($n= 45$) of positive perception teachers stated there was not enough time to prepare ICT resources for class. While 23.7% ($n=14$) answered there was enough time to prepare ICT resources for class that mean the teachers with positive perception are more likely to consider the factor as a barrier than negative perception teachers as shown in Table 4.14.

Table 4.14: Chi-square test result for the teachers' perception and the barrier on lack of ICT training has been provided

Crosstab			
	Sufficient ICT training has not been provided		Total
	Yes	No	
Positive perception	71.2% (n= 42)	28.8% (n=17)	59
Negative perception	58.3% (n= 7)	41.7% (n=5)	12
Total			71
	Observed <i>n</i>	Expected <i>n</i>	Residual
Positive perception	49	36.5	13.5
Negative perception	22	36.5	-13.5
Total	71		
Chi-square Statistics			
	Positive	Negative	
Chi-Square	9.986	9.986	
df	1	1	
Asymp. Sig.	.002	.002	

The relation between teachers' perception and barrier on the school management do not view ICT as a priority is significant, $X^2 (2, n = 71) = 14.918 p < .01$. Positive perception teachers are less likely to consider the factor as a barrier than negative perception teachers as the results show in Table 4.15.

Table 4.15: Chi-square result test for teachers' perception and barrier on the school management do not view ICT as a priority

Crosstab			
	Management do not view ICT as a priority		Total
	No	Yes	
Positive perception	30.5% (n=18)	69.5% (n= 41)	59
Negative perception	83.3% (n=10)	16.7% (n= 2)	12
Total			71
	Observed <i>n</i>	Expected <i>n</i>	Residual
Positive perception	52	36.5	16.5
Negative perception	19	36.5	-16.5
Total	71		
Test Statistics			
Chi-Square	14.918		14.918
Df	1		1
Asymp. Sig.	.000		.000

Teachers' who have positive perception towards ICT adoption viewed the followings as barriers: there is not enough time provided to prepare for class, lack of ICT training and the school management does not view ICT as a priority. Significant associations are recorded between the positive teachers' perception and factors that teachers perceive as barriers.

4.6 DISCUSSION

The findings of each research question will be discussed further in this section.

4.6.1 Research Question 1: What are the ICT tools available at the school and to what extent do the teachers use ICT in teaching and learning?

Upon initial observation, the available ICT infrastructure suggests that the school provides relevant ICT tools for teaching and learning. However, in terms of adoption of ICT in the classroom, the types of ICT tools, computer application software and Internet-based applications used by the participants in their teaching and learning processes indicate that their use of ICT is still very traditional. This is illustrated by the evidence from the activities and tasks they perform using ICT. Hooper and Rieber (1999) highlight that the traditional role of ICT is confined to three phases: familiarisation, utilisation and integration (see p. 13). In these phases, teachers are still the one who shapes how and when ICT is used in the classroom. Students have no voice and teaching and learning processes are still similar to face-to-face classes. The participants in this study are still at the utilisation phase. This is clearly shown by the tools the participants mainly use which are computers, printer and data projector. They also use ICT to do basic teaching tasks such as to create quizzes, conduct word search or to download video clips for teaching. This suggests that the participants are trying out the technology without actually integrating them in their teaching because these activities are class preparation rather than using ICT for activities in the classroom.

Very few of the participants use the internet and other ICT tools made available to them at the school. The teachers use internet tools, such as email only to communicate with other teachers and the management about teaching. Essentially, a teacher who has reached this phase have progressed further than familiarisation phase as this is clear in that the participants are using ICT tools in the classroom. However, their adoption has only reached the second phase. Being only at utilisation phase, there is an inherent danger that the participants will become prematurely satisfied with their limited use of the technology and have not achieved the breakthrough phase of integration (Hooper & Rieber, 1999). In that phase, the participants will have used ICT tools for classroom activities such as asking students to type their work on Microsoft Word and email it to the teacher. There is an inherent danger teachers who progress only to this phase will probably discard the technology at the first sign of trouble because they have made no commitment to it. This means that the teachers need more training workshops

to develop and sustain their ability to reach the subsequent stages. Mueller and his colleagues (2008) relate that training can lead to successful adoption of technology in the classroom.

The findings from this research question is surprising because the Smart School implementation should have reached Phase 3 whereby it is projected that all schools in Malaysia will become smart schools (see Figure 2.2). Instead, the teacher's use of ICT at the school in this study which is part of the Smart School the Pilot project has not gone beyond the utilisation stage. This is similar to findings in the Smart School Roadmap 2005 to 2009 report which highlights that ICT tools are under utilised in most smart schools resulting in low level adoption of ICT by teachers. (Multimedia Development Corporation, 2005). This can be because the training that is provided to most of the teachers is either basic or intermediate level courses (see Table 3.2) which have not helped teachers to integrate technology and transform their teaching practices (Diehl, 2005; Brinkerhoff, 2006).

4.6.2 Research Question2: What are the teachers' perceptions towards the adoption of ICT in Teaching and Learning?

Firstly, the results show that most of the teachers have positive attitudes towards the adoption of ICT in teaching and learning. The majority of the teachers feel competent and confident when using ICT in the classroom. Findings from several studies show that feelings of competence and confidence of using ICT are crucial factors affecting ICT adoption (Windschitl & Sahl, 2002; Mahani, 2006; Thang, et al., 2010). With the teachers' positive attitudes, adoption of ICT at the school should not be a factor that hinders implementation of the technology because it has often results in successful implementation in a school (Mahani, 2006). The teachers also say that their use of computers has increased and improved since commencing employment in the school.

The participants believe that they are willing to change to accommodate ICT in their teaching and learning, and this is a factor that contributes to effective adoption of ICT. Studies have shown that professional teachers are at the forefront of ICT adoption in education today and with their willingness to embrace change, implementation will

be easy (Cuban, 2001; Mueller et al., 2008; Nut, 2010; Alwani & Soomro, 2010; Ageel, 2011; Chen et al., 2012; Mohamed Zaki, 2013).

Another contributing factor to the adoption of ICT is support from the school management. The participants believe that the support is satisfactory and the school has provided maintenance of ICT equipment, computer room reservation system and technical head of department. The school management plays a vital role in the successful implementation of ICT in the school. Findings of studies indicate that one of the factors affecting ICT adoption is the positive stance of the school management towards ICT (Albirini, 2006; Multimedia Development Corporation, 2006; Bingimlas, 2009). The teachers' positive attitude towards ICT adoption could have stemmed from the school management's attitude towards ICT adoption, even though there was more than half of participants stated that the school management support ICT adoption while almost of the participants mentioned that the school management didn't put ICT as a priority in their school plan. Nevertheless, this study has also shown that the ICT facilities are not enough to cater for all teachers and students. Even though the teachers have a positive attitude and the school supports ICT adoption, this poses a problem too (McCombs, 2000). Thus granting of financial support to the school to equip it with more computers is recommended.

However, most of the participants asked for further training which illustrates that there is room for improvement in the process of continuous professional development for the teachers. Training and professional development is essential to ICT adoption (Bauer & Kenton, 2005; Diehl, 2005; Schoepp, 2005; Wozney et al., 2006; Brinkerhoff, 2006; Wepner et al., 2006; Hew & Brush, 2007; Lawless & Pellegrino, 2007; Keengwe & Onchwari, 2008; Clair, 2008; Chen, 2008, & Levin & Wadmany, 2008; Somekh 2008; Redecker, 2009; Nut, 2010). Thus, upon reflection on the findings of Research Question 1 whereby most of the participants is at utilisation stage, perhaps training will boost their usage to the subsequent levels. This is because the teachers already have positive attitudes to adopt ICT in their teaching and learning. Perhaps they only need more training to improve their ICT skills so that they can move further than utilisation to proceed to Integration, Reorientation and Evolution levels

4.6.3 Research Question 3: What are the factors that contribute to the teachers' use of ICT in teaching and learning?

Less than half of the participants responses that using ICT in their teaching takes up too much time is similar to the findings from other studies which indicate that one of the factors affecting ICT adoption is time constraints (Ofsted's, 2002; Liaw, 2002; Rutherford, 2004; Ertmer, 2005; Schoepp, 2005; Brinkerhoff, 2006; Redecker, 2009). The participants feel that they do not have enough time to discuss and share ideas, or to learn to use ICT resources. These could become barriers to the adoption of ICT at the school. Another factor that participants highlight as a barrier is not being given enough time for training. This is consolidated by the fact that most of the teachers have only basic computer training (see pg. 37). This could be a strong justification why the participants are still at the utilisation phase (Hooper & Rieber, 1999).

Support from the school management also plays an important role in the adoption of ICT in schools and should not be underestimated. Many studies have reported on the importance of management opinions and attitudes towards ICT directly affecting ICT use in the school (Albirini, 2006; Multimedia Development Corporation, 2006; Bingimlas, 2009). Even though for Research Question 2 the participants indicate that the school support ICT adoption, the support is mainly in providing the facilities, technician, or computer expert teacher and a booking system. However for this research question, school support is clearly lacking in time allocated to discuss or share resources and learn to adequately use ICT. The teachers also said they lacked appropriate training and time provided to explore using the ICT facilities. Thus, even though the teachers in this study are positive as well as confident about ICT adoption, they are not given time to explore, be adequately trained and receive support in the classroom form of easy accessibility to ICT, specifically computers, in the classroom, then their motivation will be affected. This is supported by Bingimlas (2009) who reported that lack of ICT technical competency as a significant factor affecting teachers' motivation to use ICT.

More than half of the participants feel that the school management does not put ICT adoption as a priority in the school teaching and learning agenda. Even though the school has the ICT facilities and support system, provision of ICT training at the school

has not been satisfactory. Perhaps, the participants feel that the school support ICT implementation because of the Ministry of Education agenda, but there is lack of significance put on it. This can be seen from the lack of computers made accessible to teachers and students at the school. As a result, the participants believe that they lack support in terms of the number of computers accessible to teachers and students. This will affect teachers' ICT adoption because the main ICT tools they use in the classroom is the computer.

4.6.4 Research Question 4: Is there association between teachers' perceptions of ICT adoption and factors that contribute to the use of ICT in teaching and learning?

The participants consider three major factors as barriers to ICT adoption which are: there is not enough time provided to prepare for class, lack of ICT training has been provided and the school management does not view ICT as a priority. Similar to findings by Alwani and Soomro (2010) who claimed changing teachers' pedagogical beliefs are both time consuming and complex tasks given to teachers consider as barriers to ICT adoption. For teachers to become proficient in using ICT, adequate time and resources must be provided to all teachers to develop confidence and competence in displaying ICT skills. In addition, appropriate ICT training has been found to increase teachers' confidence levels in using ICT (Redecker, 2009). Schools where the top management supports ICT professional development and ICT leadership also reported higher levels of ICT integration in the classroom (Nut, 2010). In addition, many studies have reported on the importance of management opinions and attitudes towards ICT directly affecting ICT use in the school (Albirini, 2006; Multimedia Development Corporation, 2006) found that lack of interest and commitment by the school management in the implementation of ICT in a school has a negative impact on the implementation of ICT at the school. Similarly, Bingimlas (2009) reported that teachers' willingness to undertake ICT training is influenced by the management's attitudes towards ICT. Thus, in order for ICT adoption of the school to progress from utilization to higher levels, the barriers have to be overcome effectively.

4.7 SUMMARY

This chapter can be summarised by the major findings which are:

Table 4.16: Summary of the chapter

Summary of findings	
RQ1	<ul style="list-style-type: none"> a. Most of the teachers have access to a computer and most have internet connection at home. This indicates that the teachers are willing and interested to use a computer and have a positive attitude toward ICT use. b. The participants use ICT to prepare exam materials, content for their classes and worksheets or handouts for their teaching.
RQ2	<ul style="list-style-type: none"> a. The teachers have a positive attitude toward the integration of ICT in teaching and learning. b. They feel competent and confident when they are using ICT in teaching and learning, c. The teachers' use of computers has increased and improved since commencing employment in the school. d. They are willing to change to accommodate ICT in their teaching and learning. e. The teachers think the students learn more when they used ICT in the classroom. f. They have a positive attitude towards the implementation.

RQ3

- a. Majority of the participants' state that the time allocated to access ICT, specifically computers are limited. As a result, the participants feel that they do not have adequate time to: learn to use ICT, share and discuss resources or be adequately trained to use ICT.
- b. They feel that enough time is provided to prepare ICT resources.
- c. Most of the participants feel confident when using ICT in their teaching.
- d. They feel that the school management do not put priority to ICT.
- e. About half of the participants feel that the school has very good ICT facilities.
- f. They feel that the school management support ICT adoption in teaching and learning.
- g. Provision of ICT training at the school is satisfactory.

RQ4

- a. Teachers consider three major factors as barriers to ICT adoption: there was not enough time provided to prepare for class, lack of ICT training and the school management does not view ICT as a priority.
 - b. There is a significant association between the teachers' positive perception of ICT adoption and barriers that highlighted by them: there was not enough time provided to prepare for class, insufficient training and the school management does not view ICT as a priority.
-

CHAPTER 5

CONCLUSION & RECOMMENDATIONS

5.1 INTRODUCTION

The main objectives set out by the researcher are to examine the use of ICT in teaching and learning at a Smart School, focusing on the availability of ICT facilities and the factors contributing to the adoption of ICT. This chapter presents the conclusion and recommendations of the study.

5.2 CONCLUSION

The conclusion from this study is reported according to the research questions set out at the initial proposal of the study:

5.2.1 **Research Question 1: What are the ICT tools available at the school and to what extent do the teachers use ICT in teaching and learning?**

The availability and use of ICT at the school reveal that the teachers have not reached the highest phase of adoption, which is integration, even though the school is a smart school and it has been almost 15 years since ICT was introduced to the school. In spite of the fact that the teachers have positive attitudes, confidence, willing and interested to use ICT in their classroom, they have only reached the utilisation phase.

The basic training that most of the participants attended do not facilitate their teaching practices. The participants use the computer, scanner and printer in their teaching and learning and prefer to use Microsoft Word in their classes. They use ICT just to do class preparation work which can be considered routine work for a teacher. Thus, their ICT use means that the teachers at the smart school have only developed their skills up to a stage where they could do basic tasks for teaching and lesson preparation. This is perhaps due to the fact that teachers are not empowered to plan their own teaching when using ICT. Most of the lesson plans are taken from the Ministry of Education or structured by the ICT head of department.

Even though, the participants' use the internet and internet-based applications for sharing ideas or resources for teaching and learning, which is required by the school administrator and Smart School programme, frequent communication is lacking. This is because the teachers are given a whole year's teaching plan to follow and the principal monitors each teacher's progress diligently. Thus, there is not much room for teachers to expand on the ideas in the teaching plans and share resources or ideas. The teachers do not fully utilise the potential of ICT for their teaching and learning. Furthermore, they are not given training to successfully integrate ICT in their teaching to progress to subsequent phases such as reorientation and evolution

5.2.2 Research Question 2: What are the teachers' perceptions towards the adoption of ICT in teaching and learning?

The results show that the participants have a positive attitude toward the integration of ICT in teaching and learning. The participants feel competent and confident when they are using ICT, and strive toward further ICT integration. Mueller et al. (2008) stated that teachers' own pedagogical views have a very important role to play in the teachers' integration of ICT. It has been found that teachers who only use ICT do not change their teaching style dramatically (Alwani & Soomro, 2010). For teachers to become proficient in using ICT adequate time and resources must be provided to all teachers to develop confidence and competence in displaying ICT skills. However, having the right attitude is a good starting point.

The participants are also willing to change to accommodate ICT in their teaching and learning. Teachers' unwillingness to incorporate ICT into their teaching and learning could be one of the obstacles that might delay the adoption of ICT in all secondary schools (Schoepp, 2005). In addition, Mohamed Zaki (2013) report that not all teachers are willing to embrace change in the classroom viewing ICT as an "unnecessary intrusion". However, the participants in this study are willing to change to adopt ICT. In fact, they asked for further training to better integrate ICT in their classroom. Bingimlas (2009) reported that teachers' willingness to undertake ICT training is influenced by the management's attitudes towards ICT. The school should have taken the opportunity to provide all the needs of the teachers so that they can expand their skills and add variety to their teaching and learning process at the school.

It is important to ICT adoption when the teachers feel that the students are learning more when they use ICT in the classroom. Afshari et al. (2009) state that ICT has the potential to make a significant contribution to both students' and teachers' overall development through motivating and promoting higher-order thinking, creating new and exciting opportunities as well as helping to create independent creative thinkers. Therefore, the integration of ICT in teaching and learning is perceived by the teachers as bringing greater benefits to the students. and should have been encouraged by the school management through providing accessibility to computers for teachers and students.

In sum, even though the participants perceive that the school management provides support to ICT adoption, there is still room for improvement. For example, further training could be provided to the participants so that they could accept the challenge to fully adopt ICT. This is especially since the participants are already positive and willing to change.

5.2.3 Research Question 3: What are the factors that contribute to the teachers' use of ICT in teaching and learning?

The participants state that using ICT in their teaching take up too much time. It is the same barrier found by Laurillard (2007) that labeled the factors affecting ICT uptake as “barriers to change”. The participants also state that there is not much emphasis put on using ICT for teaching and learning in the school. This is similar to findings by the Organisation for Economic Co-operation and Development (OECD, 2001) report which place serious emphasis on the importance of teacher motivation and teacher ICT use. The report identified a number of key motivating factors that encouraged teachers to engage with ICT. In addition the facilitation of collaborative teaching and learning through online technology was also recorded as a key motivator in the use of ICT by teachers (Baek et al., 2008). To overcome these barriers more ICT training should be provided.

The majority of participants' state that the time allocated to access ICT, specifically computers is limited. This is due to the lack of computers at the school. As a result, the participants feel that they do not have adequate time to: learn to use ICT, share and discuss resources or be adequately trained to use ICT. Alwani and Soomro (2010) claim that changing teachers' pedagogical beliefs are both time consuming and complex. For teachers to become proficient in using ICT adequate time and resources must be provided to develop confidence and competence in improving and displaying ICT skills. Pedagogical implications of insufficient time allocated for training to use ICT is the adverse impact on positive implementation of ICT. According to the findings by (Schoepp, 2005) there are schools which do not give teachers enough time to get familiar with ICT. The insufficient access to ICT is noted as an obstacle to successful implementation of technology (Kay, 2006).

Furthermore, the participants feel that the school management do not put priority on ICT. Multimedia Development Corporation (2006) state that the lack of interest and commitment by the school management in the implementation of ICT will have a negative impact on the implementation of ICT. This is not in line with the vision of the Smart School programme objectives. Therefore, the school administrators need to

ensure that teachers have access to ICT tools and the tools are well-maintained for the programme to be successfully implemented. Kay (2006) identified organizational capacity are major factors influencing ICT adoption and integration into teaching. For example, teachers' professional development is a key factor to successful integration of computers into classroom teaching. (Mohad Sofi Ali, 2002). Teacher centres should facilitate the professional development of teachers, and should be accessible whereby they should be built in strategic locations, equipped with modern technology, fully funded and adequately staffed, for teachers to embrace the challenge to adopt ICT fully (Mohamed Zaki, 2013). Teachers must be provided with the technical and pedagogical skills to integrate ICT into the classroom. The school management should be taking action to solve these barriers and encourage the teachers towards ICT adoption. The school needs to support this more adequately.

Most of the participants in this study feel confident when using ICT in their teaching. This is similar to findings by Mueller et al. (2008) that found that as teachers become more confident using ICT they will become empowered by its potential and strive towards further ICT integration. This is positive to the growth of teachers in adopting ICT in their classroom.

5.2.4 Research Question 4: Is there association between teachers' perceptions of ICT adoption and factors that contribute to the use of ICT in teaching and learning?

The participants have only reached the utilisation level and they point to a few barriers that may have affected their ICT adoption. These factors could be considered as barriers and the school management as well as Ministry of Education need to look further on how to overcome these barriers.

Having not enough time to prepare for class is a major barrier to the teachers. For teachers to become proficient in using ICT, adequate time and resources must be provided to all teachers to develop confidence and competence in displaying ICT skills. (Alwani & Soomro, 2010) and this is not provided at the school.

Another barrier is lack of ICT training provided. In addition, Redecker (2009) highlighted the need for effective ICT professional development to assist teachers in the adoption of ICT into their teaching and learning. Similarly, teachers will adopt and integrate ICT into their teaching when training programmes concentrate on subject matter, values and the technology (Plair, 2008). This can be overcome by increasing the number of workshops and training courses for teachers and the school management should take action. Teachers' professional development is a key factor to successful integration of computers into classroom teaching. Several studies have revealed that whether beginner or experienced, ICT related training programmes develop teachers' competencies in computer use (Bauer & Kenton, 2005; Wozney et al., 2006; Franklin, 2007; Mueller et al., 2008). Training could lead to successful adoption of technology in the classroom. It is further, believed that teachers who integrate technology with new teaching practices gained through professional training can transform the performance of the students (Lawless & Pellegrino, 2007).

In addition, the teachers point out one of the barriers for ICT adoption is the school management does not view ICT as a priority, the school management should facilitate ICT adoption and change the negative feedback from the teachers, because the school management plays an important role in ICT adoption, the role of the school management in the adoption of ICT in schools should not be underestimated. Many studies have reported on the importance of management opinions and attitudes towards ICT directly affecting ICT use in the school (Albirini, 2006). Multimedia Development Corporation (2006) found that lack of interest and commitment by the school management will have a negative impact on the implementation of ICT at the school. Similarly, Bingimlas (2009) reported that teachers' willingness to undertake ICT training is influenced by the management's attitudes towards ICT.

Thus, it is clear that school management commitment to ICT adoption is an important factor, since it is well recognised that senior managers in schools have a major impact upon classroom and curriculum practices (Multimedia Development Corporation, 2006).

5.2.5 Conclusion of This Study

In conclusion, this study has shown that in spite of being a smart school for the past 15 years, the participants' ICT adoption is still at a low level. This is due to the fact that extended training is not provided regularly, the participants feel that the school management does not put ICT adoption as a priority and participants feel that the time allocated to use, explore ICT tools and to prepare the resources is not enough. Even though the participants' attitudes are positive and ICT infrastructure is in place, it is still not sufficient to cater to the needs of the teachers and students. In addition, teachers have to be allocated time to explore and use ICT effectively and efficiently in the classroom which is currently limited by the lack of computers at the school. Therefore, the level of ICT adoption in the smart school in this study is still at a basic level which is the utilisation phase perhaps due to the barriers that the participants highlighted.

5.3 RECOMMENDATION

Implications of the findings of this study on the school are that a few points can be improved to bring up the level of ICT adoption in the school. Firstly, there needs to be an increase in the number and type of training programmes as this will be very important to improve and encourage the teachers' adoption as most of the teachers mentioned about the lack of ICT training. Furthermore, as the school is a smart school it is essential to increase the number of computers in the school and it will be better if each teacher and student have access to a computer when they need to use it. The participants feel that the time allocated to use and explore ICT tools is not enough. To be familiar with and explore ICT tools the school management must take action to overcome this shortcoming by providing more time and reduce the task for other activities.

In terms of the research process itself, for future studies using questionnaires and interview to evaluate and assess the level of ICT adoption in schools researchers can consider the following recommendations. Firstly, is to increase the number of participants in the survey and interviews to obtain superior findings. Secondly, a more

extended length of time could afford more data on the level of ICT adoption. In addition, this study could also be conducted using different research instruments like observations to evaluate the level of ICT adoption in the classroom. Involving the students in the interview could also provide a holistic view of the situation. Furthermore, increasing the number of smart schools involved in the study could show the true level of ICT adoption in the smart schools in Malaysia. This will allow for comparisons on the level of ICT adoption between the smart schools and between smart with ordinary schools. This could offer an overview of how successful the smart school programme is after more than a decade of implementation.

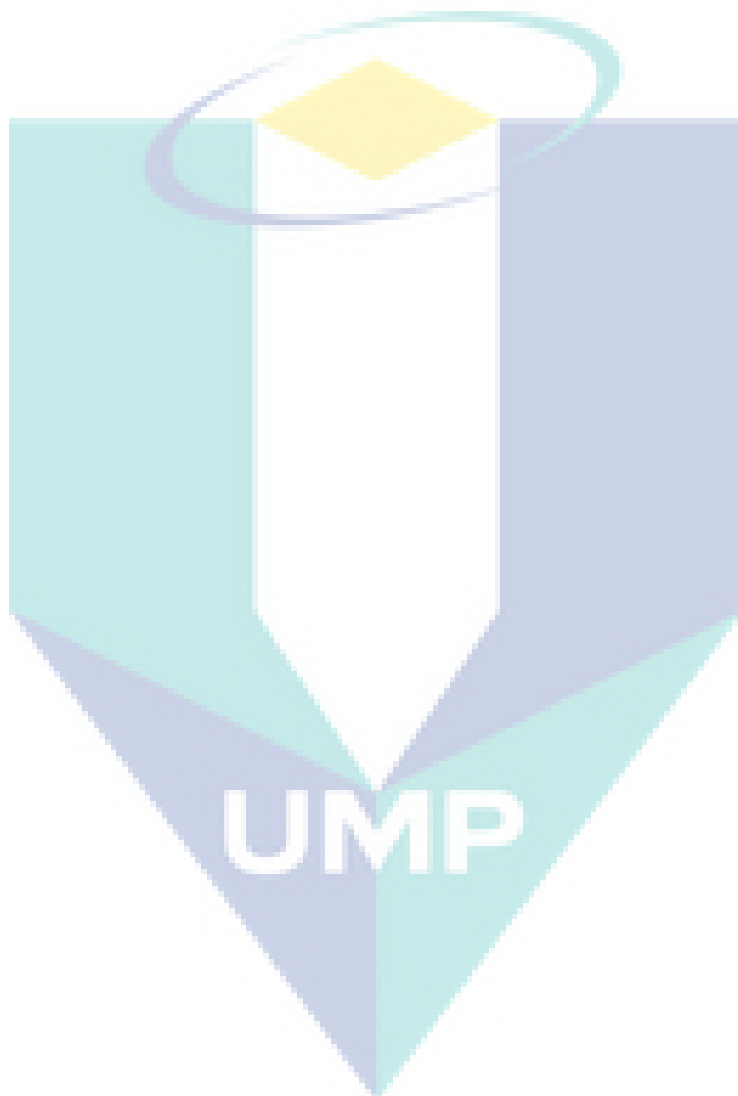
In addition, due to the case study design adopted for this study, statistical generalisations are not viable. To overcome this, a larger and a mixture of teachers and students population could be used in the future. When a larger population is used over a longer period of time, generalization of the findings to a larger population is possible. This could expand the limited body of literature on the impact of ICT adoption at Smart School.

In this study, the researcher finds that the lack of support from the school management when conducting the study plays a major role in determining the responses from the participants and the data collected. In a future study full access to the research site may provide richer and more extensive data.

5.4 SUMMARY OF THE STUDY

This study can be summarised in that the participants in the school has only arrived up to the utilization phase. The participants have positive attitudes and the participants feel confident when they used ICT in their classroom. The participants are also willing to change to accommodate ICT in their teaching and learning. However the participants identify three barriers that affect ICT adoption at the Smart School which need to be tackled by the school management.

This case study has given valuable insights into ICT adoption and problems teachers face in the process. The findings could be used as guidelines for Smart School improvement. Further research would give a deeper understanding on the effectiveness of the Smart School programme in the implementing ICT in teaching and learning.



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APPENDIX A
LETTERS FROM EDUCATION DEPARTMENT

	<p>UNIT PERHUBUNGAN DAN PENDAFTARAN SEKTOR PENGURUSAN SEKOLAH JABATAN PELAJARAN PAHANG BANDAR INDERA MAHKOTA 25604 KUANTAN</p>	<p>Telefon : 09-5715' Faks : 09-5734'</p>
<p>Rujuk Kami : JPNP, SPS. 04. 600 – 2/6 (28) Tarikh : 23 Mac 2011 : 18 Rabiulakhir 1432</p>		
<p>Puan Zaenab Saad No. 1, Lg 1, Blok C, Tembeling Kuantan Resort KUANTAN</p> <p>Puan,</p> <p>KEBENARAN UNTUK MENJALANKAN PENYELIDIKAN DI SEKOLAH MENENGAH NEGERI PAHANG</p> <p>Dengan segala hormatnya, saya diarah merujuk perkara di atas.</p> <p>2. Sehubungan dengan itu, pihak kami tiada berhalangan untuk memberikan keizinan atas permohonan pihak puan. Semoga apa yang dirancang beroleh kejayaan. Walau bagaimanapun, pihak tuan diminta berhubung terus dengan Pejabat Pelajaran Daerah Kuantan bagi tujuan di atas.</p> <p>Sekian, terima kasih.</p> <p style="text-align: center;">"BERKHIDMAT UNTUK NEGARA"</p> <p>Saya yang menurut perintah,</p> <p style="text-align: center;">  SARUCHI BIN SAWAL Penolong Pengarah Unit Perhubungan dan Pendaftaran b.p. Pengarah Pelajaran Pahang </p>		
<p>s.k. : Pengarah Pelajaran Pahang : Timbalan Pengarah Pelajaran Pahang : Fail Timbul</p>		

APPENDIX B
THE AUDIT TRAIL

Preparation before field work		
Date	Activities	Record/Sources
23/3/2011	Submit a letter to ask the registrar of the university to conduct research at the Japatan.	Application letter
13/5/2011	Received the letter of the approval from the registrar after waiting 2 months.	Approval letter
18/5/2011	Called the school to seek permission to conduct research at their school after looked for contact number from the internet	Phone call
8/6/2011	Meet deputy principal of the school and got the approval from school management to do research in their school.	Approval letter
16/6/2011	Meet the school principal and discussed about my research. Checking of questionnaire questions and the interview by school principal. And arranged a time for the teachers interview.	Field notes
20/6/2011	Checked the school website for information	www.smart.edu.my
30/6/2011	Meeting with the school principal to discuss the research idea and do some of arrangement after preparing all the copies for questionnaire.	Guidelines of the research importance
5/7/2011	The school called to give the permission to observe ICT classes in school.	Phone call

Field work		
Date	Activities	Record/Resources
5/10/2011	Interviews were scheduled for ten teachers, but the teachers had classes they couldn't come for the interview.	
13/10/2011	The principal suggested that I should give the questionnaire, I asked him to give questionnaire for different teachers' subjects and he will randomly select the teachers to answer the written questionnaire questions.	Meeting with principal
1/11/2011	Collected the questionnaire from the 73 teachers	
15/12/2011	Discussion with supervisor about research tools	Meeting
10/1/2012	Formulation of interview questions, and how to arrange the data	
20/1/2012	Discussion with the school principal about the interview procedures and results.	Meeting
16/2/2012	Meet the gate keeper and discussion about the interview procedures and interview questions	Meeting
28/2/2012	Informal observation and visit of computer lab and record the class conducting by the teacher	Observing
8/3/2012	Set the last arrangement of the interview and the school management will select the key participants for the interview	
16/4/2012	first interview with 5 teachers, recording the interview procedures and answering the participants if they need any further explanation for interview questions	Record
20/4/2012	Second interview with 5 teachers, recording the interview procedures and answering the participants if they need any further explanation for interview questions	Record

**APPENDIX C
QUESTIONNAIRE**



FACULTY OF TECHNOLOGY MANAGEMENT

For teachers teaching other subjects

Please answer the following questions

(All the information is strictly confidential)

1. Please tick the box that best represents your **main** teaching subjects:

- | | |
|----------------------------|--------------------------|
| a. English | <input type="checkbox"/> |
| b. Math | <input type="checkbox"/> |
| c. Science | <input type="checkbox"/> |
| d. Religion | <input type="checkbox"/> |
| e. Art | <input type="checkbox"/> |
| f. History | <input type="checkbox"/> |
| g. Geography. | <input type="checkbox"/> |
| h. PE | <input type="checkbox"/> |
| i. BM | <input type="checkbox"/> |
| j. Biology | <input type="checkbox"/> |
| k. Music | <input type="checkbox"/> |
| l. Physics | <input type="checkbox"/> |
| m. Chemistry | <input type="checkbox"/> |
| n. Economy | <input type="checkbox"/> |
| o. Other (please specify) | <input type="checkbox"/> |

2. Please tick the box that best represents your age:

- a. 20-30yrs b. 31- 40yrs c. 41-50yrs d. 51-65yrs

3. Please tick the box to identify your gender

a. Female b. Male

4. Please tick the box that best represents your number of years of teaching experience:

a. 1-5yrs b. 6-10yrs c. 11-15yrs d. 16-20yrs
 e. 21-25yrs f. 26-30yrs g. over 30yrs

5. Please tick the box that best represents the level of computer training you have undertaken

a. No formal training
 b. Basic introduction course
 c. Intermediate course
 d. ECDL
 e. Other

Please specify: _____

6. Do you have access to a computer at home? (Please tick the box)

a. Yes b. No

7. Do you have access to the internet at home? (Please tick the box)

a. Yes b. No

8. Which of the ICT tools are easily accessible in your **main** classroom?
 (Please tick the box)

a. Computer
 b. Printer
 c. Internet access
 d. Data projector
 e. Digital camera

- f. Digital video camera
- g. Scanner
- h. Interactive whiteboard
- i. Other

Please specify: _____

9. How often do you use the following **ICT tools** in your teaching?

(Please tick the box)

	Never	Almost Never	Sometimes	Often	Very Often
a) Computer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Printer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) Data projector	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d) Digital camera	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e) Digital video camera	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f) Scanner	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g) Interactive whiteboard	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

10. How often do you use the following **ICT Software** application in your teaching?

(Please tick the box)

	Never	Almost Never	Sometimes	Often	Very Often
h) Microsoft Word	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i) Microsoft Excel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j) Microsoft PowerPoint	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
k) Internet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
l) Email	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
m) Digital photo	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

editing					
n) Digital video editing					
o) Music editing/ downloading					
p) Website design					
q) Computer aided design					

11. How often do you use **ICT for the following tasks** in your teaching?

(Please tick the box)

	Never	Almost never	Sometimes	Often	Very often
a) Creating quizzes					
b) Creating word search					
c) Creating PowerPoint presentations					
d) Download video clips					
e) Sending/ receiving emails					
f) Preparing exam materials(e.g papers / marking schemes)					
g) Reviewing subject association online resources					
h) Maintaining student records					
i) Competing project					

work					
j) Using online translators					
k) Preparing content for class					
l) Preparing worksheet/ handouts					
m) Contacting other teachers- sharing ideas/ resources					

12. Please tick the teaching group that you use ICT most frequently:

- a. Form 1
- b. Form 2
- c. Form 3
- d. Form 4
- e. Form 5
- f. Form 6
- g. Leaving cert applied
- h. I don't use computer in my teaching

13. Please tick to the nearest figure how long you spend **using computers in school** on an average day:

- a. I never use computer in school
- b. Up to 20 minutes
- c. Up to 40 minutes
- d. Up to 1 hour
- e. Up to 2 hours
- f. Other_ please specify _____

14. Please tick to the nearest figure how long you spend **using computers at home** on an average day:

- a. I never use computer at home
- b. Up to 20 minutes
- c. Up to 40 minutes
- d. Up to 1 hour
- e. Up to 2 hours
- f. Other_ please specify_____

15. Please complete the following by placing a tick in one space only, as follows:

1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree
5= strongly agree

	1	2	3	4	5
a) I have a positive attitude toward using ICT in the classroom					
b) I feel competent and confident using ICT in the classroom					
c) I believe the school has very good ICT facilities					
d) My use of computers has increased since commencing employment in the school					
e) The level of ICT support in this school has been satisfactory					
f) The provision of ICT training in this school has been satisfactory					
g) The maintenance of ICT equipment in this school is satisfactory					
h) Further staff ICT training should be provided					
i) The computer room booking system in this school is satisfactory					
j) I get frustrated using ICT in the classroom					
k) Using ICT in the classroom take up too much time					
l) Students learn more when you use ICT in the classroom					
m) Students learn less when you use ICT in the classroom					
n) I would like to use more ICT in my classroom					

o) I believe the management in this school support teaching using ICT				
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16. Please tick which of the following do you believe are barriers to teachers using ICT in the classroom:

- a. Not enough time to learn how to use ICT
- b. Not enough time to prepare ICT resources for class
- c. No time allocated to discuss / share resource in subject areas
- d. Sufficient ICT training has not been provided
- e. Management do not view ICT as a priority
- f. Lack of confidence using ICT
- g. Lack of technical support using ICT in the class

-Thank You for Your Cooperation-

UMP

APPENDIX D
SEMI-STRUCTURED INTERVIEW

1. Do you feel your ICT use has changed since joining this secondary school?
Please Explain?
2. Have you undertaken any ICT training?
3. What skills would you like to learn?
4. Do you believe it is good to incorporate ICT into the teaching and learning environment?
5. Do you believe you have adequate ICT equipment in your classroom?
6. What (if any) is the main type of ICT that you utilize in school/home?
7. Do you believe ICT enhances your teaching/ classroom presence?
8. What do you believe are the main benefits to using ICT?(Please Explain)
9. What do you believe are the problems with using ICT in the classroom?
10. Do you feel you receive enough ICT assistance in this school? (Please Explain)
11. Do you use computer more frequently now? (Please Explain)
12. Do you have use presentation tool?(Please Explain)
13. Do you have students in computer lab working on computers?
14. Do you believe teacher resistant to change?(Please Explain)
15. Do you/ have you used any subject specific software? (Please Explain)
16. Do you feel confident using ICT in your classroom? (Please Explain)
17. Do you believe that there is possibility that too much emphasis on new ICT technology? (Please Explain)
18. Is there a lack of emphasis on use of ICT in classroom? (Please Explain)
19. Do you believe by using ICT in the classroom teachers will be more professionals?
20. Do you believe that teachers who follow the behaviorist teaching theory (chalk and talk) are less likely to use this new technology?

APPENDIX E
THE MEAN AND SUM OF PARTICIPANTS' PERCEPTION OF ICT
ADOPTION

Participant No.	Mean	Sum	Participant No.	Mean	Sum
1.	2.73	41.00	38.	4.20	63.00
2.	3.00	45.00	39.	2.93	44.00
3.	3.60	54.00	40.	3.20	48.00
4.	3.27	49.00	41.	3.80	57.00
5.	4.47	67.00	42.	4.07	61.00
6.	3.73	56.00	43.	2.67	40.00
7.	4.47	67.00	44.	3.27	49.00
8.	2.87	43.00	45.	3.67	55.00
9.	3.27	49.00	46.	3.53	53.00
10.	2.80	42.00	47.	3.93	59.00
11.	2.73	41.00	48.	3.53	53.00
12.	3.47	52.00	49.	3.40	51.00
13.	3.33	50.00	50.	3.07	46.00
14.	3.60	54.00	51.	3.47	52.00
15.	3.33	50.00	52.	3.20	48.00
16.	4.20	63.00	53.	2.93	44.00
17.	3.27	49.00	54.	2.73	41.00
18.	3.27	49.00	55.	3.40	51.00
19.	3.93	59.00	56.	3.87	58.00
20.	2.53	38.00	57.	3.67	55.00
21.	3.00	45.00	58.	2.67	40.00
22.	3.53	53.00	59.	3.07	46.00
23.	3.53	53.00	60.	3.47	52.00
24.	3.13	47.00	61.	3.27	49.00
25.	3.73	56.00	62.	4.13	62.00
26.	3.93	59.00	63.	3.43	48.00
27.	3.13	47.00	64.	3.20	48.00
28.	3.53	53.00	65.	3.67	55.00
29.	3.67	55.00	66.	2.87	43.00
30.	3.47	52.00	67.	3.20	48.00
31.	3.60	54.00	68.	3.47	52.00
32.	3.67	55.00	69.	3.93	59.00
33.	3.80	57.00	70.	3.60	54.00
34.	2.60	39.00	71.	3.40	51.00
35.	3.47	52.00	72.	3.33	50.00
36.	3.73	56.00	73.	3.40	51.00
37.	3.73	56.00			