

## **The conditions and level of ICT integration in Malaysian Smart Schools**

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### **ABSTRACT**

This qualitative study attempts to describe the conditions that facilitated the implementation of Information Communication Technology (ICT) integration in the Malaysian Smart School and the problems that emerge during the process of integration. A total of twenty-one informants were interviewed. Based on data analysis two sets of conditions were revealed. They were the essential conditions and the supporting conditions. The findings also revealed that teachers in this study employed four levels of approaches in integrating ICT in the schools. Time, course content and technical malfunction were found to be the main problems that the teachers faced during this process.

**Keywords:** *ICT integration in curriculum*

### **INTRODUCTION**

The Malaysian technology-rich schools or smart schools were launched in the year 1999. Malaysian Ministry of Education (1997) defined Malaysian Smart School or locally known as *Sekolah Bestari* as a learning institution that has been systemically reinvented in terms of teaching-learning practices and school management to prepare children for the Information Age and to promote the goals of the National Philosophy of Education. It is one of the seven flagships applications that are part of Malaysia's Multimedia Super Corridor (MSC) project. It acts as a platform for the Ministry of Education to produce technologically literate, critically thinking work force, which is prepared to participate fully in the global economy of the 21<sup>st</sup> century. It also acts as a catalyst to achieve the Malaysian vision 2020 to make Malaysia a leader of the information and communication technology center internationally. The Smart School project was built on international best practices in both the primary and secondary education (MoE, 1997).

In the initial planning, the Malaysian government planned to launch five levels of technology in the Smart School pilot project, which include a level of technology especially remote schools. However, with the economic downturn in 1998, the decision was made to revise the levels of technology into three levels. The three levels are; Level A which is known as Full Class Model, Level B+ that is Restricted Classroom Model and Level B that is Laboratory Model. There are ninety schools selected from all over the nation for this project. Nine schools were newly built schools and eighty-one are developed from existing schools. Out of eighty-one existing schools, thirty-nine are residential schools, another thirty-seven are from the day or regular schools and five from Islamic religious schools. All the Smart School regular schools are at Level B technology level (MoE, 1998).

The Malaysian Ministry of Education is also encouraging other schools to equip themselves with appropriate levels of technology according to the means and capacities of the schools. Schools are encouraged on their own initiatives to seek assistance from various stakeholders, parents, community and private sector organizations as the MoE can only provide technology to schools in stage (Ibrahim Ahmad, 2001).

Under the Smart School project, about 8,000 school will be equipped with computer facilities by the end of the year 2005. By the year 2010, it is projected that about 10,000 primary and secondary schools will have computer facilities. More schools will obtain computers with Internet connection and teachers will be encouraged to use it in their classroom teaching (MoE, 1997). In year 2004 there were more than 4000 schools with computer laboratory and today there were about 9,200 schools equipped with broadband Internet access (Minister of Education, Malaysia, 2006). According to Minister of Education Malaysia, Y.B. Dato' Sri Hishammuddin Tun Hussein (2006), under the ninth Malaysian Plan, about RM2.1 billion (about USD 600 million) is allocated for upgrading all the schools in the country to become smart school.

However, despite these computer facilities made available, there is no guarantees that teachers will use the technology extensively in their teaching. Smart School reports (MoE, 2000; MoE, 2001) and research findings (Sathiamoorthy, 2001; Lee, 2000) indicated that there was minimal use of ICT in schools. Why do teachers in Smart School have minimal use of ICT in the classroom? What are the conditions that facilitate these teachers to integrate ICT in the Smart School? It is with question in mind that this study is carried out.

### **Theoretical Framework**

Theoretically, there are many models on change in education. Meaning of Educational Change by Fullan (2001), Conditions of Change framework by Ely (1999) and Diffusion of Innovation Model by Rogers (1995) are some of the models that have been identified to give better understanding on the implementation of ICT integration experienced by the teachers teaching in secondary schools. These models also act as a guide to answer the research objectives which are:

1. To identify the existence of conditions that facilitate the implementation of ICT integration in Smart School,
2. To explore the existence of conditions that facilitate the implementation of ICT integration in Smart School,
3. To identify the levels of approaches in integrating ICT in the curriculum, and
4. To discover problems that emerges during the process of the integration of ICT in the Smart School.

Fullan (2001) factors affecting implementation are similar to Rogers and Ely's models in term of the "Characteristics of Change" and "Local Characteristics". Need, clarity, complexity, and quality are four factors related to the characteristics of change. While, teacher, the principal, the students, the district administrator, the consultant, and the community which include the parent relate to local characteristics. The external factors include government and other agencies. It is found that if any one or more factors working against implementation, then the process will be less affective.

Ely (1999), on the other hand has identified eight conditions that facilitate the implementation of innovations. The conditions are dissatisfaction with the status quo, existence of knowledge and skills, availability of resources, availability of time, rewards or incentives exist, participation, commitment, and leadership. If all the eight are present in the innovation introduced, it indicated

that there is high probability of sustained implementation leading to institutionalization. The implementation of an innovation will not work if one or more of the conditions are absent and consequently, less likelihood of continuation.

Rogers' (1995) diffusion process consists of knowledge, persuasion, decision, implementation and confirmation contributed to the "Diffusion of Innovation" model. An adopter of an innovation needs to learn about the innovation, be persuaded to try it out before making a decision to adopt or to resist the innovation. Rogers has also identified elements of innovations attributes that will assist the adopter to accept or reject an innovation. This means that the innovation attributes, as perceived by an adopter help to explain their different rate of adoption. The elements of innovation attributes are trialability, compatibility, complexity, relative advantage and observability.

Fullan (2001), Ely (1999), and Rogers (1995) had identified conditions that should be present during the implementation of innovation in education. These conditions complement each other. The conditions should be present for the innovation to be successfully implemented. Absence or lack of these conditions would see to the discontinuation or diffusion of innovation.

## **METHODOLOGY**

A qualitative methodology was employed to explore the informants at its natural setting. The data generated by interviews, classroom observations and document reviews were able to capture the teaching and learning process using ICT integration in the classroom situation. Three technology-rich Malaysian secondary schools, the *Sekolah Bestari*, of different technology levels were carried out to identify the conditions.

### **The informants**

The informants in this study were teachers teaching in technology-rich secondary schools, Smart School. These teachers had already been exposed to the use of computer and Internet. Hence, they were the best informants for conditions that facilitated ICT integration in the Smart School. Moreover, by examining teachers who were already ICT literate, the study was able to avoid problem of teachers who had not adopted or were resistant to using ICT in the classroom.

A total of twenty-one informants, who comprised of twelve teachers, three principals, three heads of curriculum department and three ICT coordinators were interviewed. The teachers were also observed during the classroom observation to look at their use of ICT at work. The teachers formed the primary informants. The principals, head of curriculum department and ICT coordinators were the secondary informants. The data from primary informants were triangulated with the secondary informants.

### **The schools**

The selected three Smart School in this study were chosen from three levels of technology specifications stated by the Smart School Project Team. School A had a technology B+ level; School B, a technology B level and School C, a technology A level. The minimal technology equipped was at Level B and the highest was at Level A. All the schools in this study had also acquired computers from other sources like contributions or donations in the form of monetary or hardware from parents, private sectors, PTA and from activities organized by the schools.

### **Data Gathering**

The duration of data gathering took about five weeks per school. Classroom observations were carried out first, followed by in-depth interview. Yin (1989) explained that the observation was an opportunity for the researcher to gather evidence for a case study. Since the study was to look at technology at work, observation was crucial for further understanding of issues that emerged during the implementation. Besides that, classroom observation triangulated the findings with the findings from the interviews and documents (Merriam, 1998). The classroom observation looked at evidence of ICT access in the classroom, students' related ICT activities, software and courseware applications that were being used and teacher's teaching practices in using ICT. During the classroom observations, the researchers had written field notes which included the basic information of date, place of event, people involved, the physical setting, and occurrences of interaction and activities that had taken place.

Interviews were carried out with the informants after the classroom observation. There were two phases of interviewing. The first phase was the formal interview session whereby the researchers explored the topics for investigation. Then, the second phase was to check the reliability of the data collected from the informants earlier. The informants were asked to read the transcriptions of their interview to see if there were any misinterpretations on the part of the researcher. The informants were given a week to read the transcription. All interviews were tape-recorded and where necessary notes were taken during the interviews. The interviews were later transcribed verbatim.

Document reviewed were carried out during the fieldwork at the time when no observations or interviews were being carried out. In this study, the documentation reviewed was teacher's record book. It is a legal document which teacher wrote down the yearly and daily teaching plans (MOE, 1999). In Malaysia, it was mandatory for a teacher to bring the record book to the class. In the daily teaching plan, the learning objectives, learning activities and teaching aids were written to guide teachers to achieve the learning objectives of the day. Thus teachers' record books were reviewed in this study to triangulate the source for ICT integration in the classroom.

### Data analysis

The data generated by interviews, classroom observations and document reviews were transcribed, coded and categorized relating to common conditions arising from the data. The data were analyzed manually and also with the used of the QSR N6 Qualitative Data Analysis software (N6).

### FINDINGS

Based on data analysis, it has shown that the teachers in school C and school B integrate ICT in their teaching, unlike those teachers in school A. The study also revealed that there are eight conditions that facilitated the implementation of ICT integration in the Malaysian secondary smart school as stated in the Table 1.

**Table1:** *Emerging Conditions that Facilitate the Implementation of ICT Integration in Malaysian Secondary Smart School*

Emerging Conditions	School A	School B	School C
Availability of ICT resources	Ample resources	Insufficient resources	Abundant resources



School A	✓	✓	-	-	-	-	-	-	Discontinuation of implementation
School B	✓	✓	✓	✓	-	-	✓	✓	Slow implementation

### The essential conditions

The essential conditions identified were availability of ICT resources and acquisition of ICT knowledge. These conditions were needed for the implementation of ICT integration in the curriculum. If one of these conditions was not present then implementation of ICT integration would not taken place. For example, in School C, the teachers were knowledgeable in ICT integration and they had accessibility to the resources. School C showed successful implementation of ICT in their school compared to School B and A. Lack of knowledge had been the caused for the teachers in School A to be less confident to integrate ICT in the curriculum.

### The Supporting Conditions

The next set of conditions was the supporting conditions. The supporting conditions comprised of the accessibility of ICT resources, existence of support, desire to change, school practices, influence of external forces and teacher's commitment to the innovation determined continuous implementation of ICT integration in the schools. The findings demonstrated a relationship between the presence of these conditions and the continuation of implementation of ICT integration. It was found that the presence of these conditions in the schools enabled them to continue with the implementation of ICT integration. However, the lack or absence of these conditions resulted in the slow down or discontinuation of the integration of ICT in the curriculum.

#### *Accessibility to ICT Resources*

The schools in this study were all technology-rich school. Availability of ICT resources did not gave the assurance that the teachers would integrate ICT in the school. The study found that availability without accessibility to ICT resources had hindered the teachers from integrating ICT in their lesson. School C and B had access to the resources but teachers in School A seemed to have lack of access to the resources. This had discouraged the teachers from using the innovation.

#### *Existence of support*

This support shown by the principals in this study had motivated teachers to integrate ICT in their lesson. Especially in School C, the principal in this school had shown her support during facilitating the change process. She had shown the ability to obtain sufficient resources for the school and gave full support to her teachers in their effort to implement ICT integration in the school.

The principals and head of curriculum departments in School C and B had not only given teachers their support, but they had also monitored their teachers in their use of ICT in teaching. They had emphasized that when they observed the teachers' teaching, they would like to see the integration of ICT in teachers teaching. Unlike School A, the administrators did encourage their teachers to integrate ICT in the teaching but did not request to see teachers' utilization of ICT. School A principal seemed to stress on syllabus content more than the teaching aids. Therefore, the teachers in school A felt that teaching should focused on preparing students to sit for the

examination. Principal C, on the other hand, strongly believed that with the vast knowledge and information plus the skills of answering the examination, any student would excel in academic performance. In fact, ICT makes a student more knowledgeable and informative.

#### *Desire to change*

Teachers in School C experienced the desire to change, which had promoted them to implement ICT integration in the curriculum. However, there seemed to be no existence of this condition in School A and School B. Teachers in School A seemed to concentrate on preparing students for examination. This condition also did not appear in School B. The teachers gave the impression that they integrated ICT in their lesson merely because the ICT hardware was there and they had to use them. It was not because they want to try a different approach in their teaching process. Consequently, this had lead to slow process of integrating ICT in the curriculum for School B.

#### *School Practice*

All teachers in this study had used computer for administrative purposes such as typing examination questions, preparing lesson and writing reports. This study found that not all teachers in these schools practiced ICT integration in their teaching. For example, in School B and A, ICT as school practice was seen as a tool in the administrative work.

#### *Influence of external forces*

Influence of external forces to emerge in school C and School B. Teachers in these two schools felt the pressure of students' advancement in ICT. These forces had promoted teachers to implement ICT in the school. However, in School A, this condition was absent. Their focus was more on the examination and completing their syllabus before the examination.

#### *Teacher's commitment to the innovation*

Teachers in School C and B had high commitment to the innovations. As Fullan (1991) states, teachers' ability to cope with the school demands and their commitment to change are crucial in sustaining implementation. However, teachers in School A showed less commitment to the innovation. This is due to the lack of confidence in the innovation and they were actively involved in non-teaching activities. The presence of this condition in the school had encouraged teachers to try integrating ICT in their teaching.

Based on the findings, it is clear that the presence of the essential conditions ensures the implementation of ICT integration in the curriculum while the supporting conditions had seen to the continuation of the implementation.

### **Levels of Approaches in Integrating ICT in the Curriculum**

The findings also revealed that teachers in the study employed four levels of approaches in integrating ICT in the curriculum. As it shows in Table 3, these teachers integrated ICT as verbal resources at level one, as printed resources at level two, as hands-on experience at level three and a combination of all the approaches at level four.

**Table 3:** *Level of ICT Integration Approaches in the Curriculum*

Level	Approaches	Situation
Level 1	ICT as verbal resources	Teacher teaches with the aid of ICT as

		verbal resource. Teacher gives the website addresses or name of courseware that would help students to enhance their understanding of the topics.
Level 2	ICT as printed resources	Teacher teaches with the aid of ICT as printed resources. Distributed printed downloaded information as teaching aids.
Level 3	ICT as hands-on experience	Teacher teaches with the aid of computer, courseware, software or Internet only.
Level 4	A combination of all the levels. ICT as hands-on, printed resources and verbal resources.	Teacher teaches with the aid of computer, courseware, software or Internet in delivering the lesson. She or he also gives out handouts with information printed from the Internet or courseware

Teachers in School C are found to be in Level 4 and 3. While, some teachers in School B are in Level 3, 2 and 1. None of the teachers in School B are in Level 4. School C are found actively implementing ICT integration in their teaching unlike School B and School A. School C teachers are very committed to the technology. Their commitment is evident from the interviews, classroom observation and document reviews. They were very enthusiastic when they shared their experiences during the interviews.

It seemed that the levels of approach were influenced by the presence and absence of the conditions that facilitated the implementation of ICT integration in curriculum. Based on data analysis, all school C teachers had integrated ICT throughout their teaching. This might be because their school was new and equipped with ICT infrastructure two computer labs as well as six computers in classroom. While the rate of integrating ICT in teaching in school B was slower than school C. The school ICT infrastructure was partly the reason for the slow integration. Insufficient hardware had caused teachers not to integrate ICT aggressively in their teaching.

### **Problems Teachers Faced during the Process of Integrating ICT in the Schools**

The study also discovered problems that the teachers faced during the process of integrating ICT in the schools. The issues that emerged in implementation of ICT integration in the Malaysian technology-rich school were time factor, irrelevancy of course content and technical malfunction.

The major problem that appeared in all the three schools was time factor. The teachers in this study complained that the free time was too short for them to prepare their lesson using ICT. Surfing Internet to search for information, skimming and selecting information took a long time. During this free time they had to do many other tasks such as to relief a teacher who was absent. However, teachers who were ICT competent were found to need shorter time to prepare their lesson using ICT compared to teachers with low ICT competent.

Regarding teaching time, all teachers felt that one-hour period was not enough for their students especially when the need to print their work at the end of the lesson. Observation data showed that students took about five to ten minutes to reach the classroom and five minutes to settle down. They took another five minutes to operate the computers. If they faced technical problem, the teacher took another five to ten minutes to start the lesson. This had shortened the teaching time and the teachers were not happy with this situation.



Most of the teachers in this study had attended the 14-week course prior the implementation of ICT integration in school. Data revealed that some of the teachers were not happy with the course they had attended. The knowledge that the teachers acquired during the course could not be applied in their school. For example, software and hardware they learned during the course were not the same with what was found in school. Thus, they found their knowledge was not relevant to the school setting. They also felt the 14-week course did not teach them on how to integrate ICT in their teaching.

Teachers in Smart School had not only to teach using ICT but they also had to use the electronic management system, the SSMS or Smart School Management System. It is a comprehensive software system developed by the Ministry of Education to facilitate management and administration of resources. Teachers used the SSMS for classroom administration such as in writing reports, taking attendance, setting timetables and preparing lesson plans. If a server breaks down, the teachers could not get access to SMSS. Thus, lessons prepared and saved in the teachers' folder found in SSMS could not be retrieved. Teachers felt frustrated over this problem. The SMSS had also caused problem to the teachers because it could not accessed from home. Teachers had to prepare their lesson in school if they want to use the software.

Other technical problems that the teachers faced during implementation of ICT integration in school are malfunction of computer, server, router and LCD. Although technicians were positioned in all these schools, the frequent technical malfunction had imposed problem to teachers.

## **DISCUSSION AND IMPLICATION**

All the conditions found in this study were also found to be true to Ely's eight conditions (1998), Fullan's (2001) four factors affecting implementation and Rogers' (1995) Diffusion Model as discussed in the literature.

In the literature, Ely stated that there were eight conditions that should be present in implementing technology. However, only six of the conditions were found to be true in this study. Reward as one of the conditions mentioned by Ely was not present in this study but still, the innovation could still be implemented. Therefore, when a question on reward was put forth to the informants, they all react similarly.

The teachers in this study all agreed that reward in any form, either monetary or others was not necessary since ICT integration was seen as part and parcel of teaching tool. Teachers in School C and B felt that when their students find the lesson interesting, that itself motivated their teaching.

Time was also one of Ely's conditions. Time factor was not one of conditions that facilitate the implementation of ICT integration in the Malaysian technology-rich secondary school. Time in this study was one of the problems that emerged during the implementation. With or without time factor, the teachers in this study would integrate ICT in the curriculum.

Rogers innovation attributes help to explain teachers' different rate of adoption. In this study, two of the innovation attributes contributed to the cause of teachers not integrating ICT in the curriculum. The complexity of the SSMS caused teachers to feel the frustration over the innovation. Teachers in school A, being the late adopter would like to observe the result of the implementation. If it shows a positive result, they would likely adopt the innovation. Factors affecting implementation proposed by Fullan had also contributed to the implementation of ICT integration in these schools. The characteristics of innovations, the stakeholder involved and the external factors were equally important in these three schools. The teachers who were

the main stakeholders of the innovation with the support from the principal and others determined the implementation of the innovation.

The condition identified in this study drew attention that certain conditions should be present in any implementation of ICT integration in the schools. In the near future, for any implementation of innovation, the organization concerned should take into consideration of these conditions to see to the successful implementation. It was clearly stated that availability and acquisition of ICT knowledge were the strength of the implementation found in this study. By providing resources and not make it accessible had seen to the slow implementation of this innovation.

From the data put forward from interviews, it has clearly shown that the teachers lacked knowledge on integrating ICT in classroom. Therefore, schools and Ministry of Education should improve their course outline in teaching teachers “when” and “how” to integrate ICT. The course should be more focused on how ICT is used as a tool that assists and motivates teachers and students in teaching and learning. Teachers’ experiences also revealed that when attending the course, they had to learn software, which was not found in the school setting. Teachers should be exposed to whatever hardware and software found in the school so that they could be applied in their teaching.

Implementation of any innovation needs to be introduced one at a time. For example, in getting the teachers to integrate ICT in their lessons, they must be confident and comfortable with the technology first. The SSMS should come later. The teacher should also be given a choice of using the courseware bought by the schools.

## CONCLUSION

The present society is increasingly dependent on electronic information and communications. Large quantities of information are available and transaction can take place remotely. The ICT has become part of the society for communication between people, searching for entertainment and education, virtual meeting place, shopping and many more. Thus education plays a very important role to provide the platform and strong foundation to people. Conditions for successful implementation of ICT integration in schools are essential requirement and must be met to achieve the Malaysian vision 2020 of becoming develop country.

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