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ICT AND SCHOOL TRANSFORMATION: AN EMPIRICAL STUDY ON THE PERCEPTION OF PRINCIPALS IN THE KLANG VALLEY AREA ON THE MALAYSIAN SMART SCHOOL

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ABSTRACT

Being one of the flagship applications in the Multimedia Super Corridor (MSC), the success of the Malaysian Smart School is very important to the country. Principals, being one of the stakeholders of the Smart Schools, are the drivers of the educational reinvention at school level. This study aims to investigate the perception of principals towards the implementation of Malaysian Smart Schools. A survey was done using questionnaires. The respondents were principals of pilot Malaysian Smart Schools and ordinary schools in the Federal Territory of Kuala Lumpur. Data from 40 respondents were analyzed. The findings revealed that the principals participating in the study have a positive perception towards the implementation of the Malaysian Smart School. The principals' understanding and knowledge on the Smart School concept has a significant relationship with their perception. On the other hand, their skills in IT and computer usage, length of service and tenures as principals have no significant relationship with their perception on Smart School implementation. The study provides some insights on the perception of school leadership in building ICT-capable schools in the context of a developing country.

Keywords: ICT and Schools, ICT and Education, Malaysian Smart Schools, ICT and School Leadership.

1.0 INTRODUCTION

Technology in the form of acquiring and using information is a good advancement for society. Schools, as institutions of society, have to adapt themselves to this revolution. In 1981, only 18% of the schools in the United States had access to computers for instructional purposes. This rose dramatically to almost 100% in 1995 (United States Congress, 1995). A more recent statistic indicates that while in 1994, only 35% of the US public schools had Internet access, this figure rose to 98% in 2000 (US Department of Education, 2001). The challenge for educationists today is to find the most educationally sound application for computers in the educational process and ensuring the most equitable access to technology for all students.

During the past decade, increased attention has focused on a new set of skills necessary to prepare students for life and work in the digital age. To meet the demands of our global economy and a dramatically different society, there must be corresponding adaptations in our educational environments to develop 21st century skills (CEO Forum Report, 2001). The Report emphasized the need for the US education to provide improvement in the areas of basic skills, digital age literacy skills, inventive thinking skills, effective communication and interpersonal skills, and productivity skills. Educational technology provides educators with valuable tools to teach, develop, and reinforce these skills by dramatically altering the options for inquiry, analysis and expression.

Malaysia intends to transform its educational system, in line with and in support of the nation's drive to fulfil "Vision 2020". This Vision calls for sustained, productivity-driven growth, which will be achievable only with a technologically literate, critically thinking workforce prepared to participate fully in the global economy of the 21st century (Ministry of Education, 1997a). The catalyst for this massive transformation will be technologically-supported Smart Schools, which will improve how the educational system can foster the development of the 21st century workforce. The Smart School initiative is one of the seven flagship applications of the Malaysian Super Corridor (MSC) mega project. The Smart School establishes new expectations for students, teachers, school administrations and the communities. Changing the attitude of teachers and school administrators towards the change and integrating IT into the workplace are major factors to be considered. Since principals are agents of change, it is therefore useful and important to learn how they perceive this change. The purpose of the study is mainly to explore the perception of principals towards the implementation of the technology in schools particularly the Malaysian

Smart Schools. It was found that not many empirical studies are available on the subject, hence, it is hoped that this study will fill the gap.

Specifically, this study attempts to address the following research questions:

i. Do principals have a negative or positive perception towards the implementation of the Malaysian Smart Schools?
ii. Is there a relationship between the principals' understanding and knowledge of Smart School concept on their perception of the Malaysian Smart Schools implementation?
iii. Is there a relationship between the principals' IT skills and their perception of the Malaysian Smart Schools implementation?
iv. What other factors have an influence on principals' perception towards the implementation of the Malaysian Smart School?

2.0 REVIEW OF LITERATURE

2.1 ICT in Schools

Research projects by Sivin and Bialo (1994) indicated that technology has the potential to improve students learning. In fact much has been written on the advocacy and the usage of information technology in the classrooms (Jonassen, 1996). More recently, learning enabled by information technology took the constructivist view of educational practice. A learner is seen as an active agent, constructing meanings in response to the instructional situation. The learner is put in the driving seat of learning with the teacher as a coach (Duffy & Jonassen, 1991).

The shift from the traditional teacher-centred teaching to that of student-centred teaching began in the 1960s (Oliver and Omari, 1999). The shift provided the students with the freedom to learn in an environment that catered for individual learning styles. The shift also meant the change of focus in education from that of teaching to that of learning (Oliver and Omari, 1999). With this move, the need for use of IT as an aid to learning and development of the student-centred learning has increased. The development of technology is now making it possible for technologies to be designed and deployed to produce powerful educational tools and link technologies that can substantially address some of the core problems in education such as teacher isolation, access to rich and substantial resources, and parent involvement in schooling (Honey, 1999).

The main issue concerning the use of ICT in education is its effectiveness in improving education. Kulik (1994) summarised more than 500 individual studies of computer-based instruction conducted independently using different methods by different research teams. The study concluded that students like their classes more and developed attitudes that are more positive when they receive computer-based instruction. Research done in the eighties, where usage of computers was mainly for drill and practice exercises, noted that computers however do not have a positive effect on every area of study.

Mandinach and Cline (1997) analysed 176 studies conducted between the years 1990 to 1995. The study concluded that the use of technology as a learning tool had positive effects in all major subject areas and made a measurable difference in students' achievements, attitudes, and interactions with teachers and other students. They noted, however, that the impact of technology is too multifaceted and cannot be answered without considering the impact on students learning and motivation, classroom dynamics, and the school as an organisation. A similar conclusion was also derived by Berman *et al.* (1997) in their study on the implementation, effectiveness, and role of technology in the context of education reform efforts. Broadly, the studies showed that learning under the technology-enabled environment had positive effects on the students and that the outcomes were highly dependent on the quality of implementation of the instructional design.

In United States, CEO Forum (2001) found that education technology can improve student performance. Studies indicate that that the impact of technology proves most powerful when focused on specific, measurable educational objectives, such as improved literacy (Mann et al., 1999). In addition, students demonstrate higher levels of motivation and engagement when using technology, which also contributes to improved achievement (Sivin-Kachala, 1998). In conclusion, although studies on the impact of technology in education are in their infancy, evidence indicates that educational technology changes the processes of teaching and learning.

More recently, Rodrigo (2003) summarized the use of ICT in education into three broad categories: ICT as objects under study, ICT as support tools, and ICT as catalysts for transformation. When ICT are the objects under study, these technologies are subject matter in themselves. The goal of this approach is for students to develop mastery over technology. When ICT are used as productivity tools or enrichment resources, this generally means that they support the traditional teacher-led mode of instruction in subject areas such as

mathematics, language or science. Transformative application of ICT refers to non-traditional emerging uses where exposure to and deployment of ICT fundamentally changes the way education is conceived and delivered to students. ICT are enablers that optimize student-centred pedagogical methods. They are used to develop broad, generic skills such as problem-solving, independent and collaborative learning, and communication.

2.2 The Role of Principals in Developing ICT Capable Schools

To be successful with ICT innovation, a school must possess a culture that incorporates a strong belief that using ICT can help pupils to learn, increase the efficiency of day-to-day activities within the school, and generally improve the quality of the school's performance. A school's culture is shaped by its history, and by the influences of the local education authority, the community and the teaching staff. The principal and the senior management play important roles in building a professional culture of teaching which is responsive to change (Hargreaves and Dawe, 1990).

The way in which ICT is used is becoming an important facet of school culture; with some schools seeing it as a key subculture that can empower pupils' learning and make radical changes to the way the school operates (Goodson and Mangan, 1995). It could be said, that, if a school is to move forward with its use of ICT, such a subculture must be embedded in the structure of the school. However, cultural changes are difficult and time-consuming, and may provoke considerable anxiety among all teaching staff (Schein, 1997). A conscious decision has to be made to transform the culture of the school by challenging the existing views concerning the nature of ICT. Such changes may be brought about through a leadership of dynamic staff who are able to stick to their convictions and take others with them.

McKinnon and Nolan (1995) stressed that professional development is a key factor in the process of successful innovation adoption. Bohlin and Hunt (1995) suggested that for pre and in-service teachers training, the frequency of meetings and instruction of training have a significant impact on the learners post course anxiety, confidence, and attitudes towards technology. Heck (1995) confirmed that school leaders are less able to organise the work environment in part due to lack of training and learning. If we expect teachers and principals to turn around and use technology daily, they need to discover personally the power of the new technologies when combined with the rich information

(McKenzie, 1998). IT competent teachers have positive attitudes to IT, that is, they are confident, open-minded, flexible, and have the vision to explore the potential of IT (Beck, 1997).

More recently, Kennewell *et al.* (2000) noticed the extent of the impact which the principal could make. In a school where the principal was playing a leading role in encouraging the use of ICT in classrooms and administration, the staff looked upon ICT as a help and not something that needed to be done merely to satisfy National Curriculum requirements. They concluded that principals continue to be the powerful definers of the culture, ethos, and organization of their schools, and it is through working with small groups, or even individuals, within the school system that they are able to build the momentum and involve others in the process of change.

2.3 Implementing Information Technology in Malaysian Schools

Computers in the classroom in Malaysia started in mid eighties with the Curriculum Development Centre piloting ten schools implementing computer literacy as a subject. At the same time, schools were also encouraged to set up computer clubs. The earlier effort was to teach computer literacy to familiarise students with computers. Later, the Ministry of Education decided to incorporate computing across the subjects.

By the 1990s, the Ministry of Education has experimented with several projects, which can be categorized into six initiatives (Ministry of Education, 1997b):

1. Computers in Education – First Initiative (1992)
   --60 secondary schools were equipped with computer labs.
2. Computers Aided Instruction (1994)
   --15 primary schools were equipped with computers and educational software produced by the Ministry of Education.
3. Computers In Education (CIE) (1995)
   --50 secondary schools in 1995; additional 90 secondary schools and 20 primary schools in 1996; 111 secondary schools and 222 primary schools in 1997.
4. Invention Project (1995-1997)
   --selected schools with computers were installed with Auto-CAD and S-Cad software

5. The MUNSYI Network Project (1995)
   --14 schools were linked to the MOE via Local Area network (LAN) and Wide Area Network (WAN) to access the Electronic Resource Centre.
6. Form Six Computer Programme (1997)
   --started with 12 schools equipped with the necessary hardware and software.

In 1997, the Malaysian government announced the highly acclaimed Malaysian Smart School initiative, which aims to change the culture and practices of Malaysian primary and secondary schools from memory-based learning to an education that stimulates thinking, creativity, and caring in all students. The new educational practice will cater to individual abilities and learning styles, and is based on more equitable access. It will require students to exercise greater responsibility for their own education, while seeking more active participation by parents and the wider community. It is hoped that the Smart Schools will improve how the educational system achieves the National Educational Philosophy, and develop the potential of individuals in a holistic and integrated manner, so as to produce individuals who are intellectually, spiritually, emotionally, and physically balanced and harmonious (Ministry of Education, 1997a).

2.4 The Malaysian Smart School: Concept and Implementation

In the Malaysian Smart School Conceptual Blueprint (Ministry of Education, 1997a), the Malaysian Smart School is defined as:

> *"A learning institution systemically reinvented in terms of teaching learning practices and school management in order to prepare the school children for the challenges of the information age"(page 20)*

The Malaysian Smart School is unique to Malaysia and has been formulated for the needs of Malaysia. The reinvented learning institutions would synergistically utilise the components of the Smart Schools, i.e. the teaching learning, the management and administration, the human resources, the enabling technology, the schooling processes, and the underlining supporting policies. As far as the concept of the Malaysian Smart School is concerned, the term 'smart' goes beyond using computers and gadgetry. Putting computers into schools would not automatically turn the schools into Smart Schools as envisioned by the

Government. This was clearly stated in the Malaysian Smart School Conceptual Blueprint (Ministry of Education, 1997a):

> *"Technology alone will not make a school smart. Only improved teaching-learning strategies, management and administrative process, and capable, well trained people with enthusiasm for their work can do that" (p.14)*

While pursuing technological competence, the young generation should not be over specialised to the extent of ignoring noble values, arts and culture (Ministry of Human Resources, 1995).

In terms of implementation, the Malaysian Smart Schools were piloted in 90 schools beginning 1999, and supposedly completed in year 2002. The piloted schools will serve as the nucleus for the eventual roll-out in all 10,000 schools through out the nation by the year 2010. The lessons learnt from the pioneer phase will enable improvements to the 'Broad Deployment' phase. The Government and the private sector jointly worked on the project at a cost of about RM300 million for the pilot stage.

As far as technology is concerned, the latest classification of the schools involved three levels: Level A, Level B+ and Level B (Ministry of Education, 1997b). These levels are arbitrary classifications to identify the level of technology in the schools. The assignment of technology levels of a particular school is based on the number of computers in the school. The number of computers allocated according to the levels of technology is as follows:

- Level A: Each school will be equipped with state-of-the-art technology; two computer labs; each classroom and science lab will be equipped with computers to the ratio of 1:5; A total of 406 computers in primary schools, 479 computers in secondary schools.
- Level B+: 15 classrooms/science labs are equipped with 4 computers each; the rooms with computers will be used on a rotation basis; A total of 86 computers, all secondary schools.
- Level B: Implement technology supported learning by utilising a computer lab with 21 computers; use various applications and the available courseware; A total of 42 computers, all secondary schools.

Apart from that, schools would be equipped with Local Area Network (LAN) connection, Internet connections and linkages to the District, State and Federal Education Offices. The technology infrastructure was installed in stages until

April 2000. Table 1 shows the number of schools in the pilot project of the Malaysian Smart Schools and the technology level assigned to them.

Table 1: Pilot Malaysian Smart Schools and The Assigned Technology Level (Ministry of Education, 1997)

Schools	Primary	Secondary	Levels of technology
Putrajaya (new school)	2	1	A
Seri Bintang School Complex (new school)	2	2	A
Batu Permai Complex (new school)	1	1	A
Residential Schools	-	39	B (two residential schools have been assigned with B+ technology level)
State schools	-	42	B
Total	**5**	**85**	**90**

3.0 RESEARCH MODEL

One of the main stakeholders in the Smart Schools is the school principal. As the Smart School requires a systemic reinvention of the learning institution, principals are in the forefront of the reinvention process. The main aim of this study is to analyse the perceptions of principals in the Federal Territory towards the implementation of the Malaysian Smart Schools. Perception is defined as the process where people select, organise, and interpret information. Perception is not only influenced by the qualities of the stimuli but also by the context in which the perception occurs and the personal qualities of the perceiver. Perceptions are both shaped by our experience and expectations from the past and are a primary source of our thoughts in the future (Bell, *et al.*, 2000).

Based on the views of Bell, *et.al.*, (2000), this study attempts to look at the influence of several factors on principals' perception towards the implementation of the Malaysian Smart School. The factors include the principals' skill in the use of computer, their length of tenure as principal, their length of service in the teaching profession, and their knowledge about the Malaysian Smart School concept. The difference in perceptions of principals based on their pilot Smart School or non-pilot Smart School status was also examined. Figure 1 summarises the conceptual framework that will be used in the study.

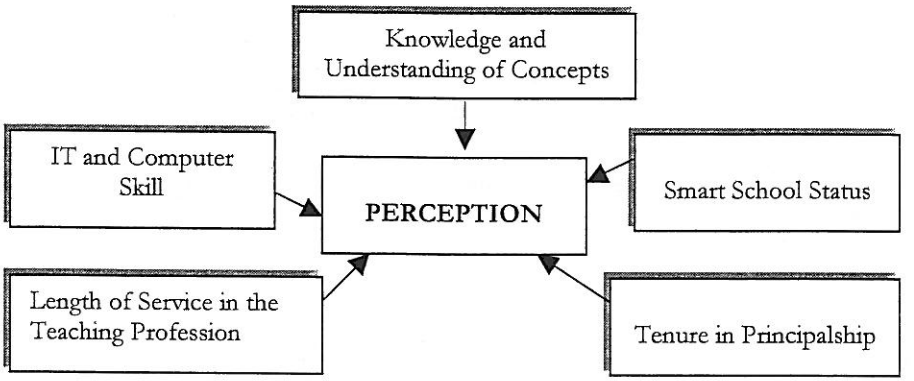

Fig. 1: The Conceptual Model of the Study

The following hypotheses were explored in the study:

H1: Principals' level of knowledge and understanding on the Smart School concept has no significant relationship with their perception towards the implementation of Malaysian Smart School.

H2: Principals' skill in using computer and IT has no significant relationship with their perception towards the implementation of Malaysian Smart School.

H3: Principals' length of service in the teaching profession has no significant relationship with their perception towards the implementation of Malaysian Smart School.

H4: Principals' tenure as principals has no significant relationship with their perception towards the implementation of the Malaysian Smart School.

H5: There is no difference in perception between principals of pilot Smart Schools and principals of non-pilot Smart Schools.

4.0 METHODOLOGY

The study employed a survey research design to determine the perceptions of school principals towards the implementation of the Malaysian Smart Schools. According to Leedy (1996), one the best ways to describe perception in research is the use of a survey method. Data collected for this study was by means of a questionnaire. Since respondents in this study comprised of

principals of secondary schools and were relatively large in number, the interview method would have been time consuming. The use of questionnaire to gather information had been proven effective since data can be collected in a short time.

The questionnaire was prepared in Bahasa Melayu which is the language that the principals are fluent in. The questionnaire consists of six parts: (i) Part A gathers information on the demographic profile of the respondents and the school; (ii) Part B consists of one item to gauge on principals' rating of their knowledge on Smart School; (iii) Part C measures principals' level of understanding and knowledge on the concept of Malaysian Smart School; (iv) Part D measures principals' perception on the implementation of Malaysian Smart Schools; and (v) Part E gauges principals' skill and experience with computers. Prior to the survey, a pre-test was conducted with post graduate students. Ten students, who were previously senior teachers, were chosen to answer and comment on the suitability of the questionnaire. As a result, section E was amended and incorporated in the finalised questionnaire.

The data was collected at the end of year 2000. Permission was granted from the Educational Policy Planning and Research Division and the Education Department of the Federal Territory prior to the collection of data. To ensure a high response rate, the questionnaires were personally delivered to and collected from the principals. Fifty-five questionnaires were distributed to schools in all four zones in the Federal Territory, based on convenience sampling. Out of fifty-five, forty completed questionnaires were returned and analysed, giving a response rate of 72.7%. Data collected was processed and analysed using the Statistical Package for Social Science (SPSS) Version 10.05.

5.0 RESULTS OF THE SURVEY

5.1 Profile of Respondents

The study used the following demographic variables for the respondents: 1) gender, 2) ethnicity, 3) age, 4) education level, 5) specialization, 6) years of service in the teaching profession, 7) tenure in principalship, and 8) experience of working in the district or state or ministry level. Table 2 shows the results for the demographic variables.

Table 2: Demographic Characteristics

Variables		Frequency	Percentage
Gender:	Male	11	27.5
	Female	29	72.5
Ethnicity:	Malay	38	95.0
	Chinese	1	2.5
	Indian	1	2.5
Age:	41-45 years	4	10
	46-50 years	18	45
	51-55 years	18	45
Level of Education:			
	First Degree	32	80
	Masters Degree	8	20
Specialization:	Economy	7	17.5
	History	12	30.0
	Bahasa Melayu	11	27.5
	Others	10	25.0
Exper.in Teaching:	10-20 years	2	5.0
	20-30 years	34	85.0
	More than 30 years	4	10.0
Exper. as Principal:	Less than 5 years	22	55.0
	5-10 years	12	30.0
	More than 10 years	6	15.0
Exper. at District, State and Federal level:			
	No Experience	31	77.5
	Less than 5 years experience	2	5.0
	More than 5 years experience	7	17.5

From Table 2, it shows that about 73% of the respondents were females and 27% were males. This finding is quite similar to the ratio published by the Education Policy Planning and Research Development (EPRD) in January 2000. According to the report, 62% of secondary school teachers in Malaysia are females and 38% are males. Generally, the majority of teachers in Malaysia are females, hence this proportion is expected.

Table 2 shows that the vast majority of the respondents were Malays. They made up 95% of the respondents while the remaining were Chinese and Indians. In terms of age, it appears that the majority of the respondents (90%) were above 45 years old. One possible explanation for this is perhaps due to the norm set by the Ministry of Education whereby teachers would be able to assume principalship at the age of 45 years and above.

Table 2 also indicates that only 20% of the principals have a Master degree as the highest academic qualification; the rest only has a first degree. However, it should be noted that all respondents are degree-holders which is in line with the basic qualification set by the Ministry of Education for secondary school teachers in Malaysia. In terms of specialization, Table 2 indicates that most of the respondents (75%) specialized in Arts disciplines; only 25% specialized in science, mathematics, and others.

To gain further details, the study obtains information related to respondents' experiences. From Table 2, it appears that a vast majority of the respondents (95%) had served the teaching profession for more than 20 years. This is perhaps related to the fact that most principals were above 45 years of age, where, by then, they would have been in the profession for more than 20 years. In terms of experience as principals, Table 2 also shows that slightly more than half of the respondents were principals for less than 5 years. Hence, we can conclude that most of the respondents are quite new to the post. In terms of administrative experience, Table 2 indicates that only 22.5% of the respondents have working experience in the district, state or Ministry of Education.

5.2 Profiles of the Schools

Table 3 shows the background of the schools participating in the study.

Table 3: Type and Status of the School

Variables	Frequency	Percentage
School Grade		
Grade A	27	67.5
Grade B	13	32.5
Smart School Status		
Pilot Smart School	6	15.0
Non-Pilot Smart School	34	85.0

The school grade has two categories, A and B. Table 3 shows that 67.5% of the respondents were from schools in the Grade A category, while the rest were from Grade B category. This finding is expected as it was found that there are more Grade A schools than Grade B schools in the state. Since the schools selected were from the Federal Territory, all the respondents came from urban schools. On the status, Table 3 indicates that 15% of the respondents were

principals of the pilot Smart Schools and 85% were principals of non-pilot Smart Schools. This proportion is expected as there are only six pilot Smart Schools in the Federal Territory.

5.3 Respondents' Self-Rated Level of Knowledge on Malaysian Smart School

Respondents were asked to rate their knowledge on the Malaysian Smart School on a 5-point Likert-scale. The aim was to gauge on the level of awareness on the Smart School project.

Table 4: Respondents' Self-Rated Level of Knowledge on Smart School

Rating	Frequency	Valid Percent
None at all	1	2.5
A little	6	15.0
Fair	12	30.0
Quite a lot	15	37.5
A lot	6	15.0
Total	**14**	**100.0**

From Table 4, it appears that, about 52% of the respondents rated their knowledge as either a lot or quite a lot. Meanwhile, 30% rated their knowledge as fair, and the rest rated their knowledge as a little or not knowing any thing on Smart School project. Generally, we can conclude that most of the respondents are aware and quite knowledgeable on the Smart School concept. However, it should be noted that only 14 out of 40 principals responded to this questions, which merely represents about 35%.

5.4 Respondent's Experience with Computers

The result of principals' experience with computers is summarized in Table 5.

From Table 5, we can conclude that slightly more than 90% of the principals owned a personal computer and were interested in using them. They also believed that computers are effective tools for gathering the latest information. A majority (73%) of principals had attended some kind of computer course, and this explains that about half of them do not have difficulties in using computers. In general, we can conclude that principals in the sample have strong interest and good experience with computers.

Table 5: Respondent's Experience with Computer

Question	Yes		No	
	Frequency	Percent	Frequency	Percent
Do you own a personal computer?	37	92.5	3	7.5
Have you ever attended any computer course?	29	72.5	11	27.5
Do you encounter any problems in using the computer?	17	42.5	23	57.5
Are computers more effective in providing the latest information?	39	97.5	1	2.5
Are you interested in computers?	37	92.5	3	7.5

From Table 5, we can conclude that slightly more than 90% of the principals owned a personal computer and were interested in using them. They also believed that computers are effective tools for gathering the latest information. A majority (73%) of principals had attended some kind of computer course, and this explains that about half of them do not have difficulties in using computers. In general, we can conclude that principals in the sample have strong interest and good experience with computers.

5.5 Knowledge on the Malaysian Smart School Concept

One of the objectives of the study is to determine the Principals' level of understanding and knowledge of the Smart School Concept. Questions in Part C of the questionnaire were used for this purpose. The result is shown in Table 6.

Table 6: Descriptive Statistics of Respondents' Understanding and Knowledge on Smart School Concept

	N	Minimum	Maximum	Mean	Std. Deviation
Knowledge and understanding of the Smart School Concept	40	3.11	5.00	4.07	.47

Table 6 shows that the mean score was 4.07, with the minimum of 3.11and maximum of 5.00. As the scale used is between 1 through 5, we can conclude that the principals in the sample perceived that they have a high level of

knowledge on the concept of Malaysian Smart Schools. This is consistent with the result on the self-rated knowledge on Smart Schools in Table 4. This is not surprising as the Ministry had given briefings to principals all over the country on the Smart School implementation. Furthermore, principals who are directly involved were given courses and feedback on the current stage of the implementation in their respective schools. Principals who claimed that they had little or no knowledge on Smart Schools could probably be those who were newly appointed as principals.

5.6 Perception on the Implementation of the Smart School

The perception of the principals on the implementation of the Smart School is the dependent variable in the research model. Questions in Part D of the questionnaire measure this variable. Table 7 shows the descriptive statistics of the result.

Table 7: Descriptive Statistics of Respondents' Perception towards the Implementation of the Smart School

	N	Minimum	Maximum	Mean	Std. Deviation
Perception	40	3.17	5.00	4.10	.52
Valid N (listwise)	40				

From Table 7, it is found that the mean score is 4.1, with the minimum of 3.17 and maximum of 5.00. The results indicate that principals in the sample have a positive perception towards the implementation of the Malaysian Smart Schools.

5.7 Level of IT Skills

The study also seeks to find out the level of IT skills of the respondents. The scores for questions 6 through 10 in Part E of the questionnaire are shown in Table 8.

From Table 8, it appears that the means for the level of skills for all applications are generally low, ranging from 1.83 to 2.55. The highest levels of skills are for using Windows and Internet, and the least are for electronic spreadsheet and graphic applications. To gain insights on the overall score, the means for each application is accumulated. It was found that the cumulative

Table 8: Mean Level of Skill in Various Applications

	N	Minimum	Maximum	Mean	Std. Deviation
Level of skill in word processing	40	1.00	4.00	2.33	.89
Level of skill in electronic spreadsheet	40	1.00	4.00	1.85	.66
Level of skill in graphic application	40	1.00	3.00	1.83	.64
Level of skill with windows	40	1.00	4.00	2.55	.75
Level of skill with internet	40	1.00	4.00	2.50	.82

mean score for all the five skills is 2.21, with the minimum of 1.00 and maximum of 3.80. It supports the general impression that the principals do not have sufficient skills in using common software applications.

5.8 Tests of Hypotheses

Reliability coefficient of Cronbach's alpha was used to measure the reliability of the questionnaires for Parts C, D and E (questions 6 to 10). Cronbach's Alpha Coefficient is an estimation of the reliability of the internal consistency of the items in the scale. The Cronbach's Coefficient Alpha for Part C was 0.84 and for Part E was 0.82. After deleting items 1, 2, 8 and 10, the Cronbach's Coefficient alpha for Part D was 0.70. The items were deleted since they have a negative item–to–total correlation. All the three Alpha Coefficients are preferred according to Nunally's (1978) guidelines.

Based on the research model, five hypotheses were formulated. This section describes statistical tests carried out to determine whether each hypothesis is supported or not. Hypotheses 1, 2, 3 and 4 were tested using Pearson correlation, and One- way ANOVA was used to test Hypothesis 5.

H1: Principals' level of understanding and knowledge on the Smart School concept has no significant relationship with their perception towards the implementation of Malaysian Smart Schools.

This hypothesis was tested using Pearson Correlation. The result is shown in Table 9.

Table 9: Pearson Correlation of Respondents' Understanding and Knowledge and Perception.

		Perception	Understanding / Knowledge on Smart School Concept
Perception	Pearson Corr.	1.000	.505
	Sig.(2-tailed)		.001
	N	40	40
Understanding and Knowledge on Smart school Concept	Pearson Corr.	.505	1.000
	Sig. (2-tailed)	.001	
	N	40	40

** Correlation is significant at the 0.01 level (2-tailed)

Since the significance level obtained was 0.001, it is reasonable to conclude that Hypothesis 1 is not supported. The result implies that there is a positive correlation between principals' level of understanding and knowledge on the Smart School concept and their perception towards the implementation of the Malaysian Smart Schools.

H2: Principals' skill in using computer and IT has no significant relationship with their perception towards the implementation of Malaysian Smart Schools.

Pearson Correlation was again employed to test this hypothesis. The results are shown in Table 10.

Table 10: Pearson Correlation of Respondents' Skills in IT Usage and Perception

		Skills in IT Usage	Perception
Skills in IT Usage	Pearson Correlation	1.000	-0.180
	Sig.(2-tailed)		0.267
	N	40	40
Perception	Pearson Correlation	-0.180	1.000
	Sig.(2-tailed)	0.267	
	N	40	40

** Correlation is significant at the 0.01 level (2-tailed)

Table 10 shows that the significant level was more than 0.05 (was 0.267). Therefore Hypothesis 2 cannot be rejected. It can be concluded that there is no

relationship between principals' knowledge in IT and their perceptions towards the implementation of the Malaysian Smart Schools.

H3: Principals' length of service in the teaching profession has no significant relationship with their perception towards the implementation of Malaysian Smart Schools

Pearson Correlation was used to test the hypothesis as shown in Table 11.

Table 11: Pearson Correlation of Respondents' Length of Service and Perception

		Length of Service	Perception
Length of Service	Pearson Correlation	1.000	.017
	Sig. (2-tailed)	-	0.917
	N	40	40
Perception	Pearson Correlation	0.017	1.000
	Sig. (2-tailed)	0.917	-
	N	40	40

** Correlation is significant at the 0.01 level (2-tailed)

The significant level was found to be 0.917 which is higher than the value 0.05. Based on the result, it is reasonable to conclude that Hypothesis 3 cannot be rejected. It can be concluded that a principals' length of service has no significant relationship with their perceptions towards the implementation of Malaysian Smart Schools.

H4: Principals' length of tenure in principalship has no significant relationship with their perception towards the implementation of Malaysian Smart Schools

This hypothesis was tested using Pearson Correlation. Table 12 shows the result of the test.

The significant level obtained was 0.106. Based on the result, it is reasonable to conclude that Hypothesis 4 cannot be rejected. It can be concluded that principals' tenure in principalship has no significant relationship with their perceptions towards the implementation of the Malaysian Smart Schools.

H5: There is no difference in perception between principals of pilot Smart Schools and principals of non-pilot Smart Schools.

Table 12: Pearson Correlation of Respondents' Tenure in Principalship and Perception

		Tenure in Principalship	Perception
Tenure in Principalship	Pearson Correlation	1.000	-0.259
	Sig. (2-tailed)		0.106
	N	40	40
Perception	Pearson Correlation	-0.259	1.000
	Sig.(2-tailed)	0.106	
	N	40	40

** Correlation is significant at the 0.01 level (2-tailed)

ONEWAY ANOVA was employed in testing this hypothesis. The result is shown in Table 13.

Table 13: Oneway ANOVA of Perception of Principals of Pilot Smart Schools and Ordinary Schools

	Sum of Squares	df	Mean Square	F	Sig.
Between groups	5.718	1	5.718	.584	.449
Within groups	371.882	38	9.786		
Total	377.600	39			

The significant level obtained was 0.449 indicating a value higher than 0.05. It is reasonable to conclude that Hypothesis 5 cannot be rejected. Therefore, it can be concluded that there is no difference in the perception between principals of pilot Smart Schools and principals of non-pilot Smart Schools.

Table 14 summarises the results of the tests for the hypotheses.

Table 14: Summary of Results of Tests for Hypotheses

H	Mean/p-value	Significant Findings
1	p-value= 0.001	Principals' level of knowledge and understanding on the Smart School concept have a significant relationship with their perception towards the implementation of Malaysian Smart Schools
2	p-value= 0.267	Principals' skill in using computer and IT has no significant relationship with their perception towards the implementation of Malaysian Smart Schools
3	p-value= 0.917	Principals' length of service in the teaching profession has no significant relationship with their perceptions towards the implementation of Malaysian Smart Schools
4	p-value= 0.106	Principals' tenure in principalship has no significant relationship with their perception towards the implementation of the Malaysian Smart Schools
5	p-value= 0.449	There is no difference in perception between principals of pilot Smart Schools and principals of non-pilot Smart Schools

6.0 DISCUSSIONS AND IMPLICATIONS

6.1 Discussion of Findings

In this study, a research model on factors that influence principals' perception is formulated and tested. The results revealed that principals of the participating schools have sufficient understanding and knowledge on the Smart School concept. As the principals have undergone the Smart School training sessions provided by the Ministry of Education, it is expected that they have acquired the understanding of the Smart School project. In fact, one of the key activities under the Smart School Implementation Plan is 'training of school management and ongoing professional development of principals' (Ministry of Education, 1997b).

The study reveals that the principals' levels of knowledge and understanding on the Smart School concept have a significant relationship with their perception on the implementation of Malaysian Smart Schools. In this case, the study found that the principals have a positive perception towards the implementation of the Smart Schools. Past studies on attitude and perception of users on use of ICT among business managers also indicated similar findings (Magal and Lewis, 1995). Hence, training sessions and other forms of

educational programs to increase understanding of this initiative is very important in ensuring that school principals have a positive perception towards the Smart School project. Having a positive perception will lead to supportive actions in building the ICT culture in schools.

The study provides some evidence that having good skills in using ICT do not necessarily influence the principals' perception towards the Smart School. In other words, those who do not know how to use or are not using computers may still perceive the Smart School project positively. This finding seems to be in contradiction with the finding of Beck' study (1997) that IT competent teachers have positive attitudes towards ICT. One possible explanation is that, while it may be true that teachers with good ICT skills develop a positive attitude towards technology, the principals, on the other hand, may not have the luxury of time to use ICT due to the assumed administrative roles. A similar conclusion is found in the case of business organizations, where IT implementation is driven by CEO's knowledge and awareness of what the technology can do for the firm, rather than CEO's use of the technology (Magal and Lewis 1995; Jarvenpaa and Ives, 1991). Hence, it implies that ICT training for principals should focus more on providing awareness on the benefits of the Smart Schools rather than ICT skills per se.

The study found that the number of years in the teaching profession or as principals does not generally relate to the perception on Smart Schools. This result is not quite expected as according to Bell *et al.* (1996) perceptions are both shaped by our experience and expectations from the past and are a primary source of our thoughts in the future. As such, we would expect that principals' past experience would influence their perception on Smart Schools' initiative. However, in this case, the Smart School is an innovative and transformative educational project, where past experiences perhaps do not have much relevance.

From the study, it was found that there is no difference in perception between principals of pilot Smart Schools and principals of ordinary schools. Since training on Smart Schools cover all principals in the country, in preparation of the national roll out, it is expected that all principals would eventually gain understanding and knowledge on the Smart School concept and implementation.

6.2 Implications for Practitioners

School principals are the agents of change. In an effort to achieve transformative use of ICT in schools, school principals play an important role in leading and directing educational efforts towards achieving the goals of the National Educational Philosophy. While the Smart School project has just completed its pilot phase and is ready for the roll out, principals of all schools must be ready for the challenging task to transform their schools into ICT-capable schools. They have to be prepared to undertake the responsibility of leading a Smart School in the future. Hence they have to be equipped with the proper knowledge and understanding on the Smart School project.

This research demonstrated that understanding the concept and having the knowledge of Smart School influences the principals' perception on the Smart School implementation. Policy makers and planners who are involved in the project need to ensure that school principals understand the concept and aspirations of the Smart School in order to ensure the success of the project. Courses or training sessions need to be conducted effectively and cover all principals in the country.

Johnson (1997) identified that the usage of computers in education would undergo three phases: (i) familiarisation; (ii) acquisition; and (iii) integration. To speed up the integration process, the administrators, teachers, parents, communities, and students, must think differently about the computers. As computers become more involved in the teaching-learning process, teachers would assume more the role of managers and tutors rather than sole providers of knowledge. Hence, stakeholders of education should understand the shift and give full support to achieve true integration.

6.3 Limitations of the Study and Implications for Future Research

As with any other survey work, we need to be cautious when generalizing the results of this study for several reasons. First, this study focuses only on the Federal Territory of Kuala Lumpur, which is the capital city of Malaysia, where generally people are more IT-literate than those in other parts of the country. Hence, attempts to generalize the findings to represent the whole population of school principals in the country should be done more cautiously. Second, the factors that influence the perception of the principals explored in the study are not comprehensive. Further research can extend the results of this study by

covering a larger sample size and include additional factors that influence an individual's perception.

7.0 CONCLUSION

This study has made some contribution to the knowledge of integrating information technology in Malaysian schools. First, it investigates the level of knowledge and perception of principals towards the Malaysian Smart School concept and its implementation in the country. Since principals are key players in the school re-invention process, their perceptions influence the success of the Smart School initiative. The findings reveal that the principals have the knowledge on Smart Schools and perceive positively on the implementation of the project. As principals are educational leaders, their perception and internalization of the national aspirations are the key factors towards successful transformation of schools. Even the most inspired IT Coordinator is going to make little impact on a school without the support of the principal. Principals continue to be the powerful definers of the culture, ethos and organization of their schools. Second, the findings of this study provide important feedback to the Ministry of Education in terms of readiness of school principals in undertaking the change towards Smart School implementation. This will help them in planning the roll out of Smart Schools throughout the country more effectively. Being one of the flagship applications in the MSC, the success of the Malaysian Smart School programme is very important to the country.

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