International Journal of Education and Development using Information and Communication Technology (IJEDICT), 2012, Vol. 8, Issue 1, pp. 29-45.

A preliminary study of school administrators' use of information and communication technologies: Bruneian perspective

Afzaal H. Seyal[1]
Institute of Technology Brunei, Brunei Darussalam.

ABSTRACT

The study surveyed 96 Bruneian primary schools administrators (principals) in using the Information and Communication Technologies (ICT). Out of the five subscales used to assess the ICT usage, only two: curriculum integration and need assessment were found to be significant towards the use of the ICT. The results further indicate that majority of the school administrators have intermediate level of computer expertise and possess an adequate computer literacy. The school administrators use ICT for administrative purposes; however, the use of technology across the curriculum is still at infancy stage. The study has found some major reasons for the lack of use of ICT across curriculum. The statistical significance t- tests, ANOVA and post-hoc comparison have found a difference in the mean of novice classification and of advanced level of computer expertise. Based upon the analysis some recommendations are made for the relevant authorities of the Ministry of Education, Brunei Darussalam.

Keywords: Information and Communication Technology (ICT); technology leadership; primary schools, administrators; and Brunei Darussalam

INTRODUCTION

The schools in the various South-east Asian economies are continuously undergoing radical changes and these changes are bringing structural shift in the educational practices especially at the primary schools level. Several structural reforms are not only overhauling the school curriculum and teaching-learning methods but also integrating Information and Communication technologies (ICT) as a part of pedagogy to support the teaching and learning. It is for this particular reason that school systems are faced with intensive pressure to use ICT to enhance students' learning. To this regard, principals have been assigned with an additional responsibility of not only working with the technology but to introduce the technology as a part of pedagogy to enhance teaching and learning through it (Gurr, 2000). In his study of Australian schools, Gurr (ibid) found that technology has dramatically changed the way the principal work.

Right from the early days efforts are continuously being made to increase interest, attention and investment by the students, educators and investors to put them all into the use of the ICT in education in the schools. Hartman and Procter, (2003) conclude that effective technology integration require a new approach of leadership that demands the integration of ICT at every level of school in order to meet the school's challenges. In addition, efforts are continuously being made to adapt curricula to suit them to the environment and management demands that ICT-based knowledge acquisition creates. The emergence of knowledge economy has radically changed the traditional education system and remolded the existing framework of education practices where students' capacities for problem solving, self-learning , and critical thinking are developed and sustained in ways that make pre-ICT curricula anachronistic (Yuen *et al.* 2003). Now schools are expected to equip learners with the basic technological skills that prepare them to become technology oriented learners. With the pressure being put on schools to perform in the field of technology, demands emerge for leadership to facilitate this process (Mentz and Mentz,

2003). It is evident that induction of technology and its proliferation in the schools requires a new type of leadership. The studies such as Riffel and Levin, (1997); Technology Counts '99 (1999) and Meredyth *et al*. (1999) have pointed out that despite heavy investment in ICT in the Australian schools the potential for ICT to alter how teachers teach and how children learn has not been fully realized. They relate the discrepancy to the number of pedagogical challenges faced by the teachers and school leaders.

Rational of the Study: Results from the studies mentioned above and also from other studies such as Anderson and Sara (2005); and Tondeur *et al.* (2008) found that school administrators face a big challenge in initiating and promoting technology and for this they need to understand the capacities of new technologies and to develop personal proficiency while using them. This in return will help promote a school culture which encourages exploration of new techniques in teaching, learning and management. It is therefore expected of the administrators to assume a major responsibility in bringing and implementing academic change through proactive use of the ICT and to take complex decisions about integration of the ICT into learning and teaching (Schiller, 2003). We also agree to conclusion, made by Anderson and Dexter, (2000) in their research of 800 schools in the USA that technology infrastructure is important, and technology leadership is even more important for effective utilization of technology in the schools. These assertions have made us to conduct this pioneering study of school administrators' use of ICT among Bruneian primary schools. This will not only provide a source of knowledge and reference but will contribute with the empirical evidence to the relevant authorities at Ministry of Education in devising and formulating the ICT policies in the schools.

Background and ICT initiatives of Brunei Government

In order to meet the challenges in the emerging global information society, many countries throughout the region have launched ICT initiatives under the flagship of e-Government to ensure that their economies successfully handle technological developments. Same is true to Brunei Darussalam (henceforth referred to simply as Brunei), a small sultanate of 400,000 people situated on the northwest coast of the Borneo Island situated geographically on the equator between Singapore and Malaysia. Its main economic activity is dominated by oil and gas sector. Brunei is presently the 14th largest oil producer in the world and 4th largest natural gas producer (HSBC, 2009). Brunei is facing negative consequences from its single minded dependence on oil. Brunei therefore needs to diversify its economic activities through its national IT plans.

In Brunei, the e-Government initiative was started in 2000, when His Majesty Sultan Hassanal Bolikah in his speech expressed his wish to see the establishment of e-Brunei (www.bit.gov.bn), aiming for a paperless society by guiding Brunei into the mainstream of global information technology. His Majesty emphasized the implementation of e-Government and e-Business to develop Brunei's economy beyond oil and gas. The government's seriousness in considering ICT has seen an initial allocation of B$526 million in the 8th National Development Plan being increased to nearly B$1billion (about US$690 million) for the development and implementation of infrastructure for e-Government (Brunei Darussalam Public Sector Journey towards e-Govt, 2003). The announcement to embark e-Government was made in 2000 but it was not until 2003 that the actual planning started. There was almost a three years delay in starting e-Government despite a B$1 billion budget allocated in 2001.The ministries were asked to prioritize their projects under their ICT based strategic plans. Ministry of Education (MOE) has started their e-Education program and started bringing the ICT in teaching and learning among the schools in three phases. Phase 1 was to learning ICT and learning through ICT among the primary schools and phase 2 and phase 3 was to expand this program to all high schools and technical and vocational institutions. So far 60% of the projects were completed under MOE. The major barriers in the delay were due to each ministry little knowledge about what e–Government was and they had little experience in IT and it was very difficult to prepare a proposal as requested by e-

Government Program Executive Council (EGPEC) within a short period of time with limited knowledge and resources available. Kifle, (2008) studied the associated barriers in implementing e-Government projects and found that poor IT capabilities and experience among the Bruneian public sectors had very little experience in IT development and deployment. Non-IT officers were asked to participate in the e-Government projects in many ministries. Similarly, Kifle and Cheng, (2009) in their study found that poor leadership especially focusing on ICT based skills as one major e-Government failing factor and stressed on the strong leadership as a fundamental aspect in determining the success of e-Government implementation. They noticed that ICT diffusion was much more than just technological adoption and adaption.

Under the flagship of e-Government, MOE faced several challenges for their e-Education program. The one of the biggest challenges in integrating the ICT into the school curriculum has been: how to enable future work force to deal effectively with any technological change? As envisioned by the relevant authorities at the senior level, this integration of the ICT will bring several benefits to the country at macro level as well. These benefits will include:

- The knowledge and familiarity with the new technologies will be an important dimension of employability in the information society.
- The use of the ICT will definitely improve the quality of educational experience by providing favorable environment for learning.

These challenges and benefits have provided a road map to reshape MOE e-education program.

Objectives of the Study

With the above mentioned background, the present study was undertaken to empirically assess the primary school administrators' leadership in the use of the ICT. This research, therefore, has the following objectives:

- To examine school administrators' role in integrating the ICT into teaching and learning process
- To assess the administrators' use of the ICT for (i) managerial and administrative tasks and (ii) in teaching and learning
- To assess the administrators level of expertise in using the ICT
- To analyze professional development needs to enhance the ICT skills.

The term school administrator is synonymous with school principal in Brunei; principals in primary schools are designated as Headmaster/mistress or administrator. Similarly, the term 'technology' is also synonymous with the "ICT".

REVIEW OF LITERATURE

Role of School Leadership and ICT

The studies of technology integration in the education and in the schools date back to 1980s (Wiseman, 1985). A number of studies that were conducted in Hong Kong (Yuen *et al.* 2003), South Africa (Mentz and Mentz, 2003) and Australia (Schiller, 1997, 2003) have identified the success of ICT implementation with their school leadership. Yuen *et al.* (2003) studied the role of the school leadership based on theory of transformational leadership in relation with characteristics of ICT leadership in Hong Kong primary schools. The TTL Academy of School Administrators at the University of South Dakota states that education in the information age requires that school administrators not only update their skills and knowledge, but they also work towards the transformation of their roles as educational leaders (TTL, SA, 2002). The key issues

studied by the Academy are: assisting administrators with planning and budgeting and implementation of school-wide technology program, including a professional development program. James and Connolly, (2000) have shown evidence that ICT integration brings change in teaching and learning and the implementation of change is inter-related to the leadership and management of change. On the other hand, Yee, (2000) has outlined a framework that suggests eight categories of ICT leadership that include: equitable providing, learning-focused envisioning, adventurous learning, patient-teaching, protective enabling, constant monitoring, networking and challenging. Several investigators of educational technology integration have noted that many of school leadership have little understanding of the relationship between technology fit and school performance and students outcome (Sandham, 2001 and Slowinski, 2000).

Previous studies provide further evidence and justification of the administrators' ICT knowledge and skills deemed crucial for technological leadership (Hope *et al.* 1999; Flanagan and Jacobson, 2003; Hope and Brockmeier, 2002). Brockmeier *et al.* (2005) have investigated school principals' relationship with technology by using survey methodology in Florida, USA. They examined the role of school principals in facilitating and participating in the integration of computer technology into teaching and learning and found lack of required expertise necessary to become technology leaders: leaders who are able to facilitate technology's integration. In their research, they tried to answer the basic question: "Are principals prepared to facilitate the attainment of technology's promise through it integration into teaching and learning process?"

The integration of ICT among schools and the principals' competence and technological leadership have become a very important segment among researchers. Margaret, (2010) studied the primary schools in Ireland and noticed the schools principals' acceptance of ICT and list down the factors that are significant in maximizing their ICT acceptance. The study reviewed the school's ICT policies, expanding the Technology acceptance model (TAM) to understand the key determinants of computer acceptance and usage. Based on these parameters she developed a framework and recommended steps for school administrators to maximize ICT acceptance and usage in the classrooms. Similarly, Brannigan, (2010) found that school leadership is one of several critical components in the successful integration of ICT in schools. The locus of leadership influences the degree to which ICT integration can become viable among schools as well the role of leadership in championing ICT. Accordingly, lack of leadership capacity is often attributed to the failure of schools to systematically integrate ICT into the curriculum and school's teaching and learning practices. Tondeur *et al.* (2008) studied 53 school principals and 574 teachers from the same 53 schools in Belgium and found that having an ICT plan, ICT support, ICT training and school's leadership support have a significant effect on class use of ICT.

Leadership is regarded as a critical component in the successful integration of ICT in education (Kearney and McGarr, 2009; Kirkland and Sutch, 2009). While some evidence suggests that locus of ICT leadership centers on the principal (Kearney and McGarr, 2009,) some others supported the preposition that distributed leadership throughout an educational institution enables successful ICT integration to take place. Researchers like Kearney and McGarr, (2009) further supported that leader who is close to the curriculum and teaching are well placed to influence pedagogical change through ICT. On the other hand, Hayes, (2007) supports the notion that school leadership harness commitment to improve teaching and learning through ICT integration. Kirkland and Sutch, (2009) viewed school leadership as to establish a culture that enables innovation as well as a shared sense of responsibility for innovation. Otto and Albion, (2002) stressed the creation and articulation of a shared vision of ICT use which is key to driving and managing change in the use of ICTs in teaching and learning.

While most of these prior studies have been undertaken in the western world and within the context of Asia-Pacific, there are not many studies done within the South-East Asian perspective. However, some work on the use of the ICT in the educational institutions was previously

undertaken in the Brunei Darussalam but that were not directly related to this research. These studies focused on the students rather than studying the school principals' use of technology (Seyal and Rahman, 2003; Dhamortharan and Aminatol, 2006 and Hj. Derus *et al*. 2006).

Whereas, some other studies were undertaken among schools on the teaching and learning stream, and researchers like Salleh and Albion, (2004) investigated the school teachers' intentions and the use of the ICT in teaching by using Theory of Planned Behavior (TPB, Ajzen, 1985) as a framework for predicting teachers' intentions in using the technology. The result indicated that teacher' attitudes towards the use of the ICT and subjective norms significantly predict their intentions that further predict specific behavior. However, perceived behavioral control was not significant enough to predict their behavior. In addition, several others studies investigated the effects of ICT on students' achievement in biology (Zamri and Yong, 2006), class management and school leadership changing role (Heng, 2006) and learner technology by teachers (Dhamortharan, 2006).

Within the continuum of techno-school leadership, little has been researched in Brunei. Seyal, (2007) studied the primary school principals leadership style and found the transformational leaders are effective school leaders in facing the challenges of technology. In another study, of school teachers use of ICT, Goh and Leong, (2006) found that many teachers in Brunei have positive attitudes toward application software and the use of the Internet and CD-ROM resources in their teaching. However, when it comes to using the resources directly in classroom instruction there are reservations, barriers, and constraints of facilities and resources (Leong, 2006; Kam, 2007). Kifle, (2008) in his study of e-Government mentioned on the strong need of champions and leadership on not only to influence on directing, pushing, encouraging and mobilizing and follow-up and monitor the implementation project.

Conclusively, there are several studies undertaken in the past focusing on the different dimensions of ICT in the teaching and learning continuum; however there is a dearth of studies focusing exclusively on school administrators' role as ICT leaders and to the best of our knowledge no prior study on this domain exists in Brunei Darussalam. Therefore the current study will not only fill-in the gap in the literature but also provides insight and will add to new dimension to school administrator's role as ICT leader.

METHODOLOGY

Sampling Design & Population

The study is descriptive and of an exploratory nature. The target population in this study is all the administrators of 122 primary schools located in all four geographical and administrative districts of Brunei Darussalam. Out of these, 60% of the schools are located in the main capital district and whereas, only 5% of the schools are located in less developed and remote district. Such type of division based upon strata either geographically or administratively separated are ideal for random stratified sampling design (Wiersma, 1995). As the population is not homogenous and varies noticeably, it is advantageous to sample each one independently (ibid). However, keeping in view the population size (122 administrators) we therefore decided to design the study based upon total population sample. Total population sampling is a type of purposive sampling techniques that involves examining the entire population (total population) that have a particular set of characteristics, traits, experiences, knowledge, skill and exposure to an event (Moore and McCabe, 2005). However, Sharon (2009) has identified two aspects of examples that illustrate as when total population sampling may be appropriate: (1) the population size is relatively small and (2) the population shares an uncommon characteristic. In our case, the uncommon characteristic is school administrators who are using ICT.

Data collection

The questionnaire was emailed to the administrators (headmaster/headmistresses) of all 122 government primary schools across the country with a covering letter addressing the nature of the survey. This was achieved through Planning, Research and Development Department of Ministry of Education. The respondents were advised to return the filled-in questionnaire to the research section through email or through fax. In the first phase, only 35 questionnaires were returned within due date of ten days. A follow-up letter was faxed to all the remaining schools to improve the response rate to 57%. Final attempt with personal telephone calls increased the response rate up to 79% with 96 valid questionnaires that were retained to draw logical conclusions.

Design of Instrument

In line with the objective of the study, the survey instrument developed by Hope *et al.* (1999) was used for this research. The questionnaire as given in Appendix-A is a 40-item, 5-point Likert-type scale with anchors labeled as 1= not at all to 5=strongly agree. The forty items are grouped into five constructs to evaluate how frequently, or to what degree, individuals believe that their supervisors/administrators engage in forty specific categories of behaviors toward technology. Table 1 provides the details. Part B of the questionnaire captures the data about the demographical as well as organizational characteristics, such as, age, gender, number of years of experience as administrator, educational qualifications and school locations (urban or rural), computer expertise, use of strategic planning for technology acquisition, and various types of information systems practiced in the schools.

Table 1: *Various domains of the ICT Questionnaire for School Leaders*

Construct	Explanation
Curriculum Integration	Contain items on how far technology is integrated across curriculum
Perception	Administrators beliefs about the technology usage and provisions it makes
Acquired Expertise	Use of technology for creating database, using email, internet, and web search, use to make presentation, preparing budgets, and finally using school MIS
Needs Assessment	Anticipatory benefits of ICT on student achievement, integration of technology into the curriculum, understanding legal and ethical issues. Use of technology for problem-solving in daily operations
Professional Development	Training received by the MOE and ICT Department of MOE on database, Internet, budget, evaluating educational software and hardware, leadership and integration of technology into the curriculum

Instrument reliability and validity

Several techniques were used to assess the Cronbach's (1951) reliability coefficient alpha and to assess face and construct validity. In order to ascertain face validity, an initial questionnaire was passed through the routine editing after it was given to the panel of experts (Academics, HR practitioners and Principals). They were asked to respond to the questionnaire. Very few

comments were received and some minor changes were done to enhance the clarity. Table 3 shows the reliability coefficients and convergent validity for the various constructs.

Table 2: *Pearson Correlations of all constructs with the overall Use of ICT (n=96)*

Subscales	CI	PER	AE	NA	PD
Curriculum Integration (CI)	**1.00**				
Perception (PER)	.615	**1.00**			
Acquired Expertise (AE)	.450	.518	**1.00**		
Needs Assessment (NA)	.449	.478	.447	**1.00**	
Professional Development (PD)	.239	.438	.314	.272	**1.00**
Use of ICT	.706	.803	.749	.681	.700

All correlations are significant at the 0.01 level (2-tailed)

In general, validity refers to the degree to which instrument truly measure the constructs for what it is intended to measure. Table 3 shows the reliability values for the various constructs with variance extracted. Cronbach's alpha for the constructs ranged from 0.76 to 0.92 indicating a sufficient level of reliability with the variance explained above 50% for all the constructs showing sufficient validity of all constructs. In general results show that constructs have sufficient reliability and validity.

Table 3: *Reliability & Validity Analysis*

Constructs	No of original items	No of items retained	Alpha value (.60 and above)	Mean	Std. Dev	Variance explained <.50
Curriculum Integration	9	4	.76	4.03	.480	.57
Perception	8	7	.76	3.87	.441	.52
Acquired Expertise	7	4	.81	3.79	.609	.63
Need Assessment	8	7	.85	4.00	.452	.58
Professional Development	8	8	.92	3.45	.779	.74
Total	40	30		3.82		.60

(Number of items retained that has corrected-item total >.40)

Limitations

Our study has major weakness that is usually inherent in the traditional survey research. As such the data analysis is based on self-reported responses of the administrators which may lead to the possibility of response bias. Not much has been done to respond this biasness. We therefore suggest that cautions must be made while generalizing the results.

ANALYSIS OF THE RESULTS

Ninety-six questionnaires received were analyzed using SPSS version 17 for descriptive analysis, correlation analysis and for ANOVA and t-tests in order to assess the school administrators' techno-leadership. Table 4 describes the demographics as well as organizational characteristics of respondents.

Table 4: *Demographic characteristics of the respondents*

Gender		**%**
	Male	47
	Female	53
Age of School Headmasters		
	25-30 years	2
	31-36	9
	37-42	15
	43-48	40
	49-54	35
Experience as Headmaster		
	1-3 years	46
	4-6	28
	7-10	15
	11-14	6
	15 or more	5
School Location		
	Urban (Brunei-Muara)	50
	Tutong 1	11
	Tutong 11	9
	Belait	13
	Temburong	13
Educational Level		
	Certificate in Education (CE)	3
	CE and First degree	27
	First degree	40
	Masters degree	31
Computer Expertise		
	Novice	17
	Intermediate	73
	Advanced	8
	Expert	0
Does your school have Web site?		
	Yes	58
	No	41
Do you use strategic planning for the use of technology for teaching/learning?		
	Yes	73
	No	24
Do you believe decision to integrate ICT for teaching/learning should be taken at?		
	At School Level	71

Gender		**%**
	At MOE Level	24
Do you have the following Information Systems at schools?		
	Student Information System	45
	Student Examination System	19
	Administrative Support System	17
	Management Information System	19

The respondents were asked to assess their responses on all forty items pertaining to the various attributes of the use of the ICT on five point Likert scale; 1- strongly disagree to 5-for strongly agreed. However for the calculating the overall ICT usage, the mean of all five constructs was extracted and after the analysis it was found that 96% of the respondents have high mean score on the use of the ICT with total mean of 3.82. It reinforces Seyal's (2006) findings that 70% of the schools administrators are confident in using the ICT.

Determining the Factors Contributing towards the Use of ICT

In line with the principles of multivariate data analysis, we conducted a zero-order correlation between the various constructs is shown in Table 2. The correlation provides directional support for the predicted relationship and shows that collinearity among all the independent variables is moderate with the correlation values less than 0.90 as pointed by Tabachnich and Fidell, (1996). The Pearson Correlation coefficient between ICT usage and other five constructs range from .68 to .80 and inter-constructs correlation range between the subscales ranges from .23 to .61. Professional development subscale correlates weekly with curriculum integration and need assessment and correlates moderately with perception and acquired expertise but all are significant at $p<.05$.

Analysis of Variance and of Means

In order to answer two substantive research questions an ANOVA test were used with post-hoc comparisons. We posed two questions; first, is there a significant difference on the ICT usage by computer experience? Second, do all or some of the ICT usage subscales contribute significantly toward the ICT usage?

An ANOVA was performed on the ICT usage by computer expertise rating and significance was found with $F(2, 91) = 2.91$, $p<.05$. The post-hoc comparison test rendered that the mean of the novice classification was significantly lower than advanced level of computer expertise classification. It is evident from Table 5 that two out of five subscales are significantly contributing toward the use of the ICT by the school administrators, however, perception and acquired experience remains insignificant with the professional development shows significant but inverse relationship as shown by the negative sign.

Table 5: *Result of t-test for the subscales contributing toward the use of ICT*

Subscales	t-test statistics	Remarks
Curriculum Integration	t= 6.021, df = 95, p = .000	**Significant**
Perception	t= -.270, df = 95, p = .787	Non Significant
Acquired Experience	t= -.526, df = 95, p = .600	Non Significant
Need Assessment	t= 5.303, df = 95, p = .000	**Significant**
Professional Development	t= -6.291, df = 95, p = .000	**Significant but inverse**

FINDINGS & DISCUSSIONS

It is evident from the analysis that the subscale curriculum integration positively contributes toward the ICT usage with the higher mean of 4.03. Initially this subscale measured nine items but five items had to be dropped due to the lowest corrected-item total in the analysis of reliability. The remaining four subscales along with their retained items are reflected in the Table 6. The Table shows the percentage of administrators' responding "agree" to "strongly agree" to each item of computer usage scale. 79% of the administrators facilitate curriculum integration of computer technology into teaching and learning process and consider it an important instructional task. In addition, 69% spend a significant amount of time assisting teachers in integrating computer technology into their instruction. In addition 66% of the respondents agree or strongly agree to encourage teachers' use of the ICT to meet learners' individual needs.70% provide equitable access to ICT resources. Unfortunately only 35% of the administrators agreed to provide teachers release time to evaluate software appropriateness for integration into the curriculum. Again, only 28% administrators provide teachers release time to facilitate their familiarization with the capabilities of technology devices. This is not a very promising practice. We believe, however, that appropriate software is a key element to enhance teaching and learning. If the teachers do not receive release time to practice the software for inclusion in instruction their ability to integrate computer technology across curriculum will be underutilized and will affect their effectiveness. Results further show that more than half of the administrators are unwilling to give over this important issue solely to the teachers. Our results therefore support Brockmeir *et al*. (2005).

Although the subscales on perception of computer technology for managerial, administrative and teaching/learning tasks do not contribute significantly towards the ICT usage, two items are very important such as 88% of the respondents agree that administrator' professional development has been a focus of MOE to infuse the computer technology into the schools and 78% of the administrators responded that technology standards for school administrators can assist in facilitating computer technology into the instruction. Regarding the administrators' role of being technology leaders in the schools, 60% responded that their ICT expertise makes them as technology leaders.

Professional development is considered as a key area and reflects the users' performance on the diffusion of technology and the achievement of organizational goals. School administrators responded strongly that they need sound professional development programs in assessing computer technology's influence on the student achievement (92%), using computer technology to collect and analyze data (92%), and using computer technology in their work as administrators (80%). Unfortunately we got the lowest response for the item using computer technology to facilitate organizational change. This item, because of its lowest correlation had to be dropped from the subscale. It might be for this reason that most of the administrators misunderstood the term "organizational change".

Comparatively, less percentage of the administrators (from 38% to 43%) responded favorably for professional development in understanding ethical issues (70%) and in legal issues (69%) related to software licensing, copyright and patent issues. There is a strong need to develop these key areas of computer technology knowledge. The result support Hope et al. (1999) and Flanagan and Jacobsen, (2003).

Table 6: *Percentage of Administrators' Response to each item in ICT Usage Scale*

Item Number	5	4	3	2	1	Mean	Std. Dev
C2 (CI)	10	69	10	9	2	3.98	.54
C5	24	45	22	7	2	4.17	.64
C8	16	50	15	10	9	4.03	.75
C9	8	62	15	8	7	3.96	.58
C11(PER)	11	68	16	2	3	3.82	.78
C12	11	77	6	2	3	3.92	.74
C13	11	80	8	0	0	4.03	.45
C14	8	52	31	7	2	3.64	.78
C15	4	48	38	8	1	3.46	.75
C16	5	73	19	2	0	3.82	.53
C17	19	71	6	2	2	4.02	.73
C18 (AE)	30	62	3	2	2	4.17	.76
C20	10	50	27	8	3	3.57	.91
C21	7	41	44	6	1	3.47	.77
C23	15	67	15	1	0	3.98	.64
C25 (NA)	14	78	5	1	0	4.07	.49
C26	13	77	8	0	0	4.05	.47
C27	8	69	20	2	0	3.84	.59
C28	7	67	22	2	1	3.78	.66
C29	22	72	1	1	3	4.09	.74
C30	22	69	5	1	3	4.05	.77
C32	26	66	5	1	1	4.16	.65
C33 (PD)	10	45	24	13	5	3.43	1.03
C34	13	38	27	15	4	3.42	1.05
C35	17	51	16	11	4	3.65	1.03
C36	14	57	15	8	4	3.70	.96
C37	10	60	19	6	2	3.72	.82
C38	4	28	42	17	6	2.96	.93
C39	2	36	38	16	5	3.15	.90
C40	3	40	35	17	3	3.23	.89

Our survey result further reveals that 71% of the administrators received professional development in using application software. About 65% received professional development in leadership and using computer technology for research purpose, 43% in evaluating hardware, 38% in evaluating software and 50% in developing budgets. Whereas, the 37% administrators admitted about not receiving professional development to integrate computer technology across curriculum into teaching/learning of core subjects and this item has the lowest mean of 2.96. This strongly suggests the lack of administrators' professional development in integrating technology across the curriculum. As educational decision making is becoming complex by using more and more data and options, the school administrators should be equipped with proactive approach and have an expertise in these areas. As is evident from the administrators' responses, there is a need for staff development in the areas of curriculum integration and in the areas of evaluating hardware and software especially in the environment where 71% of the school administrators believe that decision to integrate ICT for teaching and learning should be taken at the school level and not at the level of Ministry of Education as shown in Table 4.

Our analysis of the five subscales summed up the relevancy of the two subscales: curriculum integration and assessment of needs. The professional development subscale was partially relevant. Though the professional development subscale was responded aggressively, as it does not provide much support compared with two others and an inverse relationship was noticed with the ICT usage. This is mainly due to the multidimensional nature of the construct. Five out of eight items asked about the role of the MOE in providing training in Microsoft office. Three items asked questions about administrators' experience in technology integration in teaching and learning process and about particular educational software and hardware. This is in contrast with Trotter, (1997). However, the responses are high for five questions and comparatively very low for the remaining three items that has possibly caused the inverse relationship as indicated by the negative t-value in Table 5. Our results partially support Brockmeier *et al.* (2005) and in line with Kearsely and Lynch, (1992) and Slowinski, (2000).

RECOMMENDATIONS

Based upon the above conclusion, several recommendations can be made: ICT Department of MOE should conduct in-service ICT training sessions and workshops on higher levels of ICT in the classroom as a part of curriculum and design various forums focusing on professional development of the administrators in integrating ICT across school curriculum that will enable the school administrators to become ICT savvy leaders.

As ICT continue to drive changes in education, school policies need to define their organizational vision and actions more clearly in view of planned change (Senge, 2000). The findings from the study found the importance of leadership in developing a commitment to change as leadership plays a key role in ICT integration in education. In fact, for the success of any ICT integration programs, administrators themselves must be competent in the use of the technology and should have a broad understanding of technical curricular and administrative dimensions of ICT use in education. Ministry of Education Department of Schools and Department of ICT must work together and can benchmark several of the international agencies programs such as WorLD Program and British standards in ICT for learning education and training, UNESCO (www.unesco.org), OECD (www.oecd.org) and international society for Technology and Education Standard (www.iste.org/standards.aspx). The World Links for Development (WorLD) program that was started in 1997 has developed training models for policymakers on educational ICT management and is currently active in over twenty countries in South Asia and Africa. Bruneian authorities can learn from the best practices..

,

CONCLUSION

The study has fulfilled its objectives and our findings suggest that significant relationship exists between the school administrators' computer skills and their role of the technology leaders. It was confirmed by the researchers that appropriate ICT leadership has been described as conducive to the meaningful use of ICT learning tools in restructuring the educational system. Several important findings emerged from the study. While many principals recognize a connection between giving teachers the time to master technology and student achievement, they do not provide their staff with release time to accomplish this prime skill. This may be due to the lack of staff, or may be computer teachers are assigned with an additional load of regular teachers. We believe that the sole justification of expensive technology integration in the educational institutions is its competitive advantage into teaching and learning over the traditional methods; thus there is a strong need for professional development for the administrators to facilitate them integrating technology into teaching and learning processes and subsequently this need to be addressed properly by the relevant authorities at the level of the Ministry of Education. It is evident from our

findings that all of the surveyed administrators have computer literacy but majority of them lack training in integrating technology into teaching and learning and on educational software and in the ICT savvy leadership.

The school administrators understand the importance and benefits of the ICT and the majority of them reported that their expertise translated into the impression of being technology leader in the schools. We believe that in today's techno-environments technology leadership in the schools is indispensable. This again needs to be brought up to the authorities of the ICT department at the MOE. Despite its importance, there has been a significant gap in the ICT leadership training for most of the schools administrators that further need to be addressed accordingly by the relevant authorities at MOE level.

The research also confirms that school administrators possess considerable computer expertise and skills (intermediate level) and the majority of them routinely use word processing for managerial and administrative work. However, the use of email to communicate with staff and colleagues is not very promising. Similarly, administrators indicated a need for professional development to use technology for web search, research, develop budgets, create databases and make presentations. In addition, administrators highlighted a need for training to evaluate hardware and software as enhanced skills in these areas are crucial for leaders to further facilitating technology's integration into teaching and learning.

The integration of technology in teaching and learning is still in progress. Investments in infrastructure and in pedagogical approaches are being carried out dynamically. But, in our view, this process can only be geared up with the administrators' vision and expertise as technology leaders as major responsibility of successful learning environments rest on their shoulders and they should make it possible for their teachers in their schools to adopt technology. We believe that administrators' vision and ability to acquire technology expertise and collaborating and facilitating with the teachers will further improve teaching and learning, and attain optimally the promise of technology.

As mentioned earlier, this is the first study of its kind conducted in Brunei Darussalam. More research is needed to classify ICT leadership and to describe the ICT competencies required of educational leaders. Further research endeavors especially on high school principals will further provide the new dimensions on the role of technology savvy leadership.

Endnote

[1] Principal Researcher (on secondment) and Senior Lecturer, Department of Planning, Research and Development, Ministry of Education and Faculty of Business & Computing, Institute of Technology Brunei, Brunei Darussalam.

REFERENCES

Anderson, R. E. & Dexter S. L 2000. "*School Technology Leadership: Incidence and impact"*. Rep. No. 6, Center for Research on Information Technology and Organizations, University of California, Irvine and University of Minnesota.

Anderson, R. E. & Dexter S. L 2005. "School Technology Leadership: An Empirical Investigation of Prevalence Effect" *Administrative Quarterly*, 41(10, 49-82..

Brannigan, N. 2010. "Enhancing Leadership Capacity in ICTs in Education through Technology Enabled Collaboration". *Research Report-CS7035 Pedagogy for Technology Enhanced Learning,* Retrieved from www.gesci.org on 08/10/2010.

Brockmeier, L. L., Sermon, J. M., and Hope, W. C. 2005. "Principals' Relationship with Computer Technology". *National Association of Secondary School Principals. NASSP Bulletin,* June, vol. 89(643), pp. 45-57.

Brunei Darussalam 2003. Brunei Darussalam Public Sector Journey towards e-Government. 12th *ACCSM Main Conference, Bandar Seri Begawan*, 13th-15th October.

Cronbach, L.J. 1951. "Coefficient Alpha and the Internal Consistency of Test". *Psychometrika,* vol. 16, pp. 297-334.

Dhamotharan, M. and Aminatol, N. 2006. "Engaging Learners: Using Interactive Whiteboard in Brunei Darussalam Primary Schools". *In proceeding of Educational Research Association of Singapore Conference.* May, 29-31.

Dhamotharan, M. 2006. "By teachers for teachers: A learning partnership". *In proceedings of Learning Technologies Conference organized by Institute of TAFE, Queensland, Australia.* Nov 8-10th.

Geo, A., Leong, Y. P. 2006. "Teacher Orientation toward ICT in Education". *Electronic Proceedings of National Conference on ICT in Education, Ministry of Education, Brunei.*

Gurr, D. 2000. "School Principals and Information and Communication Technology". Paper presented at the *International Conference 2000, Melbourne, Australia* retrieved from http://technologysource.org/extra/243/document/2/

Hartman, B., and Procter, D. 2003. "Reflections of School District Technology Leader on the Implication of the New Technology for Educational Leadership". *International Electronic Journal for Leadership in Learning*, vol. 7(19), pp. 1-13. (On line available: www.ucalgary.ca/~rej11)

Hayes, D. N. A. 2007. "ICT and Learning: Lessons from Australian Classroom". *Computers & Education*, vol. 49(2), pp. 385-395.

Heng, W. 2006. "The Role of Information Technology in Enhancing Education". *Electronic Proc of National Conference on ICT in Education,* Jan 24-26, 2006.

Herman, J. 1994. Evaluating the Effects of Technology in School Reform. In B. Means (Ed), *Technology and Education Reform: the Reality behind the Promise*, pp.133-168. [San Francisco: Jossey-Bass].

Hj. Derus., Dk. Nazhatul, S, and Hasslinah, S. 2006. "Teacher Perception and Usage of Interactive Whiteboard as Instructional Tools in Brunei Darussalam". *Electronic Proc of National Conference on ICT in Education,* Jan 24-26, 2006.

Hope, W. C., Kelley, B., and Kinard, B. 1999. "Perception of Training Need: Principals' Use of Computer Technology in the School Environment". *In proceeding of Annual Conference of the Society for Information Technology and Teacher Education, San Antonio, TX, USA.*

Hope, W. C., and Brockmeier, L. L. 2002. Principals' Self-report of their Computer Technology Expertise. In F.K. Kochan & C.J. Reed (Eds), *Accountability: Education and Educational Leaders under a Microscope,* pp. 57-64. Auburn AL: Truman University, Pierce Institute.

HSBC 2009. Hong Kong Shanghai Bank Country Report (www.hsbc.org)

Hughes, M., Zachariah, S. 2001. "An Investigation into the Relationship between Effective Administrator Leadership Styles and the Use of Technology". *International Electronic Journal for Leadership in Learning,* vol. 5(1-10).

James, C., & Connolly, U. 2000. *Effective Change in Schools,* [London: Routledge Falmer].

Kearney, G., and McGarr, O. 2009. "The Role of the Teaching Principal in Promoting ICT Use in Small Primary Schools in Ireland". *Technology, Pedagogy and Education,* vol. 18(1), pp. 87-102.

Kearsley, G., & Lynch, W. 1992. "Educational Leadership in the Age of Technology: The New Skills". *Journal of Research on Computing in Education,* vol. 25, pp.50-60.

Kam, B. L. 2007. Identifying Exemplary Uses of ICT in Mathematics Teaching. *Unpublished Master's Thesis,* Universiti Brunei Darussalam.

Kifle, H. 2008. Public Sector Innovation: The Case of e-Government in Brunei. *Unpublished PhD Dissertation,* University of Manchester, UK.

Kifle, H., and Cheng, P. L. K. 2009. "E-Government Implementation and Leadership: The Bruneian Case Study". *Electronic Journal of e-Government*, vol. 7(3), pp. 271-282. (On line available: www.ejeg.com/issue/download.html?idArticle=198)

Kirkland, K., & Sutch, D. 2009. *Overcoming the Barriers to Educational Innovation: A Literature Review*. [Bristol: Futurelab.]

Leong, Y. P. 2006. Some Policy Issues on ICT in Education. In Hjh Zaitun, Hj. Taha, D. Brown, J. Suffolk, O.Chukwu (Eds.), *Studies in Education*, 11, pp. 133-140. [Brunei: Universiti Brunei Darussalam].

Margaret, O'G. 2010. How can Primary School Principals maximize ICT acceptance and Usage in the Sample Schools in accordance with the Department of Education & Science's ICT for Schools Policy? *Unpublished Master's thesis, National University of Ireland, Galway, Ireland.*

Mentz, E., and Mentz, K. 2003. "Managing Technology Integration into Schools-A South African Perspective". *Journal of Educational Administration*, vol. 41(2), pp. 186-200.

Meredyth, D., Russell, N., Blackwood, L., Thomas, J., and Wise, P. 1999. "Real Time: Computers Change and Schooling". *Department of Education, Training and Youth Affairs, Canberra, Australia*. (www.detya.gov.au/publicat.htm)

Moore, D. S., and McCabe, G. P. 2005. Introduction to the Practice of Statistics (5th edition) [USA: W.H. Freeman& Company] ISBN. 0-7167-6282-x.

Norris, D. M., and Dolence, M. G. 1996. "IT Leadership is the Key to Transformation". *CAUSE/EFFECT*, vol.19 (1), pp. 12-20.

Otto, T. L., and Albion, P. R. 2002. "Understanding the Role of School Leaders in Realizing the Potential of ICTs in Education". *Paper Presented at the International Conference of the Association for Advancement of Computer in Education*.

Riffel, J., and Levin, B. 1997. "Schools Coping with the Impact of Information Technology". *Educational Management and Administration,* vol. 21(1), pp. 51-64.

Salleh, S. and Albion, P. 2004. Using the Theory of Planned Behavior to Predict Bruneian Teachers' Intentions to Use ICT in Teaching. In C. Crawford et al. (Eds.), Proceedings of Society for Information Technology and Teacher Education International Conference (pp. 1389-1396). Chesapeake, VA: AACE.

Sandham, J. 2001. "Tech. Training 101: Time, Leadership and Incentive", *Wireless Solution.* Retrieved from www.convergemag.com/magzine/stay.html?id=2530000000002317)

Schiller, J. 1997. The Role of Primary School Leaders in Integrating Information Technology: A Longitudinal Study. In Conners, B. and d'Arbon, T. (Eds), *Change, Challenge and Creative Leadership: International Perspective on Research and Practice,* Hawthorn: Australian Council for Educational Research.

Schiller, J. 2003. "Working with ICT: Perceptions of Australian Principals". *Journal of Educational Administration,* vol. 41(2), 171-185.

Seyal and Rahman, M. N. 2003 "Students' Use of the Internet: An Extension of TAM in Technical and Vocational Institutions in Brunei Darussalam", *Australian Journal of Information Systems*, vol. 10(2), 91-104.

Seyal, A. H. 2006. "A Survey Report on Findings the Impact of ICT in the Teaching and Learning of English, Mathematics, Science and Malay Language in the Government Primary Schools for the Year 2006". *Department of Planning, Development and Research, Ministry of Education, Brunei Darussalam.*

Seyal, A. H. 2007. "A Study of Leadership Styles of School Administrators: A Bruneian Perspective". *Journal of Applied Research in Education*, vol. 11, 11-28.

Sharon, L. L. (2009) *Sampling: Design and Analysis.* [UK: Duxbury], ISBN. 0-534-35361-4

Slowinski, J. 2000. "Becoming a Technologically Savvy Administrator". ERIC Clearing- house on Educational Management, ERIC Digest 135. (Retrieved from http://eric.uoregon.edu/publication/digests/digest135.html)

Tabachnich, B. G and Fidell, L. S. 1996. *Using Multivariate Statistics*, NY: Harper Collins College Publishers.

Tondeur, J., Valcke, M., and VanBraak, J. 2008. "A Multidimensional Approach to Determinants of Computer Use in Primary Education: Teachers and School Characteristics". *Journal of Computer Assisted Learning,* vol. 24(6), pp. 494-506.

Trotter, A. 1997. "A Test of Leadership". *Education Week*, vol. 17(11), pp. 30-33.

TTL SA Academy 2002. "Secondary Technology, Technology for Teaching and Learning" *Academy for School Administrators: What is TTL SA?* , available at: www.sdttl.com/2002/Admin.htm

Wiersma, W. 1995. *Research Methods in Education* (6th edition) [Massachusetts: Needham Height]

Wiseman, C. 1985. Chapter 1. In Ward, J. (1995) (Ed.), *Principles of Information Systems Management*, London: Routledge.

Yee, D. L. 1998. "IT in Educational Leadership: New Zealand Perspective"., available at: www.ucalgary.ca/~dlyee/itenz.html

Yee, D.L. 2000. "Images of School Principals' Informational and Communication Technology Leadership". *Journal of Information Technology for Teacher Education"*, vol. 9(3), pp. 287-302.

Yuen, A.H.K., Law, N., and Wong, K.C. 2003. ICT Implementation and School Leadership: Case Studies of ICT Integration in Teaching and Learning. *Journal of Educational Administration,* vol. 41(2), 158-170.

Zamri, M. Hj. Ismail., and Yong, B. Chui-Seng. 2006. "The Effect of ICT on Students' Achievement in Biology". *In the Proceedings of the Second Annual Conference of Middle East Teachers of Science and Mathematics (METS MaC*). March 14-16th.