A Preliminary Investigation of School Principals' Use of ICT: Evaluating Demographical Factors

AFZAAL H. SEYAL

ABSTRAK

Penyelidikan ini mengkaji pengunaan teknologi informasi dan komunikasi (ICT) tiga puluh lima orang guru besar melalui kesan pembolehubah demografi umpamanya jantina, umur, kelayakan pendidikan, lokasi sekolah (bandar dan luar bandar), pengalaman kepimpinan dan kepakaran dalam bidang komputer. Data yang diperolehi daripada kaji selidik menunjukkan bahawa kebanyakan guru besar mempunyai kepakaran komputer di peringkat yang purata. Walau bagaimanapun, penggunaan ICT secara menyeluruh dalam kurikulum masih pada tahap permulaan lagi. Di samping itu, pembolehubah demografi jantina, umur dan kepakaran komputer menyumbang kepada penggunaan ICT dalam kalangan guru besar dengan ketara. Walau bagaimanapun faktor umur memyumbang kepada perkara negatif terhadap pengunaan ICT. Berdasarkan hasil penyelidikan ini beberapa usul telah dibuat kepada pihak-pihak yang berkuasa di Jabatan ICT, Kementerian Pendidikan.

Kata kunci: Teknologi informasi dan komunikasi, kepimpinan teknologi, sekolah rendah, guru besar

ABSTRACT

The study investigates the thirty-five secondary school principals' use of information and communication technology and the effect of various demographical variables such as gender, age, educational qualifications, location of school (urban or rural) and no of years of leadership experience and computer expertise. The data collected through survey indicates that majority of the school principals posses average computer expertise, however the use of ICT across curriculum is still at infancy stage. In addition, demographical variables gender, age and computer expertise significantly contributing towards the principals' use of the information and communication technologies. However, age is negatively associated with the use of information technology. Based on the results some recommendations are made to the relevant authorities of ICT Department, Ministry of Education.

Keywords: Information and Communication Technology (ICT), technology leadership, primary schools, school principals

INTRODUCTION

The dawn of the new millennium, has brought a radical change in the use of the ICT into the educational institutions. Advancements in technology have opened a new venue of implementing effective instructional strategies in our educational system. Many stakeholders at that point have come to believe that transforming education with the help of technology can make teaching and learning more effective and rewarding (Herman 1994). In addition, efforts are continuously being made to employ ICT-based teaching and learning across the curriculum. These developments have radically changed the traditional educational system and remolded the existing framework of educational practice 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 required by the society. With the pressure being put on schools to integrate their curriculum with the information technology and to

support the teaching and learning process demands emerge for the school leadership to facilitate this process (Mentz & Mentz 2003). It is evident that induction of technology and its proliferation in the schools require a new type of leadership.

The quality of education in the schools therefore strongly relates the effective leadership to the school outcomes (Pelgrum & Anderson 1999). Several investigators of educational technology integration have noted that many of school leaders have little understanding of the relationship between technology fit and school performance and to students' outcome (Slowinski 2000; Sandham 2001). On the other hand, Davis (1996) and Telem (1996) have found a direct relationship between students' achievements and school leadership who are technology-oriented leaders.

As evident from above, most of the studies on the schools' leadership and their use of the ICT have been undertaken in the western world that has very different background to those of developing countries. In the current era of globalization, understanding the adoption of ICT among schools in developing counties is becoming important to improve the process of teaching and learning. The dearth of studies focusing on the issue has created a significant gap in the developing countries of South-east Asia. The present study therefore designed to address the gap in the technology integration and school leadership by investigating to the extent as how the Bruneian schools' principals utilize the ICT and to understand what demographical factors are significant determinants of the ICT usage.

BRUNEI TECHNOLOGY INFRASTRUCTURE AND E-EDUCATION INITIATIVES

Brunei Darussalam (henceforth referred to simply as Brunei) is a small sultanate of 330,700 people situated on the northwest coast of the Borneo Island divided into two areas that are separated by part of Malaysian state of Sarawak. Its main economic activity is dominated by oil and gas sectors. Brunei is presently the 14th largest oil producer in the world and 4th largest natural gas producer. The country's gross domestic product per capita was US$13,875 in 2003 (Brunei Statistical Year Book 2006). 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. The government, in its eighth development plan (2001-2006) has conceived an IT vision and has taken a range of measures to improve the IT infrastructure and the Internet environment in the country. The government, with the setting up of Brunei Information Technology (BIT) Council, is determined to provide the basic telecommunication infrastructure in line with other regional economies such as Singapore, Malaysia and Indonesia. Brunei has a very impressive telecommunication infrastructure (RaGAM-21). The "RaGAM-21" is in fact, a broadband network. The core of this includes a high speed switching ATM-based network that is expected to deliver a range of multimedia services and applications (Telecommunication & Information Group 2001). It is important for the nation to digitally link various IT hubs across the country and across the region via communication satellite. One of the projects-the digital library project aims to build linkages with other regional educational institutions and to provide access to the ASEAN School net program.

In line with the other ASEAN countries in meeting the global challenges, Brunei Darussalam has launched the ICT initiatives under the umbrella of e-Government to ensure her economy to successfully handle technological developments. One of the biggest challenges in integrating the ICT into the school curriculum has been: how to enable future work force to be able to deal effectively with any technological change?

Thus integration of the ICT into teaching and learning across the curriculum in the schools across the Negara Brunei Darussalam has been highlighted as a major national challenge. This challenge has been properly addressed in the context of economic well-being of the country. To properly implement the ICT in the schools, the Ministry of Education launched Project ICT in 1999 with an approved budget of B$2.5 million to select fifty government primary schools in phase 1 and continued in phase 2 in 2002 with additional budget of B$11.3 million. In 2003, the project "Integrating ICT across School Curriculum" was implemented (Wei 2001). This background, has led us to conduct this pioneering research early

this year 2008. The results of the study would not only add to the existing knowledge but also be presented to the Ministry of Education Brunei for planning purpose.

REVIEW OF PRIOR STUDIES

SCHOOL LEADERSHIP AND ICT IMPLEMENTATION

While studies indicate that proper and appropriate use of technology to support instruction has improved students' academic gains across the curriculum, research exists that identifies factors within school structure and promote higher student achievements (Bulach 1994). However, there are several barriers to technology integration as pointed by Bailey et al. (1995). They have identified ten major barriers and among them are: failure to develop a shared vision of how technology should be used to improve teaching and learning, the failure to design and implement effective technology, staff development program and failure to empower teachers and students to engage in risk-taking and experimentation with new technologies are among the most common ones. The most of these barriers can be overcome by the effective school leaders in developing a relationship between them as school leaders and integration of technology would bring harmony in developing and implementing ICT-based strategies to make schools more productive.

The study of technology integration in the schools started around in 1980s (Wiseman 1985). The number of studies that were conducted in Hong Kong (Yuen et al. 2003), South Africa (Mentz & Mentz 2003) and in Australia (Schiller 1997, 2003) has identified the success of ICT implementation with their school leadership. Cafolla and Knee (1995) stated that success or failure of technology integration could be linked to the behaviors and ideologies of the instructional leaders. They surveyed the educators in the UK and noticed that 81% indicated that 'more commitment' by leaders was important compared with 38% who felt as strongly about more hardware and software. Hughes and Zachariah (2001) surveyed Ohio public schools in USA and studied the relationship between administrators' leadership style and implementation of new technological program. They concluded

that for technology to be successfully employed as an instructional tool in the classroom, teachers must be willing and able to construct pedagogically approaches and meaningful implementation strategies and emphasizes on the leaders of educational communities to align these changes in meaningful productive direction for the future.

Yuen et al. (2003) have studied the role of the school leadership based upon theory of transformational leadership and its relationship in developing ICT leadership in Hong Kong primary schools and found that pedagogical practices using ICT in teaching and learning across the school curriculum is strongly dependent on school leaders' vision and understanding of the role and impact of ICT in the curriculum. The TTL Academy of School Administrators at the University of South Dakota states that education in the information age requires that school leadership not only update their skills and knowledge but they also work towards the transformation of their roles as educational leaders (TTL, SA 2002). 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 (1998) proposed that the organizational challenges, opportunities, responsibilities and leadership are crucial to the successful ICT implementation in schools, and the schools leaders are leaders of change, supporters of teacher developments and modelers of ICT use. Hartman and Procter (2003) have concluded that effective technology integration requires a new approach to leadership and further requires the integration of leadership at each and every level of the schools to attain the objectives of the educational institutions. They believe that effective leadership is essential for the successful integration of new technologies in the schools, school district, and provincial or national system of education. Anderson and Dexter (2005) confirm from their survey data that although technology infrastructure is important but technology leadership is even more necessary for effective utilization of technology in the schools.

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 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?"

We finally agree with Yuen et al. (2003) that successful implementation of change ICT is not about equipment or software but influencing and empowering teachers; and it is also about acquiring computer skills but supporting teachers in ongoing engagement with students in their learning for which leadership and their technological expertise is crucial for success.

ROLE OF DEMOGRAPHICAL VARIABLES ON THE LEADERSHIP

Researchers have focused on the impact of demographics in the formation of particular leadership style (Sass 1989; Fears 2004; Hayward 2005). Demographic characteristics of leader include gender, age, educational qualifications and that are likely to influence teachers' leadership perception when the recognition based processes are used (Leithwood et al. 1999).

Socio-demographic factors in general and gender in particular influence perceived leadership style. Sergiovanni (1991) asked "were senior staff more committed than ordinary teachers in schools?" or "did principals having higher academic qualifications create any difference in perceived leadership" or school size has an impact on leadership dimension. Stumpf (2003) in his study tested the relationship of perceived leadership style of North Carolina County's directors and found a relationship of age, gender and no of years employed with the transformational leadership style and finally concluded that professionals were shown to be less satisfied in their current position if they perceived their county's directors to be of transactional leaders. In his research Eppal (2004) studied the leadership style and organizational culture and tested the relationship of demographics with their leadership style. Multi Leadership Questionnaire (MLQ) type transformational leadership style was positively correlated with

education and is higher in female employees. He suggests that gender status alone may not predict a particular leadership style; it may be more likely that along with leadership style particular organizational culture plays a significant role.

The research on educational leadership shows the mixed results of the impact of demographic variable gender on the particular leadership style. The researchers believe that gender like heredity and environments may influence traits and therefore we might expect difference in the leadership style of men and women leaders. Women tend to be more relation-oriented leader and exhibit cooperative and empowering style that include nurturing team members. Shakeshaft (1987) argued about the gender issue in educational administration and to know if male and female principals were different in term of various dimension of leadership. Rosener (1990) pointed out that women tend towards a transformational style and are less likely to practice management by exception, however, both male and female appear to use contingent recognition with equal frequency. Groves (2005) asserted that female leaders scored higher on social and emotional skill and found a relationship between gender and charismatic leadership style. Bass et al. (1996) found that men are more likely to display transactional leadership than women. While women tend to perform transformational leadership behavior particularly individualized consideration more often than men. Heckman et al. (1992) studied the leadership and gender and result showed a strong positive relationship between femininity and transformational leadership particularly charisma and individualized consideration. Groves (2005) further speculated that individualized consideration and charisma could be classified as interpersonal characteristics that match the feminine stereotypes. On the other hand, Bass (1990) and Holland (2003) find no consistent pattern on gender difference in leadership.

Schiller (2003) concluded enormous variation between principals regardless of age, gender, school size, experience as school principal and prior experience and skill in ICT.

Previous studies provide further evidence and justification of the principals' ICT knowledge and skill deemed crucial for technological leadership (Trotter 1997; Hope et al. 1999; Flanagan &

Jacobson 2003; Hope & Brockmeier 2002). In this concern it is strongly believed that successful leaders not only challenge the existing educational process and inspire a vision for meaningful change but also provide the necessary support and modeling strategies to enable teachers to become part of learning community. The review of literature therefore provides a contextual justification to examine the school leadership role of ICT implementation within the South Asian perspective focusing on Bruneian secondary schools' principals.

METHODOLOGY

DESIGN OF INSTRUMENT

In line with the objective of the study, the ICT survey instrument developed by Hope et al. (1999) was selected to conduct the research. The questionnaire 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. Appendix 1 provides the details of the items used along with their descriptive statistics. Part B of the questionnaire captures the data about the demographic profile covering organizational characteristics, such as, age, gender, number of years of experience as principal, educational qualification, school's location (urban or rural), and prior computer expertise (experience and skill).

INSTRUMENT RELIABILITY AND VALIDITY

Several techniques were used to assess the reliability Cronbach's (1951) coefficient (α) and to assess face, construct and convergent 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 the questionnaire. Very few comments were received and some minor changes were done to enhance the clarity. Table 2 shows the reliability coefficients and convergent validity for the various constructs.

TABLE 1. Pearson Correlations and AVE Table for Discriminant Validity

	CI	PER	AE	NA	PD
Curriculum Integration (CI)	**0.80**				
Perception (PER)	.615	**0.60**			
Acquired Expertise (AE)	.450	.518	**0.53**		
Needs Assessment (NA)	.449	.478	.447	**0.56**	
Professional Development (PD)	.239	.438	.314	.272	**0.54**
Use of ICT	.706	.803	.749	.681	.700

All correlations are significant at the 0.01 level (2-tailed) Diagonal represents average variance extracted in bold

In general, validity refers to the degree to which instrument truly measures the constructs for what it is intended to measure. There are several types of validity measures that include the face validity and constructs validity. Campbell and Fiske (1959) propose two types of validity: convergent and discriminating validity. Convergent validity is measured by average variance extracted for each construct during the reliability analysis that should be 0.5 or 50% or better (Igbaria and Iivari, 1995). Table 2 and 3 show the reliability values for the various constructs with variance extracted in diagonal. Cronbach's alpha for the constructs ranged from 0.76 to 0.92 indicating a sufficient level of reliability and convergent validity of all five constructs. After purifying data by trimming off the items in the reliability analysis and to further analyze for convergent and discriminating validity of these five constructs, principal component method with varimax rotation was used to assess the variance explained. Testing discriminant validity require checking the cross loading of items on multiple factors. All items loaded highly on their associated constructs but not with other factor loadings thus fulfilling the Hair et al. (1979) criteria for adequate discriminant validity. In general results show that both validities are satisfied. The result for discriminant validity is provided in Table 2, however, results for factor analysis are not provided in order to avoid unnecessary length.

DATA COLLECTION

The questionnaire was emailed to the principals of all government secondary schools across the country with a covering letter addressing the nature of the survey. The respondents were advised to

TABLE 2. Reliability & Validity Analysis

Constructs	No of original items	No of items retained	Alpha value (.60 and above)	Mean	Variance explained >.50
Curriculum Integration	9	4	.76	4.03	.80
Perception	8	7	.76	3.87	.60
Acquired Expertise	7	4	.81	3.79	.53
Need Assessment	8	7	.85	4.00	.56
Professional Development	8	8	.92	3.45	.54
Total	40	30			

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

return the filled-in questionnaire to the research section through email or through fax. In the first phase, only 20 questionnaires were returned with in the due date of ten days. Then again a follow-up letter was faxed to all the remaining schools to improve the response rate to 67%. Final attempt with personal telephone calls increased the response rate to 92% with 31 valid questionnaires that were retained to draw logical conclusions and to further avoiding the response-biasness.

FINDINGS & ANALYSIS

Thirty-one questionnaires received were analyzed using SPSS version 13 for descriptive analysis, correlation and multiple regression analysis to assess the school principals' usage of ICT. Table 3 describes the demographics as well other organizational characteristics of respondents.

The respondents were asked to assess their responses on all forty-five items pertaining to

TABLE 3. Demographical and Organizational Characteristics of the Respondents

Gender	Type	%
	Male	45
	Female	55
Age	25-30 years	2
	31-36	9
	37-42	15
	43-48	35
	49-54	40
Experience as School Leaders	1-3 years	40
	4-6	25
	7-10	15
	11-14	10
	15 or more	10
School Location	Urban (Brunei-Muara)	50
	Rural 1	15
	Rural 11	10
	Rural 111	10
	Rural IV	10
Educational Level	Certificate in Education (CE)	3
	CE and First degree	27
	First degree	40
	Masters degree	31
Computer Expertise	Novice	15
	Intermediate	75
	Advanced	10
	Expert	0
Does your school have Web site?	Yes	75
	No	25
Do you believe decision to integrate ICT for teaching/learning should be taken at?	At School Level	85
	At MOE Level	15
Do you have the following Information Systems at schools?	Student Information System	45
	Student Examination System	19
	Administrative Support System	17

the various leadership attributes on five point Likert scale; 1- strongly disagree to 5-for strongly agreed. However for calculating the overall ICT usage, mean of all five constructs was taken and after the analysis it was found that 96% of the respondents have high mean score of 3.82 on the use of the ICT. It reinforces Seyal's (2006) findings that 70% of the schools principals 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 leadership constructs and are shown in Table 1. The correlation provides directional support for the predicted relationship and shows that collinearity among all the independent variables is moderate so as not to affect the regression analysis. Tabachnich and Fidell (1996) point out that problem of "multicollinearity" occurs at much higher correlation of 0.90 or higher between the independent variables. The Pearson Correlation Coefficient between the ICT usage and other five constructs range from .23 to .70 and do not pose any threat to collinearity.

TABLE 4. Hierarchical Regression Analysis of Antecedent Variables and ICT Use

Variables	Beta	t-statistic	p-value
Gender	.229	2 .22	.041*
Experience as School Leader	.159	1.48	.825
Age	-.289	-2 .46	.048*
School Location	-.188	-1.35	.179
Educational Level	-.074	-.631	.530
Computer Expertise	.277	2.67	.049*

$R2 = 18\%$. Dependent variable: Use of the ICT

Prior to the regression analysis data were screened for outlier. Cases with standard deviation greater than 2 and with missing values were removed. The result of the hierarchical regression analysis is provided in Table 4. It is evident from the table data that gender, age and computer expertise are significantly contributing toward the ICT usage however, age is negatively related to the ICT usage. The regression analysis presents a low parsimony of the model as indicated by the R^2 value. That

explain that only 18% of the variance is explained by these three demographical variables gender, age and computer expertise. Although it threats model parsimony, however, this is not unexpected as various Brunei-based studies have reported to share a low variance by the demographical variables (Seyal 2006, 2007). The significance of variable gender supports prior studies of Bolman and Deal (1992) also Reed and Beekley (1997) that women leaders are more symbolic and attentive in their relationship with their subordinates than their male counterparts.

DISCUSSION

The purpose of the present two-fold study is (1) to assess the secondary school principals' use of ICT toward teaching and learning and (2) to find out the role of various contextual variables in determining the ICT usage. To fulfill the first objective, we measured the ICT usage through five different subscales that was further categorized into: Curriculum integration, perception, acquired expertise, need assessment and professional development. The overall mean of the ICT usage 3.82 indicates that Bruneian secondary school principals not only have the right perception about the technology integration but has also started applying the technology integration into the curriculum. It is evident from the analysis that the subscale curriculum integration positively contributes towards 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 Appendix. The Table shows the percentage of principals' responding "agree" to "strongly agree" to each item of computer usage scale. 79% of the principals facilitate curriculum integration of computer technology into teaching and learning process and consider this as 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 principals agreed to provide teachers release time to evaluate software appropriateness for integration into the curriculum. Again, only 28% principals 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 under utilized and will affect their effectiveness. Results further show that more than half of the principals are unwilling to give over this important issue solely to the teachers.

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

Professional development is considered as key area to enhance the users' performance on the diffusion of technology and to the achievement of organizational goals. 92% of the principals responded strongly that they need sound professional development programs in assessing computer technology's influence on the student achievement. 92% responded using computer technology to collect and analyze data, and 80% responded using computer technology in their work as administrator. 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 principals misunderstood the term "organizational change".

Comparatively, 70% of the principals responded for professional development in understanding the ethical issues and 69% need professional development in understanding legal matters related to software licensing, copyright and patent issues. This might be due to lack of knowledge of the administrators in these areas.

Our survey result further reveals that 71% of the principals received professional development in using application software. About 65% received professional development in leadership and using computer technology for research purpose. Unfortunately 40% of the principals responded unfavorably about receiving professional development in integrating computer technology across curriculum into teaching/learning of core subjects and has the lowest mean of 3.10. This finding supports to some extent Brockmeier et al. (2005) work in USA where 50% of the principals responded negatively to participating in professional development that demonstrated how to integrate computer technology into the curriculum. As educational decision making is becoming complex by using more and more data and options, the school leaderships should be equipped with proactive approach and to have an expertise in these areas. As is evident from the 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 principals believe that decision to integrate ICT for teaching and learning should be taken at the school level and not at the level of the Ministry of Education.

In order to fulfill the second object as to test the relationship of demographical variables of the school principals' use of ICT, the data was analyzed through hierarchical regression analysis to establish the significant factors. Gender, age and prior computer experience are significant determinant of ICT usage among the secondary school principals. However, age is negatively related to the ICT usage. This might be due to the facts that principals who are around and above fifty years of age failed to establish a link of the technology integration across curriculum. The result further supports Schiller (2003) who found a statistical difference in the age of the principals

and their use of computer technology. The use of computer technology is higher among principals below the age of 50.

Gender is a significant variable as most of the females principals either are using the ICT or have favorable disposition towards ICT integration across curriculum. The results support the previous studies of Seyal (2007) on the school leadership style of Bruneian primary schools' headmasters/headmistresses that most females are practicing transformational type of leadership. The results further support Rosener (1990) assertion of more females supporting ICT in teaching and learning. The variable gender was also reported to be significant as more female principals are using ICT as compared to their male counterparts (Schiller 2003). The prior work of Silins (1992), Howell and Hall (1999), Jung and Avolio (2000) are also supported.

Finally the prior computer experience shows a significant relationship with the principals 'use of the ICT and also support the previous work of Silins (1992), and Schiller (2003).

CONCLUSION

The study has fulfilled its objectives and overall findings from this study confirm that significant relationship exists between the school principals' gender, age and computer skills and their role of the technology leaders. More female principals comparatively younger in age and with prior computing skills and experience could further make a difference in school leadership in becoming the technology savvy 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 restructured educational system (Norris & Dolence 1996).

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 lack of the staff, or may be computer teachers are assigned with an additional load of regular teachers. As the major task of the technology integration into teaching and

learning is the heart of technology's promise, thus there is a strong need for professional development to facilitate integration of 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.

The school leaderships understand the relevant importance of ICT and majority (60%) of them has reported that their expertise translated into the impression of being technology leader in the school. 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 school principals (Kearsley & Lynch 1992).

The research also confirms that school principals 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, principals indicated a need for professional development to use technology for web search, research, develop budgets, create databases and make presentations. In addition, principals 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 promise of integrating technology in teaching and learning is still in progress. This can only be geared up with the leaders' vision and expertise as technology leaders' major responsibility of successful learning environments rest on their shoulders. They should make it possible for their teachers in their schools to adopt technology. We believe that principals' vision and ability to acquire technology expertise and collaborating and facilitating with the teachers will further geared up the task of attaining the promise of technology.

As mentioned earlier, this is the first study of its kind conducted in Negara Brunei Darussalam. More research is needed to classify ICT leadership and to describe the ICT competencies required of educational leaders.

REFERENCES

Anderson, R.E., Dexter, S. 2005. School Technology Leadership: An Empirical Investigation of Prevalence and Effect. *Educational Administration Quarterly* 41(1): 49-82.

Bailey, Ross & Graffin. 1995. Barrier to Curriculum-technology Integration in Education: Are you Asking the Right Question?. *Catalyst for Change* 25(1): 16.

Bass, B.M. 1990. From transactional to transformational leadership: learning to share the vision. *Organizational Dynamics* 18(3): 19-31.

Bass, B.M., Avolio, B.J. & Atwater, L. 1996. The Transformational and Transactional Leadership of Men and Women. *International Review of Applied Psychology* 45: 5-34.

Bolman, L.G. & Deal, T.E. 1992. Leading and managing: Effects of context, culture, and gender. *Educational Administration Quarterly* 28(3): 314-329.

Brockmeier, L.L., Sermon, J.M. & Hope, W.C. 2005. Principals' relationship with computer technology. *National Association of Secondary School Principals. NASSP Bulletin* June 89(643): 45-57.

Brunei Statistical Year Book. 2006. Department of Economic Planning, Brunei Darussalam.

Bulach, C. 1994. *The Influence of the Principal's Leadership Style on School Climate and Student Achievement*. West Georgia State University (ERIC Document Reproduction Service No ED374506).

Cafolla, R. & Knee, R. 1995. *Factors Limiting Technology Integration in Education: The Leadership Gap*. Online available: www.coe.uk.edu/insite/elec_pub/html1995/152.html.

Campbell, D.J. & Fiske, D.W. 1959 Convergent and discriminant validities by the multitrait, multimethod matrix. *Psychological Bulletin* 56: 81-105.

Cronbach, L.J. 1951. Coefficient alpha and the internal consistency of test. *Psychometrika* 16: 297-334.

Davis, B. 1996. Re-engineering school leadership. *International Journal of Educational Management* 10(2): 11-16.

Eppal, R.G. 2004. Leadership style and organizational Culture. Unpublished PhD. http://scholar.lib.vt.edu/theses/available/etd-02182004-165946/unrestricted/DissertationFinalDoc.pdf.

Fears, A.A. 2004. A Study of School-based Leadership and School Improvement Process for Elementary Schools that have Demonstrated High and Low Student Achievement. Unpublished PhD dissertation, Union Institute and University Graduate School.

Flanagan, L. & Jacobson, M. 2003. Technology leadership for the 21st century principal. *Journal of Educational Administration* 41(2): 124-142.

Groves, K.S. 2005. Gender difference in social, emotional skill and charismatic leadership. *Journal of Leadership and Organizational Studies* 11(3): 30-46.

Hackman, M.Z., Furniss, A.H., Hills, M.J. & Paterson, T.J. (1992). Perceptions of Gender Role Characteristics and Transformational and Transactional Leadership Behavior, *Perceptual and Motor Skills* 75: 311-319.

Hair, J.F., Anderson, R.E., Tatham, R.L. & Black, W.C. 1998. *Multivariate Data Analysis with Readings*. NJ: Prentice-Hall.

Hartman, B. & Procter, D. 2003. Reflections of school district technology leaders on the Implication of the new technologies for educational leadership. *International Electronic Journal for Leadership in Learning,* 7(19) [Online available: http://www.ucalgary.ca/~iejll/volume7/hartman.html.

Hayward, B.A. 2005. Relationship between Employee Performance, Leadership and Emotional Intelligence in a South African Parastatal Organization. (Unpublished Masters Dissertation) http://eprints.ru.ac.za/302/01/BA_Hayward-M.comm.pdf

Herman, J. 1994. Evaluating the effects of technology in school reform. In *Technology and Education Reform: the Reality behind the Promise*, edited by Means, B. San Francisco: Jossey-Bass.

Holland, L.J. 2003. Comparison by Gender of School Board Presidents' Perception of Leader Practices Relating to Superintendent in Selected School Districts in Texas. Doctoral Dissertation, Texas A & M University, Kingsville, Texas, USA.

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

Howell, J. & Hall, M.K. 1999. The ties that bind: the impact of leader-member exchange, transformational and transactional leadership, and distance on predicting follower performance. *Journal of Applied Psychology* 84(5): 680-694.

Hughes, M. & Zachariah, S. 2001. *An Investigation into the Relationship between Effective Administrative Leadership Style and the Use of Technology* 5(5). [Online available: http://www.ucalgary.ca/~iejll/volume5/hughes.html].

Igbaria, M. & Iivari, J. 1995. Why do individuals use computer technology: A finnish case study?. *Information & Management* 5: 227-238.

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

Jung, D. & Avolio, B.J. 2000. Transformational and transactional leadership and their effects on creativity in groups. *Creativity Research Journal* 13(2): 185-195.

Kearsley, G. & Lynch, W. 1992. Educational leadership in the age of technology: The new skills. *Journal of Research on Computing in Education* 25: 50-60.

Leithwood, K., Jantzi, D. & Steinbach, R. 1999. *Changing Leadership for Changing Times*. London: Open University Press.

Mentz, E. & Mentz, K. 2003. Managing technology integration into schools-A South African perspective. *Journal of Educational Administration* 41(2): 186-200.

Norris, D.M. & Dolence, M.G. 1996. IT leadership is the key to transformation. *CAUSE/EFFECT* 19(1): 12-20.

Pelgrum, W.J. & Anderson, R.E. 1999. ICT and the emerging paradigm for life long learning: A worldwide educational assessment of infrastructure, goals and practices. *International Association for the Evaluation of Educational Achievement.* Amsterdam.

Reed, P., Smith, M. & Beekley, C. 1997. An Investigation of Principal's Leadership Orientation. Paper presented at the meeting of the American Educational Research Association, Chicago, Illinois. (ERIC Document Reproduction Service No: ED 411607).

Rosener, J.B. 1990. Ways women lead. *Harvard Business Review* Nov-Dec: 119-225.

Sandham, J. 2001. *Tech.training 101: Time, Leadership and Incentive. Wireless Solution*. www.convergemag.com/magazine/story.phtml?id=253000000000231.

Sass, M.W. 1989 *The AASA Performance Goal and Skill Area's Importance to Effective Superintendence Performance as Viewed by Professors of Educational Administration and Practicing Superintendents. Dissertation Abstract International* 50(9): 2742 University Microfilm AA19506452.

Schiller, J. 1997. The Role of primary school leaders in integrating information technology: A longitudinal study. In *Change, Challenge and Creative Leadership: International Perspective on Research and Practice,* edited by Conners, B. & d'Arbon, T. Hawthorn: Australian Council for Educational Research.

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

Sergiovanni, T.J. 1991. *The Principal Ship: A Reflective Practice Perspective.* 2nd Ed. NY: Simon and Schuster, Inc.

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. Leadership Styles of Bruneian Primary Schools Administrators: Empirical Evidence. *In the Proceedings of International Conference in Education* (ICE07), Universiti Brunei Darussalam, May 21st -23rd.

Shakeshaft, C. 1987 *Women in Education Administration.* CA, Newbury Park: Sage Publications.

Silins, H.C. 1992. Leadership for School Reform: A Test of Transformational and Transactional Model. Unpublished PhD, University of Maryland, College Park, Maryland USA.

Slowinski, J. 2000. Becoming a technologically savvy administrator. *Teacher Librarian* 30(5): 25-29.

Stumpf, M.N. 2003. The Relationship of Perceived Leadership Styles of North Carolina County Extension Directors' Job Satisfaction of County Extension Professionals. Unpublished PhD, Graduate Faculty of North Carolina State University.

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

Telecommunication & Information Group. 2001. Ministry of Communications Report, Brunei Darussalam.

Telem, M. 1996. MIS implementation in school: A systems, socio-technical framework. *Computer Education.* 27(2): 85-93.

Trotter, A. 1997. A Test of Leadership. *Education Week* 17(11): 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.html.

Wei, F.H.M. 2001. *Master Plan-Project ICT for Government Primary and Secondary Education*. Planning Section, Department of Planning, Development and Research, Ministry of Education Brunei Darussalam.

Wiseman, C. 1985. Chapter 1. In *Principles of Information Systems Management*, edited by Ward, J. London: Routledge.

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

Yuen, A.H.K., Law, N. & Wong, K.C. 2003. ICT implementation and school leadership: case studies of ICT integration in teaching and learning. *Journal of Educational Administration* 41(2): 158-170.

Afzaal H. Seyal
Institut Teknologi Brunei
Jalan Tungku Link
Gadong, BE 1410, Brunei Darussalam

Correspondent Author: afzaal.seyal@itb.edu.bn

APPENDIX 1

Showing Percentage of Administrators' Response to each item in ICT Usage Scale

Items	Percentage Above Average Responses	Mean	Std. Dev
Curriculum Integration			
Facilitating computer technology integration into the teaching/learning process is one of my important instructional tasks	79	3.98	.54
I encourage teacher collaboration in using computer technology for teaching and learning	69	4.17	.64
I encourage teachers' use of computer technology to meet learners' individual needs	66	4.03	.75
I ensure equity of access to computer technology resources	70	3.96	.58
Perception			
Computer technology generally provides a more efficient way to complete tasks than using paper and pencil	79	3.82	.78
Headmasters'/principals' professional development to use computer technology has been a focus of the district's efforts/MOE to infuse computer technology into schools	88	3.92	.74
Computer technology can improve student academic achievement	91	4.03	.45
My computer technology expertise contributes to me being viewed as a technology leader in the school	60	3.64	.78
I am capable of evaluating computer technology that can be used to support instruction	52	3.46	.75
The Technology Standards for School Administrators or guidelines prepared by MOE can assist me to facilitate computer technology integration into instruction	78	3.82	.53
My ability to use computer technology improves my managerial/administrative performance	90	4.02	.73
Acquired Expertise			
I routinely use a word-processing program to compose correspondence (memos & letters)	92	4.17	.76
I use the Internet other than email to search various Web sites for educational purposes	60	3.57	.91
I use computer technology on a regular basis to create databases	48	3.47	.77
I use computer technology on a regular basis to make presentations	82	3.98	.64
Needs Assessment			
I would benefit from experiences that assist me to assess computer technology's influence on student achievement	92	4.07	.49
I would benefit from professional development experiences that inform me on how to integrate computer technology into the curriculum	90	4.05	.47
I would benefit from professional development experiences that promote my understanding of legal issues (patents, copy right) related to software licensing	77	3.84	.59
I would benefit from professional development experiences that promote my understanding of ethical issues related (right of privacy, unethical use of the Internet) to computer technology	74	3.78	.66
I would like to participate in more professional development experiences to learn how to apply computer technology to my work as a headmaster/principal	94	4.09	.74
I would like to participate in professional development experiences to learn about protecting students from inappropriate materials available on the Internet	91	4.05	.77
I would like to participate in professional development experiences that assist me to use computer technology to collect and analyze data	92	4.16	.65
Professional Development			
The Department of schools at MOE has offered training for headmasters/principals on the use of computer technology to develop budgets	55	3.43	1.03
The Department of ICT has offered training for headmasters/principals on the use of computer technology to create databases	51	3.42	1.05
The Department of ICT has provided professional development experiences for the headmasters/principals in using the Internet for research purpose	68	3.65	1.03
The Department of ICT has provided professional development for the headmasters/principals in using applications such as spreadsheets, presentation, e-mail, and word processing	71	3.70	.96
The In-service training department, MOE has provided professional development for the headmasters/principals for the leadership skills	70	3.72	.82
I have participated in training designed to develop skills to facilitate teachers' integration of computer technology into the curriculum	38	3.10	.93
I have experienced professional development that assists me in evaluating software applications to be used in the teaching/learning process	38	3.15	.90
I have experienced professional development that assists me in evaluating computer technology hardware to be used in the teaching/learning process	43	3.23	.89