

The Level of Technology Leadership among Secondary School Leaders in Kelantan

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Abstract: In the 21st century, technology leadership is a leadership style that supports ICT integration in schools. This study was conducted to identify the level of technology leadership among secondary school leaders in Kelantan. A total of 270 respondents had been involved and they comprised of Senior Assistant, Head of Division, Committee Chair and Secretary of key unit at school. The research instrument used to study technology leadership was a five-dimensional NETS-A framework 2009. The instrument was in English and had been translated into Bahasa Malaysia. All data and details collected were analyzed using Statistical Packages for the Social Sciences (SPSS) version 21.0. Data analysis was carried out using Descriptive Mean Test, t-Test and ANOVA Test. The findings showed that overall technology leadership practices are at moderate high levels. However, the dimension of visionary leadership has demonstrated higher technology leadership practices than the other four dimensions namely the digital age learning culture; the excellence in professional practice; the whole improvement and the digital citizenship. This study also examined the different levels of leadership from respondents' demographic perspectives. In terms of gender, there is a difference in the level of technology leadership based on male and female leaders. While in terms of age and experience, the findings show that there is no difference in the level of technology leadership practices among leaders in secondary schools in Kelantan. This study suggests that school leaders practice technology leadership as a leadership style to ensure that digital learning culture can be enhanced in every educational institution in Malaysia.

Keywords: School leaders, Technology leadership, Visionary leadership

Introduction

The development of information and communication technology in education has long been introduced in developed countries. Malaysia also enjoys information flow and transformation of information and communication technology or better known as ICT in education. To cope with this transformation especially in schools, the role played by school leaders is very important as they are the pillar of school excellence. Therefore, schools need highly skilled and competent school leaders to assist principals in the succession of the school leadership to ensure the development of information and communication technology takes place in the schools as desired by the country.

At international level, the concept of technology leadership has received considerable emphasis, as demonstrated by researchers Anderson & Dexter (2005). Technology leadership is defined as a leader's ethical practice in facilitating learning and improving school performance through the creation, use and management of technology resources and processes involving appropriate technology (Mwawasi, 2014). Technology leadership also refers to the ability and influence of leaders to develop the potential and capacity of organizational members, teachers and students as they evolve through the production of innovations that can enhance school excellence and effectiveness (Moktar, 2011). Technology leadership is a combination of strategies and techniques that are common to leadership but requires particular attention to technology, especially in relation to access to equipment, technological updates and sensitivity to professional development (Juraim, F., & Hamzah, M. I. M., 2017).

In this regard, the Ministry of Education has implemented government agendas such as the Education Development Master Plan (PIPP), the Government Transformation Plan (GTP) and the latest Malaysian Education Blueprint 2013-2025 (PPPM) which outlines eleven shifts, especially the fifth shift, to ensure high-quality leadership in each school and its seventh shift is to utilize information and communication technology (ICT) to improve the quality of learning. This is because in today's fast-paced world, school leaders need to equip themselves with the latest skills as the information technology explodes to higher realm.

The Ministry of Education is working hard to ensure that every school has high quality leaders and supportive leaders who can help improve school performance. Good leadership is essential in ensuring student success. The most effective school leader is not only a manager, but also an instructional leader who can change

his or her school environment. Based on current needs, one of the key features of leadership is technology leadership (PPPM Report, 2016).

School leaders in this study refer to middle leaders consisting of senior assistants, senior teachers, heads of curriculum committees for the six core subjects of Sijil Pelajaran Malaysia (SPM), secretaries for curriculum units, co-curriculum and student affairs. The teachers who play the most important role in each unit are the personnel assigned to assist principals in managing their units. These are also potential leaders who will replace school principals and leaders who will leave the education world. How far have these school leaders reached the level of technology leadership that is a demand to meet today's challenges? This is a great responsibility in preparing leaders who are responsible and competent in every aspect.

School leaders need to act as technology leaders in facing a variety of complex responsibilities to ensure that technology is available and safe to be used by schoolchildren and teachers in order to improve the quality of teaching and learning. Therefore, leaders need to be involved in the use of technology so that they can master 21st century technology and encourage the use of it among teachers and staff. Leaders need to be aware of the demands to provide more engaging and collaborative technologies for everybody in the school (Allen, 2011, Black, 2011; Gosmire & Grady, 2007; Prensky, 2010).

Background

Anderson and Dexter (2005) emphasize that leadership of school leaders is a factor that influences school effectiveness in technology. Chang (2005) insists that the role of technology leadership lies in defining the relationship of technology with the school vision and mission which acts as the basis of education. Therefore, school leaders should understand the importance of ICT integration and provide a conducive learning environment for students. In fact, top leaders should delegate power to other leaders so as to encourage the use of technology among school leaders and to collaborate with experts and external organizations in their quest to gain support in a networking process. All school leaders should play the role of technology leaders in an effort to build an innovative learning culture.

School leaders play an integral role as technology leaders (Anderson & Dexter 2005; Dikkers, Hughes & McLeod 2005; Fletcher, 2009; Gerard, Bowyer & Linn 2008; ISTE 2007; McLeod 2008; Slenning 2000). Therefore, they have to comply with every dimension and item outlined by the International Technology Education Association which has developed the National Education Technology Standard for Administrators (NETS-A (2009)). The standard has outlined 5 dimensions of technology leadership as follows;

Visionary Leadership

Visionary leadership shows that school leaders are involved in changes that maximize learning goals using digital resources. They are involved in the ongoing process of developing, implementing, and delivering strategic plans that implement technology in line with their shared vision. School leaders support the implementation of applied technology vision and strategic plans.

The Learning Culture of the Digital Age

The Digital Age Learning Culture means that school leaders are always on the lookout for innovations in teaching that focus on continuous improvement in digital learning. They also maximize frequent and effective use of technology for learning. School leaders provide a learning environment with technology and learning resources to meet the diverse needs of all students. They maintain effective practices in technology and cultural studies across the curriculum. School leaders participate in community learning that fosters digital innovation, creativity, and collaboration

Excellence in Professional Practice

Excellence in Professional Practice requires school leaders to devote time, resources and access to ensure continued professional growth in technology expertise and integration. They participate in community-based learning that stimulates and supports teachers in teaching and using technology. School leaders demonstrate collaboration or collaborative and effective communication among stakeholders, using digital tools. They are also up to date on educational research and emerging trends in the use of effective technologies and promoting new technologies that have the potential to enhance student learning.

Systemic Improvements

Systemic or holistic improvements indicate that school leaders should adhere to changes aimed at maximizing learning achievement and goals through the use of technology and mass media resources. They work together to enhance assessment, collect and analyze data, interpret data and share insights to enhance staff

performance and student learning. School leaders are competent staff in the use of technology to advance academic and operational goals. They utilize strategic partnerships to support comprehensive improvement. School leaders create and maintain a robust technology infrastructure including integrated and manageable technology systems to support management, operations, teaching and learning.

Digital Citizenship

As digital citizens, school leaders ensure access to appropriate digital tools and resources to meet the needs of all students. They encourage, demonstrate safe, legal and ethical use of digital information and technology. School leaders also encourage and demonstrate responsibility for social interactions related to the use of technology and information. They engage in the development of a shared cultural understanding and engagement in global issues through the use of current communication and collaboration tools.

Research Problem Statement

Challenges and demands of policy change outlined by the Ministry of Education Malaysia emphasize the need for leaders to master various skills, especially in the face of rapid technological advances. Therefore, leaders must strive to equip themselves with current needs. In the five decades since independence, the Malaysian government has invested heavily in the field of ICT (Ministry of Education Malaysia, 2012). However, there is still a gap between the level of spending and the return on school improvement that is the focus of all (Leong, 2010; Lu, 2013; Wahdain& Ahmad, 2014). Nonetheless, persistent efforts have been made to increase the ICT mastery of teachers and school leaders in Malaysia (Sathiamoorthy, Leong, & MohdJamil, 2011). However, the quality and quantity of ICT use and skills are closely linked to technology leadership that has not yet reached the expected level (Fong, Ch'ng, & Por, 2013).

Thus, a study conducted by SarminahSamad (2012) shows that leadership has a strong relationship with organizational performance with significant impact on influencing individuals and organizations to achieve effectiveness. This clearly shows, the role that a school leader plays is important and they need to change from traditional leaders to technology leaders.

The purpose and objective of the study

In general, this study aims to identify the level of technology leadership among secondary school leaders in Kelantan. The study also aims to look at differences in technology leadership levels based on demographic factors such as gender, age and work experience among secondary school leaders in Kelantan.

Research questions

1. What is the level of technology leadership among secondary school leaders in Kelantan?
2. Is there a significant difference in the level of technology leadership of school leaders based on gender in secondary schools in Kelantan?
3. Is there a significant difference in the level of technology leadership of school leaders based on the age of secondary school leaders in Kelantan?
4. Is there a significant difference in the level of technology leadership based on the experience of secondary school leaders in Kelantan?

Research Methodology

Research design

This research is a quantitative study. It applies a cross-sectional study approach in which respondents answered the questionnaire distributed. The selection of the respondents was based on a simple random sampling aimed at ensuring that each of the secondary school leaders in the state of Kelantan had the same opportunity to participate in this study.

Population and Sampling

The study involved a total of 270 school leaders consisting of senior assistants, senior teachers and subject coordinators from six core subjects for secondary schools. A sample of 270 people was used because it was large enough to represent a total population of 2784 school leaders (Krejcie& Morgan, 1970). Therefore,

the distribution of the number of samples representing each school was done using a proportion ratio based on the number of samples that were determined.

ResearchInstrument

This study uses a technology leadership questionnaire adapted from the National Educational Technology Standard for Administrators NETS-A (2009), which is the framework of the International Society Technology Education (ISTE). The questionnaire consists of two (2) parts, A and B. Part A contains background of the respondents, Part B is technology leadership questionnaire consisting of five dimensions of Visionary Leadership, Culture Digital Age Learning, Excellence in Professional Practice, systemic improvement and Digital citizenship.

Data analysis

In this study, data were analyzed using Statistical Package of Social Science (SPSS) version 21. Data were analyzed using descriptive analysis method. The level of technology leadership of secondary school leaders in Kelantan is translated using mean values to measure these levels. Whereas to measure the level of technology leadership in terms of gender, the t-test was used and to measure the level of technology leadership in terms of age and experience, ANOVA was applied.

Findings

This section describes technology leadership levels based on gender, age and experience of secondary school leaders in the state of Kelantan. Based on Table 1, the mean classification of the two variables studied can be determined. According to Ary, Jacobs and Razavieh (2002), this method is used to obtain the classification of core variables as well as all personal data.

Table 1: Classification of Mean

Mean Classification	Interpretation
1.00-1.99	Very Low
2.00-2.99	Low
3.00-3.99	moderate
4.00-4.99	High
5.00	Very High

(Source: Ary, Jacobs &Razavieh, 2002)

Technology Leadership Level

Table 2: Mean, Standard deviation and Level of Practice for School Leadership Technology by Dimensions (N = 270)

Dimension	Mean	Standard deviation	skewness
Visionary Leadership	3.95	.468	-.296
Digital Age Learning Culture	3.69	.505	-.158
Excellence in Professional Practice	3.80	.459	-.092
Systemic/ comprehensive improvement	3.75	.501	-.174
Digital Citizenship	3.75	.540	.062

Based on the results of the analysis, the findings show that the level of technology leadership of secondary school leaders in Kelantan is moderate, with a mean value of 3.79. Likewise, the mean values of each technology leadership dimension are 3.95 (medium level) for visionary leadership, 3.69 (medium level) for digital learning culture, 3.80 (medium level) for excellence in professional practice. 3.75 (medium level) for systemic improvement and 3.75 (medium level) for digital excellence. Table 2 shows the findings in terms of dimensions.

**Table 3: Mean and Level for each item in the Visionary Leadership Dimension
(N = 270)**

Item	Mean	Level
KT1: I am involved in changes that maximize learning goals using digital resources	3.83	Moderate
KT2: I am involved in the ongoing process of developing, implementing, and delivering strategic plans that implement technology in line with our shared vision.	3.83	Moderate
KT3: I support the implementation of the technology vision and the strategic plan applied	4.21	High

According to Table 3, the highest item with mean = 4.21 is the school leader item supporting the implementation of the technology vision and applied strategic plan. This mean is the highest of the item mean for the visionary leadership dimension. It is evident that school leaders have shown a very positive and transparent attitude in their technology leadership practices. However, the mean for school leaders' involvement in change and process is at a moderate level

**Table 4: Mean Level of Each Item in the Digital Learning Culture Dimensions
(N = 270)**

Item	Mean	Level
KT4: I keep innovating in teaching that focuses on continuous improvement in digital age learning.	3.95	Moderate
KT5: I maximize frequent and effective use of technology for learning.	3.60	Moderate
KT6: I provide a learning environment with technology and learning resources to meet the diverse needs of all students.	3.57	Moderate
KT7: I maintain effective practice in technology and cultural studies across the curriculum.	3.72	Moderate
KT8: I participate in community learning that promotes digital innovation, creativity, and collaboration.	3.62	Moderate

Table 4 shows the mean of each item in the digital learning culture dimension. The highest item was KT4 with mean = 3.95. This shows that school leaders have ensured that innovation in teaching is focused on continuous improvement in digital learning.

Table 5: Mean Level of Each Item in the Digital Learning Culture Dimensions (N = 270)

Item	Mean	Level
QT9: I dedicate time, resources and access to ensure continuous professional growth in technology expertise and integration.	3.62	Moderate
QT10: I participate in community learning that stimulates and supports teachers in teaching and using technology	3.74	Moderate
QT11: I demonstrate effective collaboration / collaboration and communication among stakeholders, using digital tools.	3.86	Moderate
QT12: I know about the latest research in education and		

the emerging trends in the use of effective technologies and promote new technologies that have the potential to improve student learning.	3.80	Moderate
QT13: I encourage the use of new technologies that have the potential to improve student learning.	4.04	High

Table 5 is about the mean level of each item for the dimensions of excellence in professional practice. Findings show that KT13 item has the highest level of mean = 4.04. This shows that school leaders are constantly encouraging the use of new technologies that have the potential to improve student learning.

Table 6: Mean Levels of Each Item in the Total Improvement Dimension (N = 270)

Item	Mean	Level
KT14: I am pursuing changes aimed at maximizing the achievement of learning goals, through the use of technology and mass media resources	3.94	Moderate
KT15: I work to improve measurement standards, collect and analyze data, synthesize results and share insights to improve staff performance and student learning.	3.81	Moderate
KT16: I am a competent staff in using technology to advance academic and operational goals.	3.72	Moderate
KT17: I leverage strategic partnerships to support systematic improvements.	3.76	Moderate
KT18: I create and maintain a robust infrastructure for technology including integrated technology systems that support management, operations, teaching and learning.	3.57	Moderate

Table 6 shows the mean and level of each item in the systemic improvement dimension. KT14 item data was at the highest mean level of mean = 3.94. This shows that school leaders are constantly on the move in maximizing achievement, learning goals through the use of technology and mass media resources. However, their efforts in establishing and maintaining a stable infrastructure may be hindered by constraints such as financial condition that leads to the evaluation of this item at a moderate level (mean = 3.57).

Table 7: Mean and Level For Each Item in Digital Citizenship Dimension (N = 270)

Item	Mean	Level
KT19: I ensure access to appropriate digital tools and resources to fulfill the needs of all students	3.63	Moderate
KT20: I promote, demonstrate the use of digital information and technology safely, legally and ethically.	3.83	Moderate
KT21: I encourage and demonstrate the responsibility of social interaction regarding the use of technology and information.	3.88	Moderate
KT22: Through the use of the latest communication and collaborative tools, I demonstrate and guide the development of a culture of understanding and culture engaging in global issues	3.69	Moderate

Table 7 shows the mean and level of each item in the digital citizenship dimension. Item KT21 reached the highest mean value = 3.88. This shows that school leaders have always encouraged and demonstrated the responsibility for social interaction regarding the use of technology and information.

School Leadership Technology Differences by Gender

Table 8: T-Test Results of School Leaders Technology Leadership Based on Gender (N=270)

Gender	N	Mean	Standard Deviation	dk	t	sig
Male	97	3.91	0.42	268	3.76	0.00
Female	173	3.71	0.41			

Based on Table 8, t-test results were $t(270) = 3.76, p < .05$. These statistics indicate that there is a significant difference in the level of technology leadership between male school leaders (mean = 3.91, SD = 0.42) and female leaders (mean = 3.71, SD = 0.41). Therefore, it is clear that the level of technology leadership practices of male and female leaders are different.

Technology Leadership Level of School Leaders Based On Age

Table 9: Results of ANOVA Technology Leadership Level of School Leaders Based On Age

	Sum of Squares	Mean Square	dk	F	Sig.
Between Groups	1.175	.392	3	2.190	.090
In Group	47.560	.179	266		
Total	48.735	.269			

From the ANOVA test, $F(3, 266) = 2.190, p > 0.05$. This shows that there is no difference in the level of technology leadership among the age group of school leaders. This is shown in Table 9.

Technology Leadership Level Based on Experience

Table 10: Results of ANOVA Test of Level of School Leaders in Technology Leadership Based on Experience

	Sum of Squares	Mean Square	dk	F	Sig.
Between Groups	1.215	.405	3	2.267	.081
In Group	47.520	.179	266		
Total	48.735	.269			

Results from the ANOVA test is $F(3, 266) = 2.267, p > 0.05$. This shows that there is no difference in the level of technology leadership among the school leadership experience groups. This is shown in Table 10.

Discussion

This study examines the technology leadership practices of secondary school leaders based on five dimensions of technology leadership outlined by the National Educational Technology Standard-Administrators (NET-S A 2009), which are visionary leadership; digital learning culture; excellence in professional practice; comprehensive improvements and digital citizenship which have been presented by the International Society for Technology In Education, ISTE (2008).

Descriptive analysis results show that technology leadership among secondary school leaders in Kelantan is at a mean level of 3.79. This result answers the first research question raised in this study. This finding is also consistent with previous studies showing that many school leaders have low levels of knowledge and skills in ICT (Sathiamoorthy 2013) and medium (Sabariah and Spiritual 2006; Rossafri and Balakrishnan 2007; Kartini 2007; Rusnah 2007; MohdJamil 2011; Leong 2010; MohdIzham et al. 2010; Sathiamoorthy, Sailesh and Zuraidah 2012; Zamri&Rusmini 2008; MohdIzham et al. (2014). Similarly, a study conducted by Mahizer, Joseph and Ismail (2015) found that administrators' technology leadership is at the medium and high levels, which means that the technology leadership practices practised among secondary school leaders are at a moderate level and should be enhanced to an optimum or very high level in the face of global challenges in the future.

In detail, technology leadership of the secondary school leaders focuses more on the dimension of visionary leadership than other dimensions. This finding is similar to other studies (Chang, Chin, & Hsu, 2008; Yu & Durrington, 2006). This shows that school leaders are very interested in practising technology leadership to improve the quality of education in schools. It also shows that school leaders are very open to accepting changes in educational technology. Leaders are also familiar with the concept of leadership and vision that is constantly being implemented by the Ministry of Education Malaysia.

To determine the level of technology leadership of school leaders by gender, t-test was conducted. The findings show that there is a difference in the level of technology leadership between male and female leaders. This finding is contrary to the findings of Alkrdem, M (2014), who found that male and female leaders show similarities in terms of technology leadership attitudes and practices.

In order to determine the level of technology leadership of school leaders based on age, ANOVA test was conducted. The findings show that there is no difference in the level of technology leadership among the age group of school leaders. In other words, school leaders of all ages have the same level of technology leadership.

As for the findings of the study to identify the difference in technology leadership of school leaders based on experience, ANOVA tests showed that there was no difference in the level of school leaders' technology leadership practice based on experience. This finding is in line with the findings of Macaulay (2009) and Dawson and Rakes (2003) who found no differences in technology leadership practice with experience.

The findings of this study show that the technology leadership level of school leaders in the state of Kelantan is at a very moderate level to provide an overview of the technology leadership levels of secondary school leaders. In addition, the practice of technology leadership is seen as a result of the cultural environment practised in schools. In the context of this study, school leaders consisting of senior assistants, subject coordinators and key unit secretaries in the school, have practised technology leadership at a moderate level.

Suggestions

Based on the findings of this study, it is suggested that policymakers should develop professional development programs to foster technology leadership skills among school leaders so that they are more effective and efficient especially in technology-related school management. Professional development courses in technology leadership for school leaders should aim to enhance their technology leadership level. In addition, school leaders need to be encouraged to participate in technology-related management. Close collaboration with technology expert teachers will help school leaders understand and master technology leadership. School leaders' skills in technology should be considered as one of the criteria for selection as school leaders.

In addition, the findings of this study can serve as a guide to the Ministry of Education in order to set the appropriate program to always encourage and motivate the principal and the teachers of the school to inculcate the culture of control and use of ICT in schools. This will produce competent leaders in all aspects in line with the government's aspiration to produce leaders who can withstand the present and future globalization era.

The study of technology leadership among school leaders can add value and long-term impact to leadership and management practices especially to improve school leadership levels. It is hoped that future leaders will be able to compete in the world of information technology education without borders.

Conclusion

Technology plays a very important role in schools around the world. School leaders should use technology in several aspects of their daily activities. This study confirms that school leaders are heading towards the fourth wave of the Smart School Plan (2011-2020), which is a unifying and stabilizing phase in reference to the ICT policy in Education for Malaysia (Ministry of Education Malaysia, 2010) where leadership practices and use of technology is very important in education.

There is a great need for leadership in technology in order to ensure that technology is meaningful and contributes to improvement in education. Accordingly, the study revealed that school leaders should enhance existing technology leadership practices in order to lead schools to compete with the outside world

Suggestions for Advanced Study

Further studies can be conducted to look at the level of practice in technology leadership of school leaders from other demographic factors such as based on 1) the qualification of leader 2) academic field and 3) location of school.

Reference

- [1]. Allen, T. (2011, April 26). iSchool initiative. Speech presented at BYOT Symposium, Kennesaw State University, Kennesaw.
- [2]. Alkrdem, M. (2014). Technological leadership Behavior of high school headteachers in Asir Region, Saudi Arabia. *Journal of International Education Research*, 10(2), 95-100.
- [3]. Ary, D., Jacobs, L. C., & Razavieh, A. (2002). *Introduction to research in education*. Sixth Edition. USA: Wadsworth Group.
- [4]. Anderson, R., & Dexter, S. (2005). School Technology Leadership: An Empirical Investigation of Prevalence and Effect. *Educational Administration Quarterly*, 41(1), 49-82
- [5]. Black, T. (2011, April 26). Bring your own technology. Speech presented at BYOT Symposium, Kennesaw State University, Kennesaw
- [6]. Dikkers, A.G., Hughes, J.E., & McLeod, S. (2005). A bridge to success: STLI. *T.H.E. Journal*, 32(11), 20-24
- [7]. Gerard, L.F., Bowyer, J.B., & Linn, M.C. (2008). Principal leadership for technology-enhanced learning in science. *Journal of Science Education and Technology*, 17(1), 1-18.
- [8]. Gosmire, D., & Grady, M. L. (2007). A Bumpy Road: Principal as Technology Leader. *Principal Leadership*, 7(6), 16-21.
- [9]. International Society for Technology in Education. (2009). *ISTE Standards Administrators*.
- [10]. Juraimi, F., & Hamzah, M. I. M. (2017). Kepimpinan Teknologi Pengetua Dan Hubungannya Dengan Prestasi Akademik Sekolah Di Malaysia. *International Journal of Education, Psychology and Counseling*, 2(5), 215-230
- [11]. Kementerian Pendidikan Malaysia (2010). *Dasar ICT dalam Pendidikan Malaysia*. Putrajaya, Malaysia.
- [12]. Kementerian Pendidikan Malaysia. (2013). *Malaysia Education Blueprint 2013 - 2025*. Education, 27(1), 1-268.
- [13]. Kementerian Pendidikan Malaysia. (2016). *Laporan Pelan Pembangunan Pendidikan Malaysia 2013-2025*
- [14]. Krejcie, R. V., & Morgan, D. W. (1970). Determining Sample Size for Research Activities. *Behavioral Science and Psychological Measurement*, 38(1), 607-610.
- [15]. Leong Mei Wei. (2010). *Kepemimpinan teknologi pengetua dan tahap aplikasi Teknologi Maklumat dan Komunikasi (ICT) guru Sekolah Menengah Seremban*. Kuala Lumpur: UM.
- [16]. Macaulay, L. S. (2009, June). Elementary principals as technology instructional leaders. Towson University, Department of Instructional Technology and Literacy. Research paper presented at NECC. Retrieved August, 28, 2012
- [17]. Madinah Binti Mohamad. (2015). *Laporan Tahunan 2015 Pelan Pembangunan Pendidikan Malaysia (2013-2025)*. KPM: Putra Jaya.
- [18]. Mohd Izham Mohd Hamzah, Norazah Nordin, Kamaruzaman Jusoff, Rusnah Abdul Karim & Yusma Yusof. (2010). A quantitative analysis of Malaysian Secondary School Technology Leadership. *Management Science and Engineering*, 4 (2), 124-130.
- [19]. Mohd Izham Mohd Hamzah, Faridah Juraimi, Aida Hanim A. Hamid, Norazah Nordin & Noraini Attan. (2014). Technology leadership and its relationship with School-Malaysia Standard of Education Quality (School-MSEQ). *International Education Studies*; Vol. 7, No. 13, 278-285.
- [20]. Mohd Jamil Saleh. (2011). *Kepimpinan teknologi pengetua di sebuah Sekolah Bestari, Kota Tinggi, Johor*. Kuala Lumpur: Universiti Malaya
- [21]. Mokhtar Johar. (2011). *Kepimpinan teknologi dan kompetensi ICT guru di SM Agama di Daerah Kuching Sarawak*. Tesis Sarjana Kependidikan. Institut Kependidikan, Universiti Malaya
- [22]. Mawasi F. M. (2014) *Technology Leadership and ICT Use: Strategies for Capacity Building for ICT Integration*. Vol 1, No 2, *Journal of Learning for development (JL4D)*
- [23]. Noraini Abdullah, Hamidon Khalid & Mohd Izham Mohd Hamzah. (2015). *Amalan kepemimpinan teknologi pengetua dalam pengintegrasian ICT di Sekolah Menengah Kebangsaan di Malaysia*. Proceeding of the 3rd Global Summit on Education GSE 2015. Kuala Lumpur
- [24]. Nunally, J.C. (1978). *Psychometric theory*. New York: McGraw Hill.
- [25]. Noraini A, Hamidon K., & Mohd Izham M H. (2015). *Amalan kepemimpinan teknologi pengetua dalam pengintegrasian ICT di Sekolah Menengah Kebangsaan di Malaysia*. Proceeding of the 3rd Global Summit on Education GSE 2015. Kuala Lumpur
- [26]. Prensky, M. (2010). *Teaching digital natives: Partnering for real learning*. Thousand Oaks, CA: Corwin.

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- [27]. Rossafri Mohamad & Balakrishnan A/L Munindy. (2007). Menterjemahkan pemimpin teknologi sebagai melahirkan pemimpin instruksional yang cemerlang. *Jurnal Pengurusan dan Kepimpinan Pendidikan*, 17 (2): 91 – 103.
- [28]. Rusnah Abdul Karim. (2007). Pentadbir sebagai pemimpin teknologi: Kajian di sekolah-sekolah menengah di Negeri Sembilan. Bangi: Universiti Kebangsaan Malaysia.
- [29]. Sathiamoorthy Kannan. (2013). Kepimpinan teknologi pengetua. Kolokium ICT dalam pengurusan dan kepimpinan pendidikan 2013. Institut Aminuddin Baki.
- [30]. Sabariah Sharif dan Rohani Abdullah. (2006). Kepimpinan pengetua sebagai agen perubahan dalam inovasi komputer dalam pengajaran dan pembelajaran. *Konvensyen Teknologi Pendidikan ke-19*, Jilid 2 896-902.
- [31]. Sathiamoorthy Kannan, Sailesh Sharma, Zuraidah Abdullah. (2012). *Principal's Strategies for Leading ICT Integration: The Malaysian Perspective*. Creative Education 2012. Vol.3.
- [32]. Zamri Abu Bakar & Ku Ahmad Rusmini. (2008). Implementasi ICT dan kepimpinan sekolah: Kajian kes di sekolah-sekolah bestari dan SMJKC. Prosiding Seminar Nasional Pengurusan dan Kepimpinan Pendidikan Ke-15 2008. Genting Highlands: Institut Aminuddin Baki.