Factors Analysis of Technology Leadership in Thailand Royal Awarded School

Dawruwan THAWINKARN[a*]
[a]*Faculty of Education, Khon Kaen University, Thailand*
*dawtha@kku.ac.th

Abstract: Technology leadership is extremely important for these days. Education technology leadership is a key element to be successful in using technology in education. Often education technology, under the direction of an effective education technology leadership, is used as a change agent in school improvement initiative. The purposes of this research were to develop the school administrators' technology leadership scale using an exploratory factor analysis and confirmatory factor analysis. The samples were 380 administrators (principals, vice principals, and head of subjects) in Thailand royal awarded school. The research instrument was the technology leadership scale. Cronbach's alpha internal consistency was estimated for the reliability of scale. The exploratory factors analysis was examined to determine the number of factors and indicators. The confirmatory factor analysis was performed to determine the construct validity by using Mplus 6.11. The major finding were as follows : 1) internal consistency scale was .87, 2) the exploratory factor analysis indicated that the technology leadership was composed of 6 factors : technological vision, technological support, promoting technology in teaching, administrative management technology, assessment and evaluation technology, and ethics technology and 3) the confirmatory factor analysis found that the model fit the structure from the exploratory factor analysis.

Keywords: Technology leadership, confirmatory factor analysis, exploratory factor analysis, Thailand royal awarded school

1. Introduction

The ministry of education in Thailand emphasizes the importance of the computer and technology. While also taking into account of the benefits and potential of information technology development and application for students to learn and develop their skills in an advanced level. Including the way to think and to analyze the effects that may occur from the use of the technology in an inappropriate ways; this is based on the principles of moral and sufficient economic.

We are living in a time that has been characterized as the Digital Age and the Knowledge Age. The rapid advancement in information and communication technologies (ICT), coupled with the demand of the knowledge society, has a huge impact on education. Although instructional technology has been a part of the educational landscape for several decades, technology integration in classroom still falls short of the expectations for its use (Cuban, 2001). Multiple studies identified the role of principal leadership as one of the most important factors affecting the integration of technology in classrooms (Devaney, 2010). Leadership, especially from the principal, is generally acknowledged as an important influence on a school's effectiveness, a belief that is supported by empirical evidence (Leithwood & Riehl, 2003). Studies of school improvement also point to the importance of principals' leadership in such efforts. (Fullan, 2003)

Technology leadership of the executive management behavior of leaders who face the challenge of changing challenges of technology. While often focuses on the leadership skills of the school administrators, the study of education technology leadership also considers about sources of leadership from other education stakeholders, including teachers, technology coordinators, parents, students, and community members as well. The attributes of leader in the administrative process to adjust the behavior of the leadership and organizational behavior modification in accordance with the change, which caused the corporation of colleagues. The

work is achieved by placing. Flanagan and Jacobson (2003) have provided significant technology leadership of school administrators that the behavior of the leaders with a pupil engagement is a steadfast mission to organize the learning experience to students. The use of appropriate technology. A vision for the use of technology for education. A professional development effectiveness professional development to promote the professional development consistently focus on teaching and learning. Including the use of technology in various occasions. All students have access equally. Synthesis technology leadership component of school administrators, the context of education in Thailand Royal Awarded school, given by the theories and research related Yee (2000), Schiller (2003), Haslam (2006), Kozloski (2006), Redish and Chan (2006), Nikom Nakkai (2006), Chawalit Kerttip (2009) has 6 factors of technology leadership are 1) technological vision; this component encouraged leaders to facilitate the development of a share vision and to cultivate an environment that will realize that vision., 2) technological support; this is standard focused on the need of leaders to demonstrate their technological savvy as they model, support, and lead technology integration., 3) promoting technology in teaching; this standard encouraged leaders to ensure the effective integration of teaching, learning, and technology., 4) administrative management technology; this is need for leader to develop, implement, and monitor technology policies, human and financial infrastructure, and plans., 5) assessment and evaluation technology; this is described how leaders should use technology to collect and analyze data regarding appropriate uses of technology and to inform instructional decisions., and 6) ethics technology; this is highlighted the leaders' responsibility to understand the social, legal, and ethical issues to promote the responsible use of technology.

2. Literature Review

2.1 Definition of Technology Leadership

The definition of technology leadership that is that a capable of leading in management, and using technology to cut expenses of investment products. This capability is called the product cost competence, it is emerging as a new product which is in demand all the time (marketable products), which is capable in managing this so-called innovative competence. Flanagan, & Jacobson (2003) provided significant technological leadership of school administrators that is the behavior of a leader with a mission to student (pupil engagement) is a steadfast mission to organize the learning experience for students by the use of appropriate technology. A vision for the use of technology for an education, an effective professional development to promote continuous professional development is consistent focus on teaching and learning, including the use of technology in various occasions. All students have access equally.

In summary, from the viewpoint of all the above, a summary definition "technology leadership of school administrators" refers to behavior or characteristics of school administrators that expresses the vision of technological system planning director of media technology to achieve the vision. Promote a culture of accountability and policy support to developing innovative technology continuously. Supporting teacher for use of technology in teaching, and use technology in administration, use technology to measure and evaluate and ethical use of technology**.**

2.2 Global Technology Leadership

While leadership as a scientific construct emerged in the scholarly literature as early as the 1930s (House & Aditya, 1997) and has received extensive attention since then, the evolution of "the 21st century technologist". Bertoline (2011) presents a need for a new type of leadership model and a new method for education leaders. Global technology leadership is emerging as a scholarly discipline that seeks to integrate specific, contextual knowledge related to high-technology industries and integrate it with the ability to operate and lead in not only a multinational, but the synthesized global environment far more common and growing in technology fields (Daugherty et al., in press). This discipline is relatively new as an area of academic research, however, and

there is great need among scholars to begin the task of modeling the global technology leader and the nature of implementing global technology leadership into educational and organizational settings. As such, the research team sought out industries and academic programs throughout the world providing education and employment in this innovative area. Using ethnographic research methods (Lindlof & Taylor, 2002), researchers gathered data by observation and interview with the goal of analyzing this data and developing a synthesized model of the nature and future of global technology leadership as an innovative educational and industrial managing construct.

Technology leadership is newly evolving as a scholarly discipline that synthesizes historic research in multiple areas of leadership with the complexity and contextual factors unique to the technology organization. Bozeman and Spuck (1994) suggested that educational technology leaders should be able to use technology in solving real problems in their schools. Before starting full technology implementation, principals should be aware of the challenges and barriers inherent in almost technology programs. These challenges can easily undermine the confidence of even the most professional leaders (Lashway, 2003). According to Valdez (2004), leadership of technology includes a combination of many leadership qualities and the ability to implement change, resources, professional development, emerging techniques, equipment and software. As such, the present study examines how technology leaderships, learning abilities as well as other individual characteristics and perceptions could affect school leaders' behavioral intentions.

Information technology development and innovation, computers, the Internet, and other information technologies are becoming important learning tools in students' everyday lives. Principals play various roles such as a change agent, lifelong learner, main supporter, and resource provider in relation to ICT implementation in schools (Han, 2002). Therefore, principals need to understand the capacities of the new technologies to have a personal proficiency in using technologies, and be able to promote a school culture which encourages exploration of new techniques in teaching, learning and management (Schiller, 2003). The studies showed that when administrators act as technology leaders, the teachers will integrate and use technology more successfully (MacNeil & Delafield, 2007). The International Society for Technology in Education published Technology Standards for School Administrators, including the following categories:

(1) Leadership and Vision; Included in this standard is that a technology leader has the ability to inspire a shared vision among stakeholders and foster changes that maximize the use of digital resources to support instruction, learning, and student performance. Finally, the standard of visionary leadership details how effective school technology leaders advocate for policies, programs, and funding to support the vision and planning efforts related to technology.
(2) Digital-Age Learning Culture; This standard describes how school administrators must ensure that instruction improves digital-age learning and that the school and classrooms are sufficiently equipped with digital technologies that support individual student needs. Additionally, school technology leaders should "be model and promote the frequent and effective use of technology for learning"
(3) Excellence In Professional Practice; this standard focuses on the leaders' role to empower educators to enhance students learning through technology. Standard three describes how school technology leaders must ensure time and resources are devoted to technology-focused professional development of teachers. Technology leaders must also participate in technology-related professional development themselves.
(4) Systemic Improvement; Central to this standard is data-driven decision-making that includes collaborating to collect data, analyses data, interpret findings, and share results around staff and student performance. The fourth standard also describes how school technology leaders must recruit and retain technology-savvy teachers and staff.
(5) Digital Citizenship; This standard focuses on the school leaders' responsibility for ensuring equitable access to digital tools as well as promoting, modeling, and establishing "policies for safe, legal, and ethical use of digital information and technology".

Lastly, besides visions and planning, managing technology resources has become a critical role in effective technology leadership. Principals need to manage personnel, time,

support, and funding. Effective principals observe any of technologies, including teachers' technologies use, and technology infrastructure to ensure the successful technology integration.

2.3 The School Administrator as a Technology

In the majority of literature reviewed, the school technology leader is assumed to be the role model of school administrators including principles or superintendents. Both Superintendents and Principals were effective education technology leaders. These effective leaders often shared common tendencies. A supportive administrator took staffs inputs into consideration when developing school schedules or organizing school activities; engendered a high level of communication, encouragement and support that was felt by individuals; devoted resources needed to replicate successful programs; developed and supported partnerships between school and universities and corporations to stimulate the use of technology; empowered their staff; was flexible and insured that technology was accessible to teachers and students; had a commitment to professional development; respected every student as individual learners. In contrast, it is found that if it is not enough administrative support, it could limit professional growth and structure.

A survey of elementary school principals revealed that all the Principals agreed that technology was an important aspect of learning, the schools that had the highest technology-use rating had shared one characteristic: strong and enthusiastic principal technology leadership. Principals who exhibited education technology leadership were instrumental in modeling the use of technology in classrooms. They understood how it could support the best practices in instruction and assessment, and they provided teachers with guidance for its use. Principals also had to participated in professional development activities that related to education technology and provided opportunities for teachers to learn how to use those resources.

When administrators supported teachers in using technology with development staffs and on-going dialogue about technology integration in the context of teaching and learning, their teachers exhibited maintained technology integration in the curriculum. Wilsmore and Betz (2000) stated that "technology will only be successfully implemented in schools if the principal actively supports it, learns as well, provides adequate professional development and supports his/her staffs in the process of change".

While literature was found that identifies the school principal as a key factor in bringing about successful change in schools (Fullan, 2003), Schiller (2003) claimed there is very little research on the relationship between education leadership and technology. Additional research in the area of leadership and the implementation of instructional technology was found to be needed (Wilsmore & Betz, 2000; Yee, 2000).

3. Research Method

Research Objective

This study is aimed to develop the technology leadership scale using an exploratory factor analysis and a confirmatory factor analysis.

Samples

The population comprised 7,426 administrators (principals, vice principals, and head of subjects) in the royal awarded school. The samples group size was 380 principal, vice principal, and head of subject based on the table of Krejcie and Morgan and selected by the stratified random sampling method.

Instrument

The instrument used in this study was the questionnaire for the administrators (principals, vice

principals, and head of subjects) in the royal awarded school which was divided into 2 sections as follows:

Section 1 – This is the checklist for general information of the respondents. There are 5 questions for age, gender, position, education level, and work experience.

Section 2 – This included 28 five-scale rating question for the technology leadership questionnaire was used to measure school administrators technology leadership on 6 elements: technological vision (TV), technological support (TS), promoting technology in teaching (PTT), administrative management technology (AMT), assessment and evaluation technology (AET), and ethics technology (ET).

Data Collection and Analysis

The researchers first submitted an official letter asking for permission to collect data and carried out the data collection in the royal awarded schools. The researchers had collected the completed questionnaires in the first time total 250 forms and after that collected again and again later until got 330 forms back (100%). The researchers analyzed the questionnaire data by using computer software programs as follows: (i) The general information of the respondents was analyzed by means of descriptive statistics to find frequencies and percentages, (ii) The exploratory factors analysis was examined to determine the number of factors and indicators, and (iii) The confirmatory factor analysis was performed to determine the construct validity by using Mplus 6.11.

4.0 Result and Discussion

Analysis of school administrator technology leadership in Thailand Royal Awarded school that overall average in the "high" level, which can show the mean, standard deviation, minimum score, and maximum score in table 1

Table 1 : Descriptive data analysis of school administrators technology leadership

Technology leadership	mean	S.D.	Minimum	Maximum
Technological vision	4.441	.444	1.000	5.000
Technological support	4.423	.386	1.000	5.000
Promoting technology in teaching	4.511	.271	2.000	5.000
Administrative management technology	4.464	.430	1.000	5.000
Assessment and evaluation technology	4.407	.368	1.000	5.000
Ethics technology	4.382	.419	1.000	5.000

4.2 Exploratory factor analysis of technology leadership

The exploratory factor analysis of technology leadership is analyzed by the Kaiser-Meyer-Olkin index measures of sampling adequacy : KMO is .810, indicating that they are qualified to be analyzed at a good level, and Barlett's test of sphericity test results showed that the variables were correlated statistically significant ($p<.01$); so indicates that the variables can be analyzed. The principal component analysis found communality value of each variable used in the analysis of technology leadership have 21 factors (ranged .551 - .712). The results of the rotation element angle (oblique rotation) with Promax method composition of 6 elements, each element has a eigenvalue than 1. Percentage of of 72.395, which results factor technology leadership by Malcolm questions in table 2.

Table 2 : Factor loading of technology leadership

Item	Factors of technology leadership	Factor loading
Factor 1 Technological Vision (TV) Eigenvalue = 14.112, % of variance = 16.506		
1	Focus on the use of technology in education	.711
2	Technology has contributed significantly to the development and enhance the quality of education	.709
3	Policy and planning technology rationality	.678
4	Learning and development of information technology in management	.559

Item	Factors of technology leadership	Factor loading
Factor 2 Technological Support (TS) Eigenvalue = 14.001, % of variance = 15.007		
5	Procurement and preparation of technology for learning	.704
6	Promoting the use of technology in education development	.667
7	Budget planning for adequate management technology	.609
Factor 3 Promoting Technology in Teaching (PTT) Eigenvalue = 13.404, % of variance = 14.241		
8	Further support for teachers in using technology in teaching	.712
9	Deciding which technology is appropriate for teaching	.677
10	Encourage teachers to develop information technology skills continuously	.605
11	Manage the learning conducive to use of technology	.553
Factor 4 Administrative Management Technology (AMT) Eigenvalue = 10.109, % of variance = 10.453		
12	The technology involved in the administration	.709
13	Development of information technology to management regularly	.694
14	Use of media and technology in the teacher development	.605
Factor 5 Assessment and Evaluation Technology (AET) Eigenvalue = 9.445, % of variance = 9.746		
15	Use technology as a tool in assessing the performance of teachers	.698
16	Evaluation of the use of technology in the teaching and learning of teachers	.669
17	Use technology to evaluate student achievement, and to enhance the quality	.613
18	Use of technology as a tool to develop the school quality assurance system	.588
Factor 6 Ethics Technology (ET) Eigenvalue = 7.172, % of variance = 6.442		
19	An example of using technology in a creativity	.679
20	Used with caution, as necessary	.654
21	Responsibility for the consequences arising from the use of technology	.551

4.3 Results of confirmatory factor analysis of technology leadership

The relationship between observed variables using Pearson's correlation coefficient, it was found that: the variable that indicates the technology leadership all have significant statistics ($p<.01$). The correlation coefficient were .604 - .788 and the Bartlett's test sphericity, which is the test of the hypothesis that correlated between the correlation matrix and the identity matrix equal to 4,381.564 ($P<.000$). The correlation between matrix shows that the variables differ significant from the identity matrix in accordance with statistical analysis, the value of sampling adequacy measures : KMO is .786. Test results show the two sets of variables. In this data set are related to levels sufficient and appropriate to analyze the factors. The Details are shown in table 3 and the results of confirmatory factor analysis model to measure technology leadership in table 4.

Table 3 : Mean, standard deviation, and Pearson correlation product moment of technology leadership factors

Variables	TV	TS	PTT	AMT	AET	ET
TV	1.000					
TS	.767**	1.000				
PTT	.745**	.765**	1.000			
AMT	.755**	.689**	.746**	1.000		
AET	.788**	.645**	.689**	.782**	1.000	
ET	.761**	.763**	.604**	.639**	.674**	1.000
Mean	4.441	4.423	4.511	4.464	4.407	4.382
S.D.	.472	.386	.271	.430	.368	.419
Bartlett's test of sphericity = 4,381.564 df = 19 p = .000 KMO = .784						

Table 4 : Results of confirmatory factor analysis model of technological leadership of the royal awarded school administrators

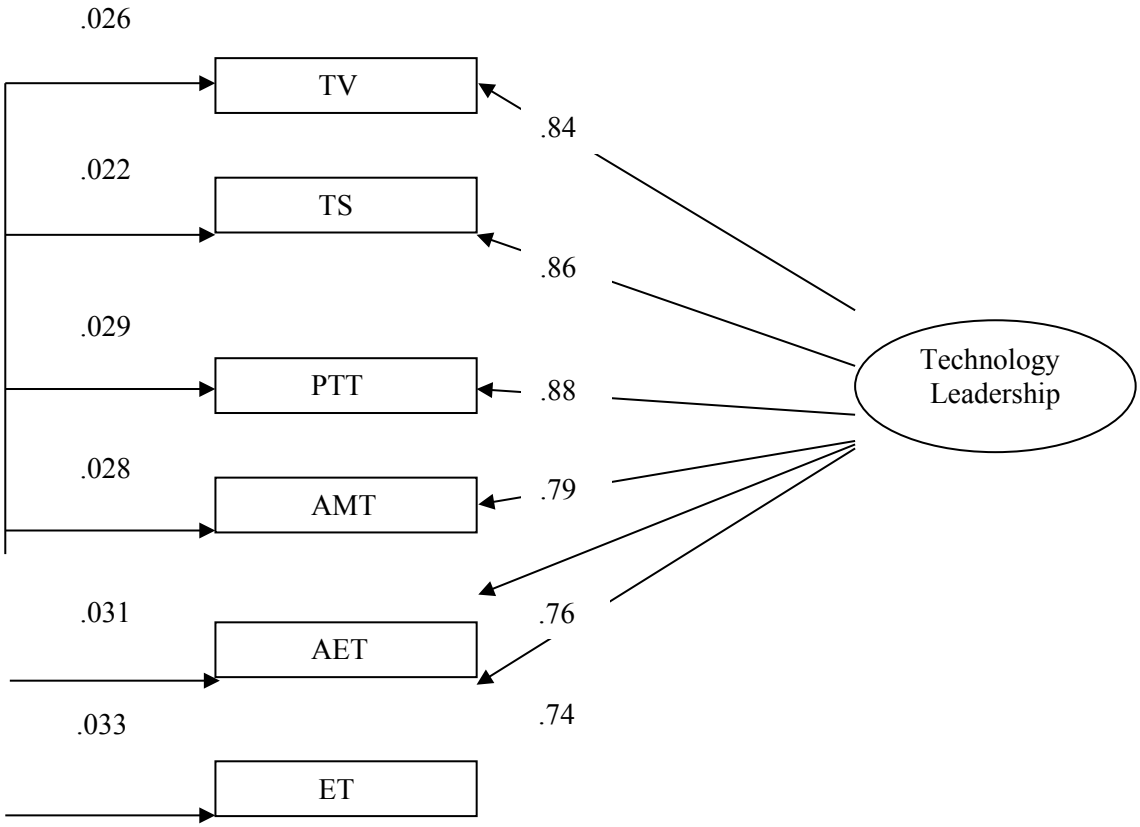
Variables	Factor Loading		T	R^2	The coefficient factor scores
	b(SE)	B			
1. Technological vision	.580(.027)	.844	21.334***	.771	.226
2. Technological support	.497(.023)	.863	21.686***	.762	.356
3. Promoting technology in teaching	.566(.027)	.881	20.432***	.642	.481
4. Administrative management technology	.671(.030)	.790	18.116***	.688	.189
5. Assessment and evaluation technology	.557(.028)	.762	21.665***	.793	.167
6. Ethics technology	.489(.029)	.740	17.801***	.619	.206
Chi-square = 3.505; df = 5; p = .752; GFI = .987; AGFI = .998 ; RMR = .002					

*** p<.001

From table 4, considering the weight of each component in the standard observed variables in the model, measurement technology leadership found: All factors are positive weights ranging from .740 to .833 and all with statistical significance level .001. The variable weight from high to low of loading score are promoting technology in teaching, technological support, technological vision, administrative management technology, assessment and evaluation technology, and ethics technology respectively. The 6 variables are Indicates of technology leadership significance statistical. Indicators of technology leadership shown in the equation:

Technological Leadership = .226***(TV) + .356***(TS) + .481***(PTT) + .189***(AMT) + .167***(AET) + .206***(ET)

Shows the validity of the model measuring technology leadership in Figure 1



Chi-square = 3.505, df = 5, p-value = 0.752, RMSEA = 0.000

Figure 1 : The Validity of The Model Measurement Technology Leadership

5. Conclusion

The administrator in the 21st century need to catch up with present technologies. They need to improve their skill in using technology due to technology plays important role in education. To be technological leaders of the administrators or principles or teachers in schools would be more effective in both studying inside and outside classrooms, it affects to a school's permanent excellence. Piceiano (2005) has indicated that technology plays an important role that may affect to education in school. Also, technological staffs have to perform many duties in school too, especially in 1) teaching 2) technique 3) analysis 4) leadership.

The result from Technological Leadership analysis in this study, it is found in 6 elements, that is; Technological vision, Technological support, Promoting technology in teaching, Administrative management technology, Assessment and evaluation technology, and Ethics technology. Which conforms with the research study of Bunjob Boonjan (2011), who studied about elements of technological leadership of the administrators or principles, and it was found that there are elements of technological leadership, that is 1) using technology in teaching 2) using technology in administration 3) using technology in evaluation 4) moral in using technology, and also it conforms to the regulation of teacher's council in the issue of professional moralities 2013 in 5 aspects; 1) self morality 2) professional morality 3) customer morality 4) colleague morality 5) social morality. Moreover, it conforms to American Institute for Research: AIR (2009) which identified National Educational Technology Standard for Administrators: NETS-A about Digital-Age Learning Cultural, which covered that the administrators must have knowledge and confidence in using technology in education development to be a role model and support using technology in education continuously and effectively, to provide vary sources of

technologies which suit for each student's desires, to apply technology in teaching effectively and conform well with the curriculums. Besides, it encourages the communities to join in education by using innovation. As well as Kozloski (2006) who studied element of technological leadership of the administrators of principles in many schools in 45 states of the United State of America and the result of the study, it is found that each state has identified technological standard which affect the movement in present. It is; there is an encouragement to encourage every of the administrators in schools to have technological leadership of the administrator follow the identified standard responsibly. Meanwhile, business section now need the graduates who has proficiency in technology to work in their companies. Those expectation and desires would be successful if the administrators emphasize on the importance of using technology and encourage students to use technology effectively in schools and in communities. Those are important to education and economic in 21st century. Element of technological leadership of the administrators includes 6 aspects; 1) Leadership and Vision 2) Digital-Age Learning 3) Excellence In Professional Practice 4) support management and performance 5) evaluation 6) social, laws, and morality issue. This study surveyed principals technology leadership in Thailand Royal Awarded School. Additional studies are needed to included World Standard School.

Acknowledgements

The researchers would like to thank to the Office of the Basic Education Commission of Thailand and the Office of the Higher Education Commission for this research scholarship.

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