A STRUCTURAL EQUATION MODEL OF TECHNOLOGICAL LEADERSHIP AFFECTING THE PROFESSIONAL LEARNING COMMUNITY IN SCHOOLS UNDER THE LOCAL GOVERNING ORGANIZATIONS, KHONKAEN PROVINCE

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Abstract—This study aimed to shed light on linear structural relationship model of technological leadership and professional learning community in schools under the Local Governing Organizations, KhonKaen province, Thailand. This study utilized quantitative survey design using questionnaire as an instrument. A total of 420 samples consisted of school principals and teachers were involved using multi-stage sampling. Findings revealed that school principals were highly practicing technological leadership and its dimensions as well as professional learning community practice. In addition, results revealed that the model of relationship between technological leadership and professional learning community were found to be consistent with empirical data, with $\chi^2=45.616$, df = 32, $\chi^2$/df = 1.4255, $P = 0.0561$, RMSEA = 0.032, SRMR = 0.012, CFI = 0.996, TLI = 0.995. On top of that, both total and direct influences of technological leadership on professional learning community were found to be positive at 0.908, with statistical significance at 0.01 level. Technological leadership could explain the variance of professional learning community at 82.5 percent.

Index Terms—Professional learning community, structural equation model, technological leadership.

I. INTRODUCTION

In the 21st Century, technological advancement has resulted rapid changes in socio-economic development which in turn emphasizing the nation development towards economy and society of wisdom and learning. Ultimately this will lead to an application of information technology as a tool for production, access and dissemination of knowledge to children, youths, and population accurately and appropriately in order to lead the nation towards the said society [1].

Technological leadership is emerging within the increasingly diversified educational leadership world. Schools striving to excel in the information age need leaders that are well versed in the potential and in the pitfalls of information and communication technology [2]. Moreover principals’ technological leadership strongly correlates with teachers’ integration of educational technology into their curriculum [3]. Technological leadership is vital for effective use of technology [4], and therefore, efforts to change and prepare schools and students for the information age demand effective technological leadership from principal [5]. As described above, in this era of digital technology, technological leadership is gaining importance. Thus, in pursuit of the ultimate goal of improving students’ abilities, principals aiming to facilitate school reform should have technological leadership ability.

Research on technological leadership began in the United States in the 1990s and has since gained significance. To be an experienced and capable technological leader, the principal must be trained in the following six dimensions namely use of technology in administration (ADM), promoting use of technology in teaching (TEA), having vision in technology (VIST), having ethics in the use of technology (ETH), supporting and assisting in management and implementation (OPE), and use of technology in assessment and evaluation (EVA) [2].

Use of technology in administration (ADM) means the principal must maintain a very clear technological vision as well as understand the potential uses of technology in the classroom. Promoting use of technology in teaching (TEA) refers to planning and establishing resources for teachers’ development are the most important responsibilities of a technological leader. In teacher development, the principal must prepare the newest models and material. Next is having vision in technology (VIST) is defined as the most important foundation of technological leadership. A technological leader must develop a vision of how school reform will be affected by technology. The development of this vision requires that the principal understand the direction and trends of technology development, as this understanding will strongly influence the principal’s effectiveness. Having ethics in the use of technology (ETH) means ethical values are important in technological leadership, and these ethical values actually override technological skills. When new technology is implemented in a school, the leader must be able to provide ethical support. Supporting and assisting in management and implementation (OPE) refers to technological leaders must supply skilled support to preserve equal access to technological resources and appropriate technology-use environments when teachers require assistance. Finally use of technology in assessment and evaluation (EVA) is defined as effective principals must administer procedures for measuring the growth of each individual teacher by...
As a result, researchers used the viewpoint of technological leadership to examine problems with domestic education practices particularly in Thailand. This is because practically principals must realize that one-sided technology use cannot effectively enhance learning quality. Rather, only through the practical leadership in the school can an appropriate environment be built to change the mindsets of teachers and create new instructional models.

KhonKaen local governing organizations including KhonKaen Provincial Administrative Organizations, Town/District/Sub-District Municipalities, and Sub-District Administrative Organizations located in the area of KhonKaen, all contribute to appropriate education administration according to local needs. These organizations are aware of teaching profession development and promoting schools to establish the professional learning community that facilitates teachers’ learning since teachers have major roles in educational reform with regard to learners’ development. School principals are required to utilize technology, an essential tool for administration in this era, to support and assist teacher professional development. Thus, administrators must possess technology leadership so that they will see the direction in the use of technology for work administration and encourage teachers to effectively apply technology for improvement of operation and self-learning.

III. OBJECTIVES OF THE STUDY

The main objective of this research was to study the linear structural relationship model of technological leadership of school principals and professional learning community of the schools under the KhonKaen local governing organizations, Thailand. More specifically, researchers seek to: (i) identify technological leadership and its dimensions practiced by school administrators and professional learning community of their schools; (ii) test the goodness of fit with the empirical data, and (iii) study the influence of technological leadership and professional learning community.

IV. METHODOLOGY OF THE STUDY

Researchers employed survey questionnaire as a method to collect quantitative data. Target group were 93 school principals and 1,248 teachers who affiliated to the 57 schools under the administration of local governing organizations, KhonKaen province, Thailand during academic year of 2015, giving a total of 1,341 persons. The sample size was obtained per parameter in the ratio of 20:1. Since there were 21 parameter, required sample size was 420 respondents. Multistage sampling technique was administered to select samples according to school size and location, followed by the simple random technique.

Structural Equation Modelling (SEM) was utilized in this study in order to fit the model. SEM is a combination of factor analysis and regression or path analysis. The interest in SEM is often on theoretical constructs, which were represented by the latent factor. In this study, there were two types of latent factor namely exogenous latent factors consisted of technological leadership (TLE) and its dimensions like use of technology in administration (ADM), promoting use of technology in teaching (TEA), having vision in technology (VIST), having ethics in the use of technology (ETH), supporting and assisting in management and implementation (OPE), and use of technology in assessment and evaluation (EVA) and endogenous latent factors comprised of professional learning community (PLC) and its components such as shared vision (VIS), encouragement and shared leadership (LEAD), team and learning network (TEAM), and supportive structure (SUP).
The relationships between the theoretical constructs are represented by regression or path coefficients between the factors. The SEM implies a structure for the covariance between the observed variables. In this study, the purpose of SEM is twofold. Firstly, it aims to obtain estimates of the parameters of the model, for example, the factor loading, the variances and covariance of the factor, and the residual error variances of the observed variables. The second purpose is to assess the fit of model, for example to assess whether the model itself provides a good fit to the empirical data.

Absolute fit indices determine how well a prior model fits the sample data [7] and demonstrates which proposed model has the most superior fit. These measures provide the most fundamental indication of how well the proposed theory fits the data. Unlike incremental fit indices, their calculation does not rely on comparison with a baseline model but is instead a measure of how well the model fits in comparison to no model at all [8]. Included in this category are the Chi-Square test, RMSEA, GFI, AGFI, the RMR and the SRMR.

SEM provides a very general and convenient framework for statistical analysis that includes several traditional multivariate procedures, for example factor analysis, regression analysis, discriminant analysis, and canonical correlation, as special case. Structural equation models are often visualized by a graphical path diagram. The statistical model is usually represented in a set of matrix equation. Mplus which is utilized in this study allows the model to be specified in a graphical way, by letting the user draw the path diagram directly in an interactive command window.

V. FINDINGS

A Total of 460 questionnaires have been distributed, researchers managed to collect 446 responded questionnaires, giving a response rate as 96.5 percent. Table 1 below shows the identification on the level of variables proposed by [9].

<table>
<thead>
<tr>
<th>Mean score range</th>
<th>Interpretation</th>
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<tbody>
<tr>
<td>4.50 – 5.00</td>
<td>Highest</td>
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<tr>
<td>3.50 – 4.49</td>
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<td>1.00 – 1.49</td>
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A. Technological Leadership and Professional Learning Community

Table 2 shows the mean scores and standard deviations of technological leadership dimensions namely use of technology in administration (ADM), promoting use of technology in teaching (TEA), having vision in technology (VIST), having ethics in the use of technology (ETH), supporting and assisting in management and implementation (OPE), and use of technology in assessment and evaluation (EVA) from school principals and teachers' perceptions. As indicated in Table 2, the mean score for all the six technological leadership dimensions ranged from 4.225 to 4.263. Average mean score of technological leadership was 4.247.

The result of the study revealed that the technological leadership aspects from respondents’ perceptions were at high level. Considering the first three orders, found that the highest level was use of technology in assessment and evaluation (EVA) ($\bar{x} = 4.263, SD = 0.532$). The second order was having vision in technology (VIST) ($\bar{x} = 4.254, SD = 0.503$). The third order was having ethics in the use of technology (ETH) ($\bar{x} = 4.252, SD = 0.546$). This is followed by promoting use of technology in teaching (TEA) ($\bar{x} = 4.243, SD = 0.555$) and use of technology in administration (ADM) ($\bar{x} = 4.242, SD = 0.545$). The technological leadership dimension with the lowest level of average value was assisting in management and implementation (OPE) ($\bar{x} = 4.225, SD = 0.532$).

Table 3 shows the mean scores and standard deviations of professional learning community components namely shared vision (VIS), encouragement and shared leadership (LEAD), team and learning network (TEAM), and supportive structure (SUP) from respondents’ perceptions. As indicated in Table 3, the mean score for all the four professional learning community components ranged from 4.264 to 4.333. Average mean score of professional leadership was 4.294.

The result of the study revealed that the professional learning community components from respondents’ perceptions were at high level. Considering the first three orders, found that the highest level was shared vision (VIS) ($\bar{x} = 4.333, SD = 0.511$). The second order was encouragement and shared leadership (LEAD) ($\bar{x} = 4.291, SD = 0.524$). The third order was team and learning network (TEAM) ($\bar{x} = 4.287, SD = 0.513$). The professional learning community component with the lowest level of average value was the supportive structure (SUP) ($\bar{x} = 4.264, SD = 0.532$).
B. Factor Loading and Validity of Observable Variables in the Relationship Model

As indicated in Table 4 below, factor loading values of all technological leadership dimensions ranged from 0.835 to 0.894 are statistically significant at 0.01. Factor loading is the importance of standard factors of each dimension in the relationship model of technological leadership and professional learning community that had been taken into consideration. The co-variance with technological leadership was from 69.8 to 80.0 percent. The technological leadership dimension with the highest factor loading was assisting in management and implementation (OPE). This is followed by having vision in technology (VIST), use of technology in administration (ADM), promoting use of technology in teaching (TEA), and having ethics in the use of technology (ETH) respectively. The dimension that had the lowest factor loading was use of technology in assessment and evaluation (EVA). As a result, all the exogenous latent factors are found to be important construct of technological leadership.

On the other hand, as for constructs of professional learning community showed the factor loading values from 0.819 to 0.900 are statistically significant at 0.01. The co-variance with professional learning community was from 67.0 to 81.0 percent. The professional learning community component with the highest factor loading was encouragement and shared leadership (LEAD). This is followed by team and learning environment (TEAM) and supportive structure (SUP) which have the same value of factor loading. The professional learning community component receiving the lowest factor loading was shared vision (VIS). All the constructs of professional learning community were important.

According to Figure 1, the Pearson correlation coefficients between technological leadership (TLE) and professional learning community (PLC) can be assessed in the standard component score ($\beta$) as 0.908 (p<.01). In other word, the variable of innovative leadership was able to explain the variance of professional learning community (TLE) as 82.5 percent, as shown in Table 5.

C. Direct, Indirect, and Total Influences of Technological Leadership on Professional Learning Community

Finding revealed that there was direct (DE) and positive influence of technological leadership (TLE) as 0.908 (p<.01). In other word, the variable of innovative leadership was able to explain the variance of professional learning community (TLE) as 82.5 percent, as shown in Table 5.

VI. DISCUSSION

Descriptive finding of technological leadership practiced by school principals showed a high mean score. This could be due to the fact that technology has become part of our daily life, and has played an
important role in education. Government organizations thus laid policies to promote and support the use of information technology in order to increase instructional efficiency and schools’ operation. School principals in the era of rapidly advanced technology are required to adjust themselves and develop their technological knowledge and skills so that they would be able to efficiently and effectively administer their schools under the changes. Technology leadership of school principals will lead to shared administration and learning of personnel in and outside of schools. In addition, the local governing organizations have set policies to encourage and support schools to produce and develop educational technologies, and in this respect, have expedited budget capacities to support the work (The Third Local Education Development Plan, 2015-2017). This agrees with [10] who studied and found that the present technology has become a vital component in education, and that school principals need to become very efficient both as a leader and a person with good knowledge and skills of technology.

The result of this study indicated that professional learning community and its components were at high levels. When considering each aspect, the components, listed from high to low, are as follows: shared vision, encouragement and shared leadership, team and learning network, and supportive structure. This was due to the fact that the second educational reform significantly resulted in learners’ and teachers’ learning reform. One important mechanism enabling the reform to be successful was changing in administrative paradigm, which empowered the Department of Local Governing in educational administration both for the mainstream and continuing education (the non-formal education and the informal education). The purpose was to enable learners to learn through their daily lives. Education had to be provided according to the three national educational standards, especially the third standard of setting the learning society/knowledge society in schools (strengthening learning approaches and resources). The affiliated schools were therefore obliged to establish the learning community in their school with an aim to quality and standardize teachers and educators so that their work outcomes would be efficient. This finding is correlated to [11], who wrote an article and mentioned one indispensable factor in school development, which is the school’s professional learning community or a venue for members or teachers to interact on students’ care, improvement of students’ academic results, and the school’s academic work.

The major focus of this study was on the importance of standard factor loading of each variable in the relationship model of technological leadership of school principals and professional learning community. Findings of this study revealed that all the dimensions of technological leadership show the factor loading values from 0.835 to 0.894, with statistically significant at 0.01. The co-variance with innovative leadership correlates well with the empirical data with statistical significance [12]. Hence findings also indicated that all the six dimensions of technological leadership namely use of technology in administration (ADM), promoting use of technology in teaching (TEA), having vision in technology (VIST), having ethics in the use of technology (ETH), supporting and assisting in management and implementation (OPE), and use of technology in assessment and evaluation (EVA) are important for innovative leadership practiced by school administrators. As a result, findings seem to be in accordance with theory and previous research studies.

On the other hand, all the components of professional learning community had the factor loading values from 0.819 to 0.900, with statistical significance at 0.01 (p<.01). The co-variance with professional learning community from 67.0 to 81.0 percent, showing that all the synthesized factor of professional learning communities correlates quite well with the empirical data [15]. As a result, researchers obtained all the four components of professional learning community namely shared vision (VIS), encouragement and shared leadership (LEAD), team and learning network (TEAM), and supportive structure (SUP) and considered as important variables of professional learning community. As a conclusion, this finding is in line with concepts, theories, and past research works to the components of professional learning community.

The degree of correlation between technological leadership and professional learning community was indicated by the standard factor loading (β = 0.908), which was high and positive with statistically significance at 0.01. Moreover, it was found that the relationship model of technological leadership and professional learning community correlated very well with the empirical data with statistically significance. This shows that the technological leadership of school principals and professional learning community correlated in the same direction. In short, if school principals have highly practiced technological leadership, their professional learning community degree will be high too. Nevertheless finding revealed that this model of relationship between technological leadership and professional learning community was found to be consistent with empirical data with β = 0.908, χ² = 45.616, df = 32, χ²/df =1.4255, p = 0.0561, RMSEA = 0.032, SRMR= 0.012, CFI = 0.996, TLI = 0.995as what has been proposed by researchers. As a result, this means that technological leadership and professional learning community model may explain the relationship between technological leadership and professional learning community closely. The results of the study of direct, indirect, and total influences of technological leadership on the professional learning community of the schools revealed that technological leadership had direct
positive influence on the professional learning community at 0.908 (p<.01). The variables of technological leadership in the model could explain the variance of the professional learning community at 82.5 percent. The observed variable of technological leadership showing the highest coefficient factor loading in the form of standard score was assisting in management and implementation (OPE) perspective. It should be understood that the local governing organizations are well prepared in terms of resources to support education since they earn incomes from collecting local taxes. The money is spent on administration and implementation of the organizations. There are also networks that cooperate with local units that are ready to support education. The schools affiliated with the organizations thus are allocated with sufficient budget and resources. Technology is promoted to be used in administering schools. [13] who had improved the structure and added a condition that influenced the school of learning, i.e., leaders should express clear visions, encourage target’s acceptance, support each individual, and help in building school’s structure in order to increase participation.

CONCLUSION

The results of validation of goodness of fit of the empirical model indicated that propelling the professional learning community in a school requires development of all components of technological leadership. Therefore, organizations related to educational administration should organize integrated development of technological leadership because the professional learning community in a school is possible through influences of all components of technological leadership. This study found to have the above mentioned aspects of technological leadership supported the proposition that technological leadership associated with professional learning community practices. Technological leadership aspects emerged as supporting the process of professional learning community practices in the context of this study. The overall findings of this study are useful for the policy makers, educational administrators, educators and practitioners. Empirical development in school organizations largely neglects to recognize technology as an element of school leadership. This study provides empirical justification that technological leadership in particular is crucial in the construction of professional learning community practices. Such findings establish school organization as a social process rather than as economic logic. The richness and justification of data reveals its valuable contribution of knowledge from an academic prospective. This study also contributes to the work of school principals in several ways. The findings highlighted the important of innovative, and thus acknowledge the managerial implications of incorporating innovative based professional learning community into the educational administration system.

There were several limitations noted. The general limitation is the scope of the study. Therefore future researchers are encouraged to conduct multiple models where individuals, organizations or educational areas are taken into account. In addition, a research conceptual framework should be developed into a model for instilling technological leadership of school administrators in order to create effective professional learning community of school organization. A truly application of this significant research results into practices in the future is necessity.

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