A CAUSAL RELATIONSHIP MODEL OF FACTORS OF EDUCATION MANAGEMENT TO ENHANCE EFFICIENCY BY TEACHING AND LEARNING INFORMATION TECHNOLOGY

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Abstract

This article aimed 1) to analyze the educational management factors to enhance teaching and learning efficiency through information technology, 2) to assess and enhance educational management for improved teaching and learning through information technology, and 3) to present a model to enhance teaching and learning efficiency using information technology in schools under the Secondary Educational Service Area Office Bangkok 2, Bangkok, Thailand. The sample comprised 400 high school students, 12 academic administrators, and head teachers, who were selected by multistage random sampling. The instruments for collecting the data were a questionnaire and interview. The data were analyzed by structural equation modeling. The research results were as follows:

1) The study included six factor components and 28 observed variables affecting educational management for enhancing teaching and learning efficiency through information technology.

2) The educational management policies significantly affected the schools' budgets (0.342), followed by Thailand's educational evolution's impact on the schools' status (0.148), and the influence of technology adaptation on teaching and learning efficiency with information technology (0.562). All these effects were statistically significant at a level of 0.05.

3) The model fitted well with the data (X^2/df = 1.930, p-Value = 0.000, CFI = 0.976, GFI = 0.931, RMSEA = 0.043, and RMR = 0.025) and was introduced as the THAM Model.

Keywords: Causal relationship model, Educational management, Efficiency of teaching and learning management, Utilizing information technology in instruction

Introduction

The use of information technology to enhance teaching and learning is an educational innovation that shifts from traditional classrooms to technology-driven methods. However, managing teaching and learning faces challenges, including IT quality and effectiveness concerns.(Jinda, 2016) Advancing school IT in curriculum, efficiency, quality assurance, teaching methods, and overall management is essential. (Jongpeeradechanon & Paiwittayasiritham, 2019) Therefore, educational institutions should adopt network technology with four dimensions—users, technology, content, and evaluation. It is important for effective technology-based learning and supports education in the digital age. (Baonerd, 2012)

This research investigated educational management factors for enhancing teaching and learning through information technology in a sample group within under the Secondary Educational Service Area Office Bangkok 2. This district housed numerous schools, some among the region's largest, where administrators and staff had expressed the need for guidance on using information technology at the foundational education level. The study explored causal relationships among these factors, offering valuable insights for future research.

Research Objectives

After reviewing related research, the need for guidelines to prepare educational management for effective adaptation to exceptional situations through technology is apparent. Research on technology-based educational management catering to learner needs is limited. Therefore, educational institutions are keen to develop a model for applying information technology in teaching and learning to support digital education. The objectives are as follows: To analyze educational management factors to enhance teaching and learning efficiency through information technology under the Secondary Educational Service Area Office Bangkok 2.To assess and enhance educational management for improved teaching and learning through information technology under the Secondary Educational Service Area Office Bangkok 2 and to present a model to enhance teaching and learning efficiency using information technology in schools under The Secondary Educational Service Area Office Bangkok 2.

Literature Review

The primary aim of this research was to investigate the factors that influenced the efficiency of teaching and learning management using information technology under the jurisdiction of the Secondary Educational Service Area Office Bangkok 2. This has studied theoretical concepts related to factors that enhanced effective teaching and learning with technology. By studying various theories as follows: Education management policies during the epidemic period, Models for effectively organizing education using information technology include: TPACK Model is used to investigate the effectiveness of various formats for organizing teaching and learning with information technology. The Learner-Learner Model comprehends how learners can effectively learn from one another. Study Connectivism Theory to harness the form and significance of networks and connections between knowledge in the digital realm to enhance digital learning effectiveness. In addition, study about IS Success Model to establish educational quality assurance management, and Technology Acceptance Model with the goal of creating a Causal Relationship Model for improving teaching and learning efficiency through information technology. (DeLone & McLean, 2003; Koehler & Mishra, 2009; Hollins-Alexander, 2013; Downes, 2012; Davis,1986)

Hypotheses of the research

After reviewing the literature, the researcher defined the Endogenous Latent Variables, which comprised 5 variables as follows:

A1: Educational management policies and principles (POLI) within the new pandemic scenario consist of 9 observed variables (X_1- X_9).

A2: The factors associated with the transformation of the Thai education into the digital age (EVOL) comprise a total of 7 observed variables (X_{10}- X_{16}).

A3: The factors associated with the adaptation and acceptance of information technology (ADAP) usage comprise a total of 9 observed variables (X_{17}- X_{25}).

A4: The school budgets (BUDG) comprise 7 observed variables (X_{26}- X_{32}).

A5: The school's status (EFFI) encompasses 7 observed variables (X_{33}- X_{39}).

Exogenous Latent Variable comprises a single variable, as follows:

B1: Factors influencing the effectiveness of teaching and learning management through information technology (PER) comprise 8 observed variables, encompassing Y_1- Y_8.

Conceptual Framework

Based on the literature reviews of each variable, the relationship between each variable was described. Next, the conceptual framework and hypotheses were formulated and presented to identify both the direct and indirect factors that influenced the efficacy of educational management through information technology. Furthermore, it involved an analysis of the causal relationships between these factor components and an evaluation of their alignment with the research hypotheses outlined for that study. The following conceptual framework in Figure 1 illustrated the interrelationships among the 5 component factors that enhanced teaching and learning management efficiency through information technology.

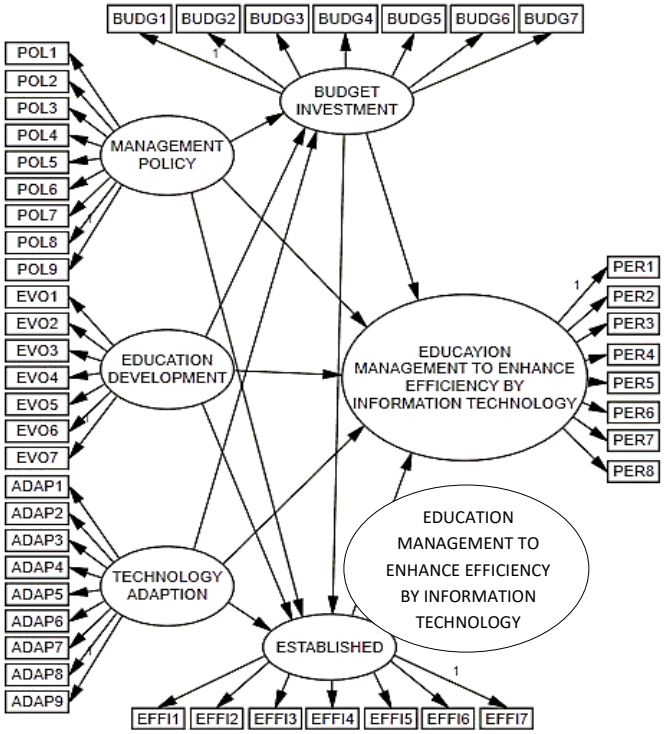


Figure 1: Conceptual framework

Research Methodology

The study titled 'A Causal Relationship Model of Factors of Education Management to Enhance the Efficiency by Teaching and Learning Information Technology' employed a mixed methods research design, utilizing a Structural Equation Model (SEM) framework. The research methodology encompassed the following procedural steps:

Populations and Samples

The population consisted of the School Director, Head of Academic Affairs, and students from educational institutions under the jurisdiction of the Secondary Educational Service Area Office Bangkok 2, for the academic year 2022. This group included 52 schools and a total of 58,490 high school students. The sample group comprised 12 individuals, including School Director and Head of Academic Affairs, who were systematically selected through a Simple Random Sampling technique. This process involved a lottery-style selection from schools in each of the 6 educational districts, typically selecting a School Director and Head of Academic Affairs. This purposeful selection yielded 12 participants for the qualitative research phase. Additionally, the quantitative research phase involved 400 students selected using a Multistage Random Sampling method, considering the proportional representation of schools in each of the 6 educational districts.

Measurements

The survey instrument that assessed educational management for improving teaching and learning efficiency with information technology comprised 5 latent variables covering Educational management policies and principles (POLI), The Transformation of the Thai education into the digital age (EVOL), The Adaptation and Acceptance of Information Technology (ADAP), The school budgets (BUDG), The school's status (EFFI). nstrated content validity, with all items having content validity index (CVI) values falling within the range of 0.67 to 1.00. Moreover, the questionnaire exhibited a notably high level of reliability, with a Cronbach's Alpha coefficient of (α-0.993). The unstructured interviews concerning opinions about factors associated with the effectiveness of managing teaching and learning through information technology in schools were executed with predefined objectives. These interviews demonstrated content validity, with a content validity index (CVI) of 1.00 for all items.

Statistical Methods

The initial data analysis had two primary components: First, it explored the demographic profiles of the sample group through descriptive statistics, including frequencies and percentages. Second, it assessed the Likert-scale questionnaire data

using statistical parameters like mean, standard deviation, coefficient of variation (CV), skewness, and kurtosis to understand variable distribution and variability characteristics.

The preliminary assessment of statistical assumptions encompasses the following procedures: Verification of Data Normality: This involves scrutinizing data normality by evaluating skewness, and kurtosis, and constructing a correlation matrix. Evaluation of Interrelationships Among Variables: Bartlett's test, with a statistical significance level below 0.05 (Sig. < 0.05), is employed to examine the interrelationships among variables. Suitability Assessment of Components: The KMO (Kaiser-Meyer-Olkin) test is utilized to appraise the suitability of components. A KMO value ranging from 0.5 to 1.0 is deemed acceptable. For Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM) analyses, it is imperative that independent variables exhibit linearity with dependent variables, and the interrelationships among independent variables should not exceed 0.8, following the guidelines outlined. (Stevens, 2002)

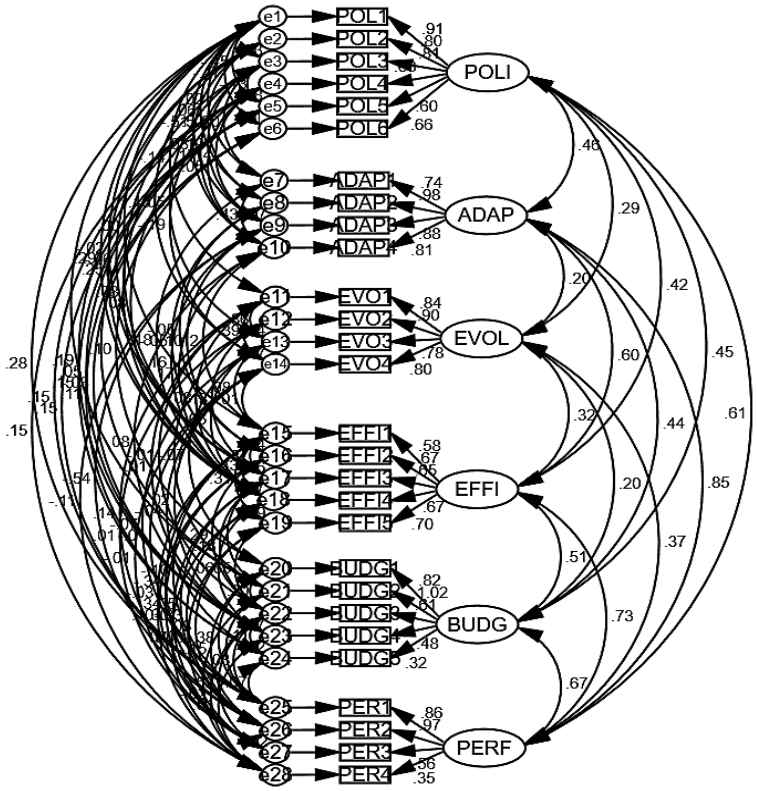
The research analysis, aimed at validating research hypotheses, encompasses the following processes: Exploratory Factor Analysis (EFA): This approach is utilized to investigate and delineate the underlying components that elucidate the interrelationships among variables. Confirmatory Factor Analysis (CFA): Is employed to authenticate the theoretically endorsed model, evaluate the structural integrity of latent variable measurement models, and corroborate model concordance with empirical data. Structural Equation Modeling (SEM): Employed to scrutinize the causal associations among each independent variable, including both direct and indirect effects as proposed by the methodology. (Hatsaprab, 2016) And focus group discussions for the synthesis of study results about the educational management model aimed at improving teaching and learning efficiency through information technology.

Results

Objective 1: The research findings revealed that the results of the Exploratory Factor Analysis (EFA) showed 6 factors comprising a total of 28 observable variables, as outlined below:

The factor related to Educational Management Policies and Principles (POLI) comprised 6 observable variables. The factors associated with the transformation of Thai

education into the digital age (EVOL) comprised 4 observable variables. The factors associated with the adaptation and acceptance of information technology (ADAP) comprised 4 observable variables. The factor concerning the effectiveness of teaching and learning management through information technology (PER) consisted of 4 observable variables. The factor related to the school's status (EFFI) included 5 observable variables. The factor concerning school budgets (BUDG) comprised 5 observable variables. The outcomes of the confirmatory factor analysis (CFA) undertaken to assess the model's conformity to the research hypotheses were presented below:



CMIN=436.080, df=226, CMIN/df=1.930, p=.000, CFI=.976, GFI=.931, RMSEA=.048, RMR=.025

Figure 2: Congruence of the model with the research hypotheses.

Table 1: Statistical measures of congruence

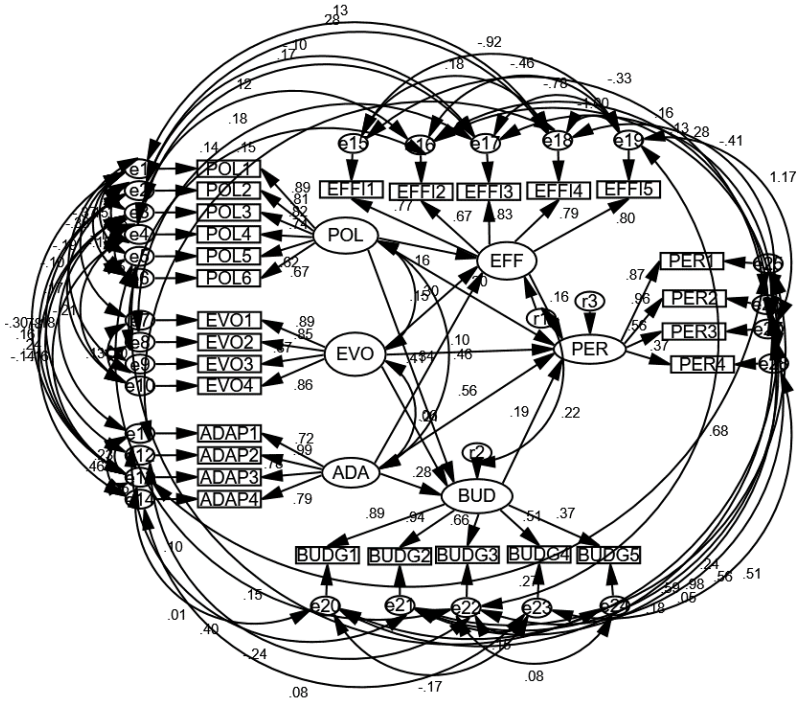
Model	X^2	df	X^2/df	P-Value	CFI	GFI	RMSEA	RMR	Result
Construct			<3.0	>.05	>.90	>.90	<0.08	<0.05	
POLI	10.291	5	2.058	0.067	0.996	0.991	0.052	0.003	Accept
EVOL	0.960	1	0.960	0.327	1.000	0.999	0.000	0.001	Accept
ADAP	0.071	1	0.071	0.711	1.000	1.000	0.000	0.002	Accept
EFFI	1.518	1	1.518	0.218	0.999	0.998	0.036	0.002	Accept
BUDG	9.258	4	2.314	0.055	0.994	0.990	0.057	0.010	Accept
PERF	2.394	2	1.197	0.302	0.999	0.997	0.022	0.005	Accept
Total	436.080	226	1.930	0.000	0.976	0.931	0.043	0.025	Accept

Table 1 provided a visual representation of the statistical indicators that depicted the alignment of the comprehensive model concerning the factors influencing educational management aimed at enhancing the efficiency of teaching and learning through information technology.

Objective 2: The research findings showed that the model exhibited an X^2 value of 566.755 with 275 degrees of freedom, resulting in an X^2/df ratio of 2.061, and a p-Value of .000. The comparative fit index (CFI) registered at .966, the goodness-of-fit index (GFI) at .908, the root mean square error of approximation (RMSEA) at .052, and the root mean square residual (RMR) at .025. These outcomes signify a strong alignment of the model with the theoretical framework. (Tabachnick & Fidell, 2007) In conclusion, the educational management model, designed to enhance teaching and learning efficiency through information technology, was statistically well-fitted at an acceptable level.

Table 2: Statistical measures of congruence following model adjustment

X^2	df	X^2/df	P-Value	CFI	GFI	RMSEA	RMR	Result
566.755	275	2.061	0.000	.966	.908	.052	.025	Accept



CMIN=566.755, df=275, CMIN/df=2.061, p=.000, CFI=.966, GFI=.908, RMSEA=.052, RMR=.025

Figure 3: Confirming model alignment after adjusting.

Table 3: Hypothsis Testing

Variables				Standardized	Unstandardized			P-value	Results
				Regression Weights	Estimate	S.E.	C.R.		
H1	EFFI	<---	POLI	.162	.187	.045	4.155	***	Accepted
H2	EFFI	<---	EVOL	.148	.151	.035	4.310	***	Accepted
H3	EFFI	<---	ADAP	.408	.383	.039	9.734	***	Accepted
H4	BUDG	<---	POLI	.342	.192	.041	4.681	***	Accepted
H5	BUDG	<---	EVOL	.056	.027	.024	1.129	.259	Rejected
H6	BUDG	<---	ADAP	.280	.127	.029	4.445	***	Accepted
H7	PER	<---	POLI	.195	.285	.046	6.256	***	Accepted
H8	PER	<---	EVOL	.102	.131	.030	4.384	***	Accepted
H9	PER	<---	ADAP	.562	.666	.045	14.766	***	Accepted
H10	PER	<---	EFFI	.162	.204	.035	5.845	***	Accepted
H11	PER	<---	BUDG	.193	.502	.111	4.529	***	Accepted

*** P $\leq$ 0.05

As shown in Table 3, the results of hypothesis testing indicated that all variables exhibited a statistically significant and positive influence on each other at a significance level of 0.05, except for EVOL, which did not show a statistically significant impact on school budgets (BUDG).

Table 4: Path Analysis results

Variable	R^2	Hypothesis	Independent variable				
			ADAP	EVOL	POLI	BUDG	EFFI
EFFI	0.316	DE	0.408***	0.148***	0.162***	-	-
		IE	-	-	-	-	-
		TE	0.408***	0.148***	0.162***	-	-
BUDG	0.304	DE	0.280***	0.056	0.342***	-	-
		IE					
		TE	0.280***	0.056	0.342***	-	-
PER	0.864	DE	0.562***	0.102***	0.195***	0.193***	0.162***
		IE	0.120***	0.035***	0.092***	-	-
		TE	0.682***	0.137***	0.287***	0.193***	0.162***

*** $P \leq 0.05$

As shown in Table 4 displays that the variable ADAP exerts the most significant direct influence on the PER (0.562), ADAP remains the most influential factor, demonstrating a total effect of (0.682). Additionally, it exerts a notable indirect influence through the mediation of EFFI and BUDG factors. In summary, ADAP is the primary factor influencing teaching and learning efficiency through information technology, both directly and indirectly through other factors.

Objective 3: The research findings led to SEM analysis results that created a prototype educational management model aimed at enhancing teaching and learning effectiveness through information technology in schools overseen by the Office of the Secondary Educational Service Area Office Bangkok 2 (THAM MODEL).

T: Transformation Learning and Technology Adoption and ICT Literacy

H: Harnessing Experience

A: After Action

M: Budget Management

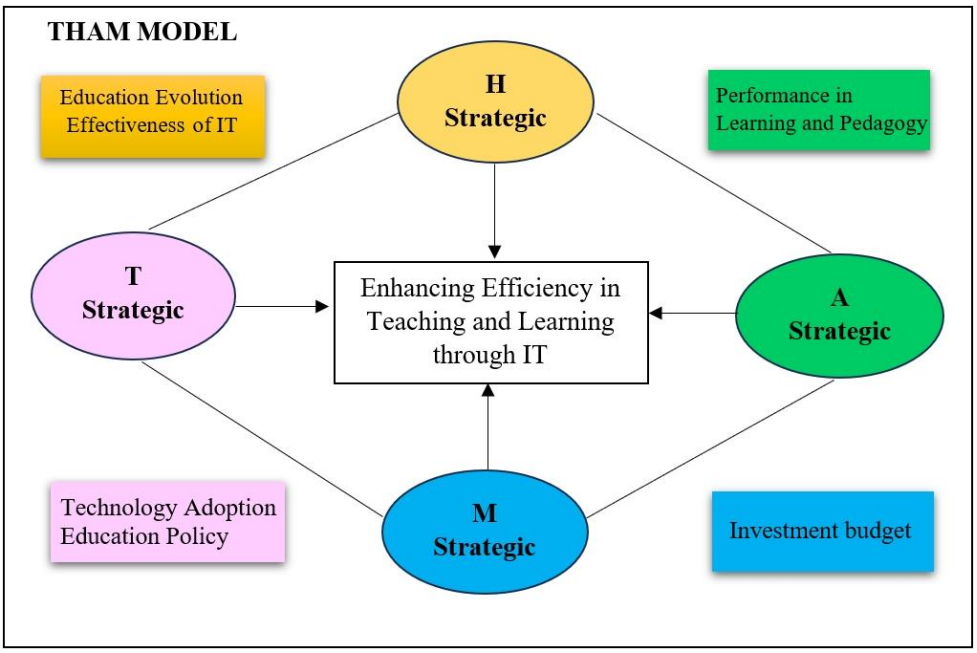


Figure 4: THAM Model

Discussion and Conclusion

The results of the Confirmatory Factor Analysis (CFA) demonstrated that all 6 factors and the overall model aligned well with the theoretical framework. This analysis confirmed the presence of 6 factors, comprising a total of 28 observed variables, which showed strong consistency. Subsequently, when subjected to Structural Equation Modeling (SEM) to examine its impact on educational management aimed at enhancing the efficiency of teaching and learning through information technology, the findings revealed that the model was in aligned well with the the proposed theoretical framework. (Tabachnick & Fidell, 2007) Consequently, it was concluded that the model was consistent with the theoretical framework at an acceptable level.

The Direct Effect (DE) pathway analysis results indicated that factors related to ADAP had the most significant direct impact on PER (0.562). This was because individuals' perceptions of technology's benefits strongly influenced their attitudes and motivation toward technology-enhanced learning, as supported by research conducted. (Annas et. al., 2022) These findings were consistent with the work of Dubey (2020), which highlighted the role of technology-related interests in Learners' satisfaction with their educational experiences. In contrast, the factors associated with EVO had the least direct

impact. Due to limited educational technology utilization in many schools, the impact of EVOL was perceived as minor by students. Analyzing the overall Total Effect (TE) using a comprehensive dataset to enhance teaching and learning efficiency through information technology in educational management revealed that the most significant influence came from factors related to ADAP. They were followed in descending order of impact by factors related to POLI, BUDG, EFFI, and EVOL. All findings maintained a statistical significance level of 0.05.

The researchers, drawing upon the preceding research study, utilized variables derived from statistical analysis to create an educational management model aimed at optimizing teaching and learning efficiency through technology, known as the THAM Model. This model adapted well to various school contexts and was structured around 4 distinct principles;

The abbreviation 'T' stands for two key concepts. 'Transformation Learning' emerged from an analysis of educational management policies and principles (POLI) within the new pandemic scenario. This paradigm shift prioritized equipping students with vital future-oriented skills, emphasizing the importance of 21st-century skills. Secondly, 'T' represented 'Information Technology, Computer, and Communication Literacy.' This emphasized the adaptation to and embrace of technology, enhancing readiness and acceptance among educators and students. 'H' embodied Harnessing Experience, uniting knowledge and expertise. Stemming from factors related to the school's status (EFFI) and the transformation of Thai education into the digital age (EVOL), it merged traditional and modern learning management. Engaged seasoned educators across epochs, shaping tailored educational strategies using suitable information technology for each school. This cultivated students with skills for future global challenges. "A" signified After Action, reflecting learning through the effectiveness of teaching and learning management through information technology (PER); it mirrored pivotal student outcomes. Continuous analysis and refinement of student outcomes facilitated efficient learning. "M" denoted Budget Management; it stressed the administration's financial governance and sought support from both the public and private sectors to invest in crucial infrastructures for technology-integrated learning environments.

The recommendations from this research are as follows:

1. Advocated for high-quality ICT service readiness in schools by seeking support and aid from various funding sources. Facilitated coordination between proficient public agencies and the private sector to invest in and maximize the advantages of government provisions.

2. Implement a comprehensive educational management approach that underscores system-wide integration. Prioritize the establishment of foundational frameworks supported by allocated budgets, personnel, and expertise from private entities. Establish objectives and cooperative frameworks among organizations to apply national strategies internationally, fortifying Thai schools from local to national echelons. Furthermore, extend the initiative to establish exemplary schools that draw interest from the private sector, particularly IT and educational technology companies. These firms can contribute investments and collaborate in school management to develop 'Learning Anywhere, Anytime' systems in alignment with prevailing global trends and policies. This initiative aims to facilitate uninterrupted learning in both current and future educational landscapes while adhering to principles and educational management policies amidst the challenges presented by the new disease situation, as derived from this research study.

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