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Development of Digital Culture Model for Small Size Schools in the Northeast Region of Thailand

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Abstract

This research was planned to study the components and indicators in developing digital culture model for small size schools in northeast region of Thailand. A total of 420 school administrators and teachers participated in a survey. A mixed mode design using survey questionnaire was employed after they conceptualized five components and indicators using document analysis. The results showed that the assessment model was consistent with empirical data with $\chi^2 = 103.850$, df = 85, $\chi^2/df = 1.221$, p = 0.0806, RMSEA = 0.023, SRMR = 0.017, CFI = 0.997, TLI = 0.995. Therefore, the assessment model has a goodness of fit.

Keywords: Components, Digital Culture Model, Indicators, Primary Small Size Schools.

Introduction

Digital culture in school administration is defined as the integration and utilization of digital technologies, tools, and practices in the management and operation of educational institutions (Duerr et al., 2018). This includes a wide range of activities, from communication and collaboration to data management and decision-making (Elia et al., 2020). Efficient communication among school administrators, teachers, parents, and students through email and messaging platforms is a main component of digital culture. Generally, they are using digital tools such as Google Workspace or Microsoft 365 for collaborative document editing, file sharing, and real-time collaboration (Elia et al., 2020).

Student Information System (SIS), Learning Management Systems (LMS), and Data Analytics are the common data management and analytics components used in school management of basic education of Thailand. SIS are digital platforms for managing student records, grades, attendance, and other essential information (Duerr et al., 2018). On the other hand, LMS is also a component of digital culture practiced in schools by utilizing digital platforms for course management, online learning, and assignment tracking (Gencer, 2019). Data analytics is used to analyze student performance data to identify trends assess learning outcomes, and make informed decisions (Gencer, 2019). In short, schools can enhance efficiency, transparency, and communication while preparing students for a technology-driven world by embracing a digital culture in school administration. However, digital culture requires a strategic approach, ongoing training and commitment to staying abreast of technological advancements in education (Gencer, 2019).

In Thailand, there are four types of school sizes, namely extra-large, large, medium, and small sizes. Small-sized schools in Thailand can offer a unique learning experience for students and provide a more personalized approach to education. However, these schools may also face some challenges, such as limited resources and a smaller pool of teachers (Thisopha et al., 2023). School leadership and management are extremely important for small-sized schools because effective school management provides structure and guidance for the overall functioning of the educational institution. Therefore, educational management is crucial for small-sized schools as it assists in providing a quality education that meets the needs of students, teachers, and the local community (Limpaiboon et al., 2023).

According to Heinz et al. (2021), a digital vision plays a crucial role in shaping and fostering a digital culture within an educational

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institution. It provides a clear and forward-thinking framework that guides the integration of digital technologies, practices, and values across various aspects of school administration. This is because a digital vision articulates the school's goals, values, and aspirations in the context of digital transformation. It assists align the use of technology with the overall mission and educational objectives of the school. Heinz et al. (2021) highlighted the importance of creating a flexible working environment within a school as part of the digital culture involves leveraging digital technologies to enable collaboration, communication, and efficient workflow, regardless of physical location. For example, school can invest in robust digital infrastructure, including secure internet connections, virtual private networks (VPNs), and cloud-based collaboration tools to support remote work for school administrators, teachers, and support staff.

Another important component of digital culture for school administrators is to incorporate innovative media into school management aligns with the digital culture and introduces values that contribute to a dynamic and effective educational environment, was suggested by Elia et al. (2020). For instance, innovative media such as interactive educational software, virtual simulations and gamified learning platforms, can make learning more engaging and enjoyable. This fosters a positive and motivated learning environment. Innovative practices in digital culture within schools involve the creative and strategic use of digital technologies to enhance teaching, learning, and overall school management (Gencer, 2019). These innovative practices such as flipped classroom, artificial intelligence for personalized learning, coding and computational thinking, online and blended learning not only embrace digital culture but also contribute to creating a dynamic and future-ready learning environment within schools. They encourage creativity, critical thinking, and adaptability among students and teachers alike. The final component is digital networks that play a crucial role in the digital culture of school management, enabling efficient communication, collaboration, and information sharing (Gencer, 2019).

Materials and Methods

Research Design

The researchers employed a mixed-mode research design that associated two different data collection methods, namely document analysis and survey. The rationale for employing this research design was to obtain a more comprehensive and nuanced understanding of the research problems as discussed above. According to Creswell and Plano Clark (2011), each data collection method has its own strengths and weaknesses, and by using multiple methods, researchers can offset the limitation of each method and enhance the overall quality of the data. In the first phase of this research, a documentary review was employed to analyze relevant literature, reports, policies, and other documents to identify existing theories, frameworks, and vital components related to digital culture. This document analysis would help the researchers develop a theoretical foundation for the quality culture model (Morgan, 2022). The results of this document analysis are aimed to further investigate their relationship in a linear structural model using structural equation modelling.

In the second phase, the researchers employed survey questionnaire as a method to collect quantitative data. A specific group of school administrators and teachers from primary small-sized schools in northeast region of Thailand participated in the survey. A survey design was chosen because surveys could be administered to a large and diverse population, providing a broad range of responses. A large sample size enhances the generalizability of the results to the target population (Gay et al., 2009). Moreover, surveys also could minimize the influence of the researchers on participants' responses. This objectivity can be valuable in obtaining unbiased information (Gay et al., 2009).

Population and Sampling

A multi-stage sampling technique was administered to select samples from multiple levels. This approach was used because the target population is large and diverse, making it impractical to conduct a simple random sample. Moreover, multi-stage sampling allows the researchers to break down the population into smaller, more manageable units and then sample from these units in stages. Firstly, a subset of clusters was randomly selected from the population, that was a province. The number of clusters selected depended on the desired sample size and the sampling method chosen was a simple random sampling technique. Secondly, systematic sampling was employed within each selected cluster depending on the small-sized schools. The number of samples within each cluster was proportional to the cluster size, depending on the school size.

At the final stage, the research population was comprised of school administrators and teachers from 20 provinces in northeast region of Thailand. The researchers employed Becker and Ismail's (2016) rule of thumb to formulate an adequate sample size (N). The identified sample size was recognized as the presence of classified practice in reaching an adequate probability of the requisite findings include model convergence, statistical precision and statistical power for particular confirmatory factor analysis (CFA) with empirical data. The sample size was obtained per parameter in the ratio of 20:1. Since there were 21 parameters, the required sample size was 420 respondents. Since the sub-group were school administrators and teachers, the researchers selected school administrator and teacher by proportionate from 6646 primary small-sized schools, making up a total of 420 samples consisting of 36 school administrators and 384 teachers. The survey was steered to evaluate the components and indicators of the digital culture model. Table 1 presents the distribution of the population and sample group.

Drovinco	Number of Schools	Populati	on	Sample	Total	
Province	Number of Schools	Adminis-trator	Teacher	Adminis-trator	Teacher	10141
Kalasin	318	192	2116	2	18	20
Khon Kaen	600	309	3937	6	29	35
Chaiyaphum	388	262	2566	2	22	24
Nakhon Phanom	252	183	1778	2	15	17
Nakhon Ratchasima	661	349	4864	3	40	43
Bueng Kan	87	62	709	1	7	8
Buriram	368	231	2767	2	23	25
Mahasarakham	374	250	2457	2	20	22
Mukdahan	142	84	1064	1	10	11
Yasothon	233	143	1521	1	13	14
Roi Et	468	267	3021	4	23	27
Loei	256	135	1407	1	12	13
Sisaket	435	292	3191	3	26	29
Sakon Nakhon	279	143	2224	1	18	19
Surin	300	165	2327	1	19	20
Nong Khai	151	97	1023	1	9	10
Nong Bua Lamphu	167	110	1135	1	10	11
Amnat Charoen	174	129	1318	1	11	12
Udon Thani	394	247	2723	2	23	25
Ubon Ratchathani	599	379	4145	3	33	36
Total	6646	4029	46293	36	384	420

Table 1: Distribution of Population and Sample Groups.

Source: Office of the Basic Education Commission (2022)

Research Procedures

The researchers started their research through determination of components and indicators of digital culture as a specialized concentrate of their document analysis. This research method involved systematically examining and interpreting documents to extract information relevant to identify components and indicators of a digital culture model for primary small-sized schools in northeast region of Thailand. Document analysis is an iterative process. The researchers refined the coding framework as needed based on emerging insights from the documents. Then the researchers continued the analysis until saturation was reached, and new information ceased to emerge.

The second phase was applied to identify components and indicators of digital culture derived from the document analysis in the first phase. The researchers conceptualized the model by developing a theoretical framework that represents the components and indicators of digital

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culture. Then, the researchers defined the latent constructs (components) and their corresponding observed indicators (refer to Figure 2). Quantitative data on the variables included in the model were collected using a questionnaire in order to capture information related to digital culture. This was to ensure that the data collected would be aligned with the identified components and indicators.

This was followed by the researchers constructed an assessment model that indicates the relationships between the latent constructs and their observed indicators. This step was used to ensure the selected indicators adequately measure their corresponding components. Once the assessment model was established, the researchers specified the relationships between the latent constructs. In other words, the researchers determined the relationships between the components based on the theoretical framework. The structural model represents the causal relationships between the components of digital culture (Hair et al., 2013). Figure 1 illustrates the research process.

Figure 1. Research Framework



Research Instrument and Data Analysis

A checklist was served as a structured research instrument for document analysis to determine the components and indicators of digital culture. The researchers-maintained consistency and rigor in this approach by recording essential details about the documents the researchers were analyzing them. The researchers summarized the content of the field notes to provide an overview of the document's content. The researchers identified the main themes, arguments, or ideas that related to digital culture presented in the documents. This was followed by noting any key findings, evidence, or examples that support the document's central message (Gay et al., 2009).

In the second phase, a questionnaire that includes a total of 30 closed items as a research instrument to collect quantitative data. The closed items were clear, concise, and appropriately worded to elicit the desired information that fit into five pre-determined components and 16 indicators from the results of the first phase. A continuous five-choice Likert scale was used to assess 420 respondents' perceptions of digital culture practice. There were six sections with a total of 35 items consisting of five items about demographic information and 30 items about five components of digital culture.

Section A collects basic demographic data about the respondents, namely age, gender, position, educational level, and working experience. The demographic information helps the researchers understand the characteristics of the sample population and analyze how different components might influence their response. This is followed by Section B to Section F which was particularly designed by the researchers to obtain data about the digital vision, flexible atmosphere for working, value of learning with innovative media, innovative practices, and digital network, respectively. The contents of the questionnaire from Section B to Section F are as follows: Section B consists of three digital vision indicators (5 items), namely creating a future vision, executing the vision, and communicating personnel, work standards and responsibility, being part of the organization, and flexibility of organizational structure. Section D consists of three values of learning with innovative media indicators (7 items), namely attitude towards new learning, creating an understanding of innovation, and team digital commitment. Section E is comprised of three innovative practices indicators (5 items), namely information technology skills, creativity, and systematic management. Section F is comprised of three digital network indicators (7 items), namely learning to connect knowledge on network, participation and exchange information, and public relations through online channels.

Results and Discussion

The results of first phase identified five vital components of digital culture: (i) digital vision (VS); (ii) flexible atmosphere for working

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(AW); (iii) value of learning with innovative media (IV); (iv) innovative practices (IP), and (v) digital network (ND). Moreover, there were 16 digital culture indicators which derived from the five vital components with regards to fit the Thai context. Table 2 display the details of the vital components and their indicators of digital culture.

After the researchers discussed with the experts in educational measurement and evaluation, they suggested determining a cut-off point as a mean score of more than 3.00 and less than 20 percent as the coefficient of scattering (CV), to create those indicators on the foundation of previous studies related to the digital culture. The results indicated that all the components and indicators of digital culture are fulfilling the conditions because the mean score are more than 3.00 and CV values are less than 20%. If we arranged the components of digital culture showed that the highest mean score was value of learning with innovative media ($\bar{x} = 4.48$; SD = 0.51). This was followed by flexible atmosphere for working ($\bar{x} = 4.47$; SD = 0.43), digital vision ($\bar{x} = 4.38$; SD = 0.58), and digital network ($\bar{x} = 4.41$; SD = 0.58), in that order. The innovative practices was found to be the least capacity ($\bar{x} = 4.40$; SD = 0.56), as illustrated in Table 2.

A digital culture model was then developed by the researchers which representing the identified five components and 16 indicators through arranging them in a logical manner to reflect their interrelationships. Hence, this model would provide a comprehensive and structured overview of the ethical considerations relevant to digital culture within the researchers' selected scope. The results of Pearson correlation coefficients were utilized to measure the linear relationships between pairs of 16 indicators.

Table 3 elucidates the results of intercorrelation between the 16 indicators of digital culture indicating that there are positive correlations for all relationships between pairs of 16 indicators. This implies that as one indicator increases, the other tends to increase too. In addition, the magnitude of the correlation coefficients ranged from 0.396 to 0.776 revealing the strengths of the relationships from moderate to strong, with values closer to 1 representing a stronger correlation and all the relationships are statistically significant at 0.01 level. Consequently, results also showed that the relationship between the systematic management indicator (IP3) and learning to connect knowledge on network indicator (ND1) (r = .776; r < .01) was the highest magnitude of the correlation coefficient was the information technology skills indicator (IP1) and being part of the organization indicator (AW3) (r = .36; p < 0.01), as illustrated in Table 3.

Components	Indicators	Mean	Std. Dev	CV
	Creating a future vision (VS1)		0.79	18.15
Divital vision (US)	Executing the vision (VS2)	4.32	0.78	18.08
Digital Vision (VS)	Communicating the vision (VS3)		0.71	15.77
	Total		0.58	13.24
	Motivating and reinforcing personnel (AW1)	4.52	0.70	15.43
	Work standards and responsibility (AW2)		0.74	16.84
Flexible atmosphere for working (AW)	Being part of the organization (AW3)	4.53	0.65	14.56
	Flexibility of organizational structure (AW4)	4.52	0.69	15.26
	Total	4.47	0.43	9.61
	Attitude towards new learning (IV1)	4.44	0.74	16.57
Value of learning with innovative modia (IV)	Creating an understanding of innovation (IV2)	4.46	0.68	15.15
value of learning with hinovative media (1v)	Team digital commitment (IV3)	4.53	0.67	14.80
	Total	4.48	0.51	11.38
	Information technology skills (IP1)	4.37	0.74	16.84
Longeventive practices (ID)	Creativity (IP2)	4.41	0.77	17.46
mnovauve practices (IF)	Systematic management (IP3)	4.45	0.74	16.62
	Total	4.40	0.56	12.72
	Learning to connect knowledge on network (ND1)	4.39	0.75	17.00
Digital natural (ND)	Participation and exchange information (ND2)	4.41	0.78	17.59
Digital network (IND)	Public relations through online channels (ND3)		0.77	17.35
	Total	4.41	0.58	13.15

Table 2: Identification of Components and their Indicators of Digital Culture

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	VS1	VS2	VS3	AW1	AW2	AW3	AW4	IV1	IV2	IV3	IP1	IP2	IP3	ND1	ND2	ND3
VS1	1.00	.711**	.662**	.657**	.638**	.539**	.611**	.523**	.617**	.528**	.430**	.581**	.591**	.589**	.515**	.536**
VS2		1.00	.700**	.672**	.675**	.611**	.638**	.582**	.706**	.632**	.441**	.629**	.634**	.646**	.567**	.586**
VS3			1.00	.667**	.656**	.580**	.654**	.570**	.644**	.595**	.446**	.627**	.648**	.600**	.571**	.561**
AW1				1.00	.682**	.548**	.648**	.587**	.682**	.612**	.418**	.653**	.665**	.625**	.555**	.568**
AW2					1.00	.628**	.672**	.616**	.704**	.571**	.423**	.606**	.647**	.623**	.545**	.562**
AW3						1.00	.730**	.662**	.674**	.577**	.396**	.516**	.598**	.607**	.538**	.542**
AW4							1.00	.725**	.703**	.644**	.448**	.580**	.690**	.677**	.619**	.631**
IV1								1.00	.658**	.598**	.428**	.520**	.592**	.566**	.538**	.545**
IV2									1.00	.686**	.412**	.586**	.691**	.659**	.609**	.587**
IV3										1.00	.491**	.605**	.607**	.621**	.551**	.551**
IP1											1.00	.582**	.515**	.508**	.443**	.456**
IP2												1.00	.700**	.671**	.596**	.563**
IP3													1.00	.776**	.678**	.641**
ND1														1.00	.669**	.618**
ND2															1.00	.771**
ND3																1.00

Table 3: Intercorrelations Results of Identifying Indicators of Digital Culture.

**Correlation coefficient is significant at the 0.01 level (2-tailed)

The Goodness of Fit of the Digital Culture Components and Indicators with the Empirical Data

The researcher wanted to acquire estimates of the parameters of the digital culture model by validating the identified components and their factor loading. Factor loading in the context of Confirmatory Factor Analysis (CFA) was used to analyze the standardized regression coefficients that represent the strength and direction of the relationships between observed variables (indicators) and latent factors. In other words, factor loading means the 'relative importance' of the identified indicators that collectively form a specifically identified components in the digital culture model of primary small size schools that the school administrators had been considered. Therefore, CFA was used by researchers to assess the digital culture model and test the construct validity of a theoretical model.

The factor loadings indicate how much of the variation in each observed variable is explained by the corresponding latent factor. As a result, the higher magnitude of a factor loading indicates a stronger relationship between the latent factor and observed variable as the magnitude of a factor loading ranges from 0 to 1. The results of the co-variance with digital culture components ranged from 79.60 to 99.10 percent. As presented in Table 4 below, the factor loading of all the digital culture components are ranged from 0.884 to 0.998 and is statistically significant at 0.01. The component with the highest factor loading value is digital network (ND) ($\beta = 0.998$). This is followed by innovative practices (IP) ($\beta = 0.991$), flexible atmosphere for working (AW) ($\beta = 0.929$), and value of learning with innovative media ($\beta = 0.899$). The component that has the lowest factor loading value is digital vision ($\beta = 0.884$). The researchers looked for values above a certain threshold, such as 0.3, to assess the significance of factor loading. In conclusion, all the vital components are found to be essential constructs of digital culture for school administrators who are administering in primary small-sized schools (refer to Table 4).

		Factor Loading					
Components	β	S.E.	t	- K ²			
Digital vision (VS)	0.884	0.019	45.400	0.796			
Flexible atmosphere for working (AW)	0.929	0.015	60.086	0.863			
Value of learning with innovative media (IV)	0.899	0.018	48.639	0.810			
Innovative practices (IP)	0.991	0.014	73.149	0.985			
Digital network (ND)	0.998	0.015	67.832	0.991			

Table 4: The Results of CFA for Key Components of Digital Culture.

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Furthermore, the results of the co-variance with the digital culture indicators are found in the range of 34.90 to 76.70 percent. As demonstrated in the following Table 5, the factor loading of all the digital culture indicators are ranged from 0.442 to 0.625 and is statistically significant at 0.01. In this line of reasoning, all the identified indicators are considered essential constructs for the digital culture model.

	Factor Loading			D 2	Coofficient of Score (ES)				
Indicators	β	S.E.	t	N ²	Coefficient of Score (FS)				
Digital vision (VS)									
Creating a future vision (VS1)	0.572	0.029	19.407	0.644	0.133				
Executing the vision (VS2)	0.583	0.027	21.740	0.748	0.230				
Communicating the vision (VS3)	0.605	0.030	20.272	0.681	0.149				
Flexible atmos	Flexible atmosphere for working (AW)								
Motivating and reinforcing personnel (AW1)	0.570	0.029	19.862	0.655	0.083				
Work standards and responsibility (AW2)	0.559	0.028	20.185	0.671	0.108				
Being part of the organization (AW3)	0.517	0.029	17.712	0.564	0.042				
Flexibility of organizational structure (AW4)	0.559	0.027	20.461	0.682	0.079				
Value of learning	Value of learning with innovative media (IV)								
Attitude towards new learning (IV1)	0.474	0.027	17.744	0.568	0.065				
Creating an understanding of innovation (IV2)	0.587	0.027	22.056	0.761	0.175				
Team digital commitment (IV3)	0.534	0.028	18.889	0.622	0.118				
Innova	tive pract	tices (IP)							
Information technology skills (IP1)	0.442	0.035	12.763	0.349	0.025				
Creativity (IP2)	0.546	0.029	19.021	0.633	0.099				
Systematic management (IP3)	0.625	0.029	21.842	0.767	0.165				
Digital network (ND)									
Learning to connect knowledge on network (ND1)	0.592	0.029	20.757	0.722	0.170				
Participation and exchange information (ND2)	0.520	0.029	18.028	0.595	0.092				
Public relations through online channels (ND3)	0.494	0.029	17.292	0.557	0.073				

Table 5: The Resul	ts of CFA for K	Cev Indicators of	f Digital Culture.
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According to Ullman (2001), the overall model whether is acceptable or not in structural equation modelling (SEM) depending on the fit indices. The goodness of fit result exposed that the digital culture model fits between the obtained values of collected data and the expected values under the digital culture model as follow, $\chi^2 = 103.850$, df = 85, $\chi^2/df = 1.221$, CFI = 0.997, TLI = 0.995, RMSEA = 0.023, and SRMR = 0.017. These tests were employed to determine how associated real values are fitting to the expected values in the digital culture model. The researchers referred to the following specialists' rules of thumb and their recommended cut-off values for evaluating fit indices in SEM as elucidated in Table 6.

Table 6: Interpretation of Goodness of Fit for Digital Culture Model.

1		0				
Goodness of Fit Indexes	Real Values	Rules of Thumb or Cut-off Values	Specialist	Interpretation		
	1 221 <2		Ullman (2001)	Daga		
χ²/df	1.221	<5	Schumacker and Lomax (2004)	Pass		
CFI	0.997	≥ 0.95	Hu and Bentler (1999)	Pass		
TLI	0.995	≥ 0.95	Hu and Bentler (1999)	Pass		
RMSEA	0.023	0.022	0.023	< 0.06	Hu and Bentler (1999)	Deeg
		< 0.07	Steiger (2007)	Pass		
SRMR	0.017	< 0.05	Byrne (1998)	Pass		

In this line of reasoning, it is finalized that the digital culture model is approved with the empirical data. Hence, the assessment model

was accepted according to the above rules of thumb and cut-off values. Therefore, the researchers established precise and significant paths of the digital culture mindset model as illustrated in Figure 2.

Figure 2: Digital Culture Model



Conclusion

A digital culture model was projected and verified its goodness of fit. The results indicated that all five components have a solid, positive, and significant impact on the digital culture of primary small-sized schools. On top of that, the assessment model showed that high prediction impact is digital network component. Therefore, primary small-sized school administrators must grow their expectations through the identified components and their indicators. It is essential to ensure that these technologies of digital network should align with the school's goals, foster a positive digital culture, and prioritize the security and privacy of information (Duerr et al., 2018).

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