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CAUSAL RELATIONSHIP MODEL OF PROBLEMS IN PUBLIC SECTOR PROCUREMENT

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ABSTRACT: Although the e-Government Procurement System has been adopted and used in the public sectors, a small number of studies have been concerned about the procurement relating to the construction sector. This research, therefore, was intended to investigate concordance between a hypothetical causal model and empirical information. Questionnaires were used with 353 samples from the government officers. Statistical analysis was conducted by utilizing SPSS 25 and AMOS 25 to determine percentage, mean, standard deviation, factor analysis, and structural equation modeling (SEM). Results revealed that the analysis model was in accordance with empirical information which resulted in Chi-square ($\chi 2$) = 43.376, $\chi 2$/df = 1.276, df = 34, p = 0.130, NFI = 0.989, GFI = 0.979, CFI = 0.998, RAR = 0.008, RMSE = 0.028 and R2 value = 0.819. This indicated that the causal relationship model from this study was appropriately corresponding to the empirical information at a substantial level.

Keywords: Causal relationship model, Government Procurement, Project Management

1. INTRODUCTION

Public procurements are highly significant for a national budget allocation in many departments such as educational management, state security, infrastructures, basic structures, health care, and public safety [1]-[3]. Such government procurements and supplies management is significant in many departments. Therefore, public procurements are considered the heart of delivering civil services and demonstrating the results of the state's operational achievements.

The average values of the public procurements for each country ranged between 10-15% of the total Gross Domestic Product (GDP) [4]. The procurements are particularly more evidenced in the construction industry which resulted in 2 billion US dollars per year [5].

To reciprocate the world's economic growth, procurement processes in many countries have rapidly developed in different aspects. Amid the changing environment, the rapid developments were designed to facilitate and enhance task execution that is performed by public and private sectors as well as a civil society [6]. As a result, the state has been enabled to perform its tasks in strengthening the private sector which mutually contributes to the development of the country's sustainable growths [7]. Technology advancement that plays a significant role in all public and private organizations mostly relies on information technology to receive higher volume, rapidly transferred, and constantly updated information. Hence, technology consequently helps to enhance work productivities. [8].

Although e-Government Procurement System has been adopted and used in the public sector, many problems related to the process remain unresolved and the actual needs of stakeholders remain unfulfilled [9]. Several research and media reports have reflected upon the problems which include non-transparent procurement in the public sector's construction projects, purchase prices which are higher than the actual price, and nepotism [10]. Ware et al. (2007) [11]. divided the corruptions from the government procurement into four types: 1) bribery, 2) bid-rigging, 3) a false company, and 4) others. These issues allow people who are responsible for the procurement could have financial gains from indirect profits by reducing the quality of supplies. The compromised quality consequently contributes to massive losses of the annual government's expenditure which were around 10-20% of a project spending [12]. Moreover, construction materials that are acquired through the procurement process may not commensurate with whether prices or quality [13]. These issues have raised the many authors' interests to discover the best solutions for developing the public sector's procurements. [2]-[4],[8]. However, a small number of studies have been concerned about the procurement relating to the construction sector.

Therefore, this research aimed to synthesize problems that are related to the Government procurement regarding the construction projects

and to develop the causal relationship model of such problems. The research hypothesis is the Causal Relationship Model of Problems in the Public Sector Procurements fits with the empirical information. The results of the research will benefit many state agencies' operations as well as other organizations in Thailand and abroad in adopting to their respective works.

2. LITERATURE REVIEW

The previous studies by Chaitongrat et al. (2017) and Leungbootnak et al. (2018) [5]-[6] mentioned the problems in public sector procurement focusing on the Government construction projects in 3 key factors (Fig. 1) which are;

Factors 1: The Planning Process (PP) factors referred to lack of staff's understanding of rules and regulations. [6] stated that the lack of understanding could cause the problems in 3 different ways: which are; 1) Preparation problems (PPA), 2) Announcement and clarification problems (PPB), and 3) Procurement process problems (PPC). As a result, many suppliers were unable to prepare a document on time. Hence, there were fewer competitors in the process.

Factors 2: the project management and technicality (PMP) indicated the complication in working procedure, budgeting, and assessments which could contribute to the low-quality of partners of contract. This factor consisted of 2 observed variables, which are; 1) Project management problems (PPE) and 2) Technical problems (PPD).

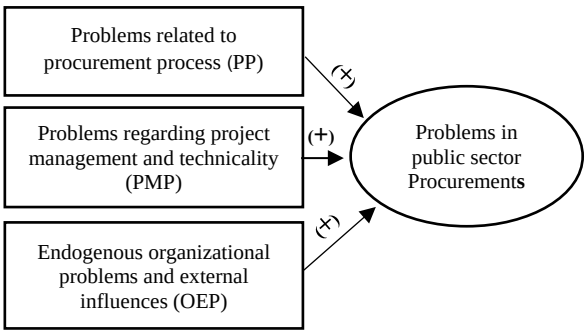

Fig. 1 Hypothesis Measurement Model

Factors 3: Endogenous organizational problems and external influences (OEP) imply the inter-and intra- organization conflict which could deliver the delaying of projects. This factor consisted of 2 observed variables, which are; 1) Internal problems (PPF) and 2) External problems (PPG).

3. RESEARCH METHODOLOGY

This research was intended to develop a causal relationship model of problems in public sector procurements for research methodology as following;

3.1 Units of Analysis

Units of analysis of this quantitative research were based on the state's construction project procurements.

3.2 Population and Samples

In this research, population and samples consisted of 5,024,885 procurements of state's construction projects (data acquired between October 2018 – September 2019) The number of samples was determined at approximately 20 times of observed variables by the concept that was developed by Hairs et al. (2010) [14]. This concept suggested that the lowest criteria in determining samples to analyze Structural Equation Modelling (SEM) should be 5-10 respondents per 1 evaluative parameter. This research model comprised of 36 parameters which indicated that 180-360 construction projects that involved the state's procurement were required.

3.3 Instrument and It's Quality

This research employed questionnaires [15]. The construction of the research tool and its quality evaluation was made in the following steps.

3.3.1 Studying of documents, concepts, theories, and research that are relevant to components that constitute the procurement problems.

3.3.2 Formation of 40 questions which were divided into two parts; personal factors, and problems related to the procurement of construction projects. The questions were constructed as standard measurements about the Rating Scale designed by Likert's 5 assessment levels of the highest, high, moderate, low, and the lowest.

3.3.3 The questionnaires were assessed by a panel of 5 experts, to determine language appropriateness, concordance between questions and research objectives, and content validity.

3.3.4 Assessment scores as determined by the experts were furthered tested for Index of Item-Objective Congruence (IOC). Only questions that received an IOC index value of 0.60 or higher were selected.

3.3.5 Amendments of questions as per recommendations by the panel of 5 experts were executed which finally yielded the last 36 questions.

3.3.6 Trying out of questionnaires with a population of 30 who were not participating in the

actual research. Then, each question was evaluated for discrimination values, to itemize the question that received discrimination values at 0.20 or higher. All of these 36 questions scored discrimination values between 0.22 and 0.73 whilst the overall confidence of this questionnaire was 0.986 which illustrated that the questionnaire is highly trustworthy.

3.4 Data Collection

The government officers were systematically contacted for assistance and cooperation. The data collection process, initiated in January 2020 and completed in February 2020, received 360 completed questionnaires which were accounted for 100% of the response rate.

3.5 Data Analysis

Computer packages, SPSS25 and AMOS25, were used to assess concordance between the model and empirical information by considering statistical Chi-square, Adjusted Goodness of Fit Index (AGFI), and Root Mean Square Residual (RMR).

Data analysis was divided into 3 phases which were; 1) the results of information analysis regarding samples' backgrounds, 2) the results of basic statistical analysis of variables that were used in the research by considering mean, standard deviation, elaboration regarding each studied variable and percentage analysis of Nominal Variable and Ordinal Variable, 3) the results of Causal Relationship Model of Problems in Public Sector Procurements which was determined against Goodness of Fit of the model as per 9 assessment criteria which were; p-value or X2, X2/df, Normal Fit Index (NFI), Goodness of Fit Index (GFI), Fit Index (CFI), Standardized RMR, and Root Mean Square Error of Approximate (RMSEA) [16].

4. RESULTS

4.1 Respondent Profiles

54.4% of the sample groups were male. The majority of samples were between 41 and 50 years of age which formed 33.7%. As for the educational background, bachelor's degree holders represented a majority of the respondents which accounted for 63.74 %. Most of these individuals have worked in a material department (46.7%), and Building Inspectors Committee (22.9%), respectively. The average experience in the procurement of construction projects was 9.5 years (SD=7.6). The procurements mostly belong to local administration organizations (36.5%) and are followed by other governmental agencies (34.6%). Lastly, the construction projects mostly involved building constructions (35.1%) and road constructions (34.0%). (Table 1).

Table 1 Demographic profiles (n=353)

Factors	Frequency	Percentage	Mean	SD
Gender				
Female	161	45.6	-	-
Male	192	54.4	-	-
Age (years)				
< 20	0	0	-	-
21-30	26	7.4	-	-
31-40	102	28.9	-	-
41-50	119	33.7	-	-
51-60	106	30.0	-	-
Level of education				
Diploma degree	32	9.1	-	-
Bachelor degree	225	63.74	-	-
Master degree	91	25.8	-	-
Doctoral degree	5	1.4	-	-
Positions				
Director of a division	28	7.9	-	-
Purchasing committee	75	21.2	-	-
Committee of Building Inspector	84	22.9	-	-
A material department's officer	165	46.7	-	-
A user	14	4.0	-	-
Average experiences in construction projects (years)	-	-	9.5	7.6
Type of organizations				
General government	122	34.6	-	-
State Enterprises	40	11.3	-	-
Educational Institution	43	12.2	-	-
Government hospital	9	2.5	-	-
Local Administration Organizations	129	36.5	-	-
Other governmental agencies	10	2.8	-	-
Types of construction projects				
Building constructions	124	35.1	-	-
Road constructions	6	1.7	-	-
System utilities	28	7.9	-	-

4.2 According to the Development of the Causal Relationship Model of Problems in Public Sector Procurements by Using Structural Equation Modelling (SEM)

According to the development of Causal Relationship Model of Problems in Public Sector Procurements by using Structural Equation Modelling (SEM) to determine the concordance of the model and empirical information, 3 exogenous variables were revealed 3 main factors which are; Planning Process (PP), Other Exogenous Problems (OEP), and Project Management Problem (PMP) there were also 4 mediating variables involved which were, Procurement Project Management (PPM), Conduct Procurement (ConP), Administer Procurement (AP) and Closing Procurement (CP). According to the concordance assessment of Causal

Relationship Model of Problems in Public Sector Procurements, results were; Chi-square ($\chi 2$) = 43.376, $\chi 2$/df = 1.276, df = 34, p = 0.130, NFI = 0.989, GFI = 979, CFI = 0.998, RAR = 0.008, RMSE = 0.028 and the value of R2 = 0.819. Thus, the model is by the empirical information from this research. The model is capable of explaining and predicting problems that are related to public sector procurements at 81.9 % as further elaborated in Figure 2 and Table 1.

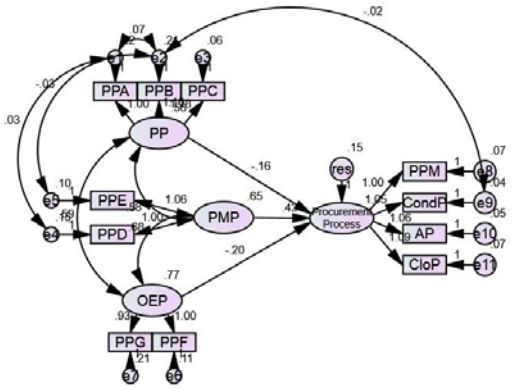

Fig. 2 Results of accuracy analysis of the Causal Relationship Model of Problems in Public Sector Procurements

4.3 According to an Analysis of the Direct Effect and Indirect Effect of Variables that Influence Problems Related to The Public Sector'S Procurements of Construction Project

7 variables generally influence such procurements at a statistical significance level of 0.05. These variables namely; preparation and planning, announcement and explanation, evaluation contractor, management, technicality, exogenous problems, and indigenous problems. Three variables that one-directionally influenced problems of public sector's procurements of construction projects were procurement procedures, endogenous organizational problems and external influences, and project management and technicality (Table 2).

Table 3 illustrates the concordance of each variable in the measuring model which, when constructing the model by using these variables, revealed that the model of problems in the public sector's procurement was statistically significant. Also, the standardized regression weights ranged between 0.85 to 0.97. Each of these variables related to latent variables and square multiple correlation values (R2) at the statistical significance level. The coefficient of determination of the observable variables of the problem in procurements was calculated to be between 71 to 93 %. The highest standardized regression weights were that of evaluate contractor (β = 0.97), endogenous organizational problem (β = 0.94) and technicality (β = 0.94), and preparation and planning (β = 0.85) respectively.

Table 2 Statistical concordance of the accuracy analysis of the Causal Relationship Model of Problems in Public Sector Procurements (PPSC)

Index	Criteria	Prior to Model Adjustment		After Model Adjustment	
		Statistical Value	Assessment Results	Statistical Value	Assessment Results
X^2/df	< 3.00	2.693	Pass	1.28	Pass
p-value of X^2	> 0.05	<0.001	Fail	0.13	Pass
NFI	> 0.90	0.974	Pass	0.99	Pass
GFI	> 0.90	0.950	Pass	0.98	Pass
CFI	> 0.95	0.984	Pass	0.99	Pass
RMR	< 0.08	0.012	Pass	0.01	Pass
RMSEA	< 0.08	0.069	Pass	0.03	Pass
R^2	0.5-1	-	-	0.82	Pass

Table 3 Concordance value of the measuring model for each latent variable related to the PPSC Model.

Latent Variable	Observed Variables	Regression Weights				Regression Standardized Weight	R^2
		Estimate	SE	CR	p		
PP	PPA	1	-	-	-	0.85	0.71
	PPB	1.10	0.04	26.70	*	0.87	0.76
	PPC	1.19	0.05	25.61	*	0.97	0.93
	Path coefficient =0.51						
PMP	PPE	1	-	-	-	0.90	0.81
	PPD	1.06	0.04	29.45	*	0.94	0.88
	Path coefficient =0.33						
OEP	PPF	1	-	-	-	0.94	0.88
	PPG	0.93	0.04	26.02	*	0.87	0.76
	Path coefficient =0.40						
							0.82

Note: *Statistically significant level (p<0.05)

The model in Figure 2 showed a set of guidelines on PPSC for Thai public construction project procurements with the weight in each latent factor:

Problems related to the Planning Process: the government should focus on procurement planning since the beginning of the process; the TOR writing and specification, then making an announcement and providing enough time to writing a proposal correctly. Last but not least, the government should monitor the middle price for government partnerships

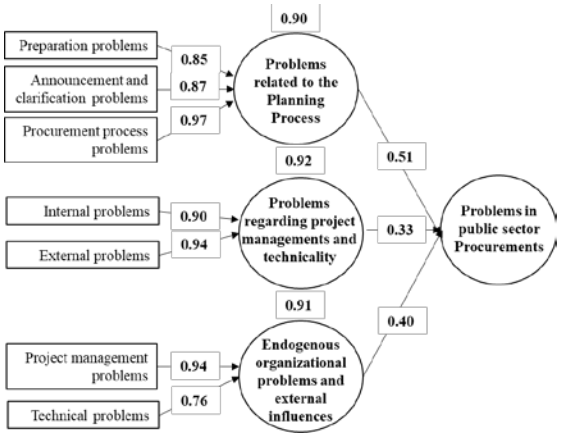

Fig. 3 PPSC model for Thai public construction project procurements

Problems regarding project management and technicality: the government should be strict on the procurement timeline, the conflict between stakeholders, and the quality of the construction projects.

Endogenous organizational problems and external influences: the government should emphasize a budget allocation for a construction project to reduce some problems about the low-quality of interested vendors sending their proposal lower than the middle price. Moreover, the related organizations suppose to focus on risks from the inter-organizational that can affect government procurement.

5. DISCUSSION

According to the results, the state's construction project procurements are highly problematic due to many causes for which 3 compositions are capable of explaining the said problems at 82 %. These compositions are;

Problems related to the procurement process: As per the research, the path coefficient value was at 0.51 and the problems mainly stemmed from evaluate contractors, announcement, and explanation, and work preparation and planning. This finding is in line with; 2012 reports from the Office of the Auditor General of Thailand (OAG) which stated that problems and inaccuracy in the procurements were due to the absence of the procurement planning, and Chonpitakwong B. et al., 2009 [17]. which studied obstacles in implementing the e-Procurement system.

Endogenous organizational problems and exogenous organizational problems: These problems resulted in the path coefficient of 0.33 which due mainly to endogenous problems of state offices and exogenous problems of state offices. The finding was supported by [10]. who explained that operators must thoroughly and carefully study each step of the procurement process.

Project management problems and technicality: The research resulted in the path coefficient value of 0.40 which due mainly to problems related to project management and technicality.

The Concordance assessment of the Structural Problem Equation Model of Public Sector Procurements revealed that the Causal Relationship Model of the Problems that influence Public Sector Procurements that has been developed well related to the empirical information. As per the research, the statistical chi-square value was not significant (P-value =0.130), relative chi-square value was 1.276, NFI index was 0.989, GFI index was 0.979, CFI index was 0.998, whereas Standardized RMR value was 0.008 and RMSEA value was 0.028. All these values were compatible with the pre-determined criteria which could be illustrated as per the following reasons;

Due to the Structural Problem Equation Model of the Public Sector Procurements that has been developed by utilizing theories and other previous research are relevant to this research, and by adhering to the content validity. Each step requires contextual analysis of the problem's components by prioritizing prior to being used to construct the questionnaire that was subsequently checked by qualified experts and subjected to further adjustments prior to being used with trial samples. The questionnaire was proven to have high reliability, and by empirical information as its construct validity was verified by existing IOC of latent variable measurement model that has been developed by using relevant theories and research. Furthermore, the questionnaire's confidence level which was determined by an assessment of the collected information was also high as well. Therefore, the above-mentioned reason may enhance the efficiency of the structural equation model that is related to the public sector's construction project procurement. Although further adjustment of the model may be required, this helps to shape the model to be more statistically appropriate.

According to the sample group of this research, expressions and practices were by the theories and other research that were used to develop the structural equation model of problems in the public sector's procurements of the construction project. The phenomenon could have been a reflection of the actuality in the public sector's procurements that has been practiced. All of the findings indicated that

the developed model is by empirical information and vice versa. Also, there are 3 variables of direct influence coefficient which were; problems that are related to the procurement process, endogenous and exogenous organizational problems, and project management problems and technicality.

6. CONCLUSION

The research reveals problems in the public sector's construction project procurement are highly problematic. 36 problems were found which could be categorized, as per the main components, into 3 groups; the problems that are related to the procurement process, the endogenous and exogenous organizational problems, and the project management problems and technicality. As a result, the obtained information could be used to explain the variance value of all variables at 82 %. Each component's details can be concluded hereafter;

The problems that are related to the procurement process, the research revealed that state offices were generally highly problematic which, upon considering factor loading of each observed variables, stipulated that such problems were; the problem with evaluating contractor $\beta = 0.935$, problems with the announcement and work explanation $\beta = 0.874$, and problems with preparation and planning $\beta = 0.850$.

The endogenous and exogenous organizational problems, the research revealed that state offices were generally highly problematic which, upon considering factor loading of each observed variables, stipulated that such problems were; the problem with project management $\beta = 0.935$ and problems with technicality $\beta = 0.898$.

Problems that are related to project management and technicality, the research revealed that state offices were generally highly problematic which, upon considering factor loading of each observed variables, stipulated that such problems were; endogenous organizational problems $\beta = 0.938$ and exogenous organizational problems $\beta = 0.873$.

The concordance assessment of the structural relationship model that affects the public sector's construction procurements, developed by using empirical information, revealed a good level of concordance which was determined by referring to; statistical chi-square value that was not significant (P-value =0.130), relationship chi-square (1.276), NFI index (0.989), GFI index (0.979), CFI index (0.998), Standardized RMR (0.008) and RMSEA (0.028).

Upon considering direct influences, indirect influences, and overall influences of the problems in the public sector's construction project procurement, this can be concluded that; direct influences have direct influence coefficient values of 3 variables which in descending order of values, were; the problems of the procurement process, the endogenous organizational problem and exogenous influences, and the problems in project management and technicality which had path coefficient values at the values of 0.507, 0.395 and 0.334 respectively.

7. ACKNOWLEDGMENTS

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