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Effect of LSMC Implementation on Contractor Performance for National Road Construction In Aceh, Indonesia

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Abstract. Performance Based Contract (PBC) which is used to replace traditional contracts in national road constructions in Indonesia has been improvised into the Long Segment Maintenance Contract (LSMC). Contractor role and risk influence contractor performance; hence, the LSMC was introduced to assist contractors in improving their organizations to enhance performance in undertaking national road construction projects. This study was conducted to investigate the relationship between LSMC and contractor performance in Aceh, Indonesia, with operational capabilities as the mediator. Data collection for this study was done through a questionnaire survey, which was carried out involving non-small contractor companies from grades 5 to 7. Questionnaires were sent to 104 respondents. From the 104 questionnaires disseminated, 100 were completed and deemed usable. The data were analysed by the PLS software, followed by SPSS. The findings showed a positive relationship between LSMC and contractor performance.

Keywords: LSMC Implementation, Contractor Performance, National Road Construction

1 Introduction

Most of the road constructions in Indonesia use conventional contracts that can be classified into the plan phase, construction phase and maintenance phase. Conventional contracts have the unit price and lump sum as the payment system. The owners have a responsibility to procure construction projects based on their needs. Contractors work on constructing roads based on specifications and supervision by the owners and consultants. The weaknesses of conventional contracts in terms of the life cycle of the project are they do not include maintenance service, different parties have different responsibilities at the planning stage, construction stage until the maintenance stage, they have no contractor innovation, and contractors are volume-oriented, not quality [1]. To improve the quality of road construction, the traditional contract was replaced by the Performance Based Contract (PBC). PBC has an advantage in time saving as it cuts down every stage in the traditional one by appointing the contractors to be in charge of the design, construction and maintenance [2]. PBC practice considers the financial feasibility and legal aspect, interim duration, price and sustainability [3]. If implemented successfully, PBC has high potential to reduce the cost of road maintenance by up to 50% [4].

Some of the challenges in implementing PBC included overloading, the many variations of road conditions, limited parties' involvement and unclear risk transfers that influence the increase of budget within the project [5]. In addition, The pilot project for PBC faced problems in design life planning, long-term funding and contractor knowledge in project implementation [6].

Because of these problems, in Indonesia, the PBC has been transformed to the Long Segment Maintenance Contract (LSMC). LSMC is an approach that accommodates PBC to minimize the problems faced. LSMC closely adheres to the PBC through a hybrid approach that has a variety of combinations of method specifications and performance specifications, while the incentives and disincentives are driven by both output and outcome [7]. The LSMC has been applied on the national road project in a single year's contract which involved local contractors (as contractors in the construction) with three years of maintenance responsibility. The LSMC determinants were defined as scope of activity, performance indicator, payment, field engineering process, requirements, and participant involvements [5], [8], [9].

The LSMC was implemented to improve the national road service through sustainable road management and maintenance. These related to the competitiveness, quality, structural coordination and bureaucracy problems in road construction [10]. The contractors were paid to maintain the territorial road based on the standard performance stated in the contract. If the target was not achieved, then the payment was reduced. This allowed the contractors to have their own control of all resources [6].

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Currently, contractors are involved in a number of contracts every year that have to be handled, which required a lot of human resources to be allocated, not to mention the competitive bidding that influenced the price. Thus, the LSMC was implemented to investigate the contractor performance and final results.

This study was conducted to investigate the influence of LSMC implementation in road construction on the contractor performance including the contractor flexibility and ability to manage and direct their work that affected the effectiveness and efficiency of the lifecycle cost in their desired goals. The performance measurements aimed to help the contractors and their organizations to set up standards, target, gain benefits, and develop the organizations in enhancing contractor performance.

2 Methodology

A quantitative method was applied as the research approach. The relationships amongst variables were exposed by the hypotheses which were the central idea of the research [11]. The approach for the research method was deductive path moving of variables in the actual data collection technique (measurement process) to define numerical information and empirical representation [11]. Data collection was acquired from contractors involved in the LSMC national road construction projects that were registered under the Indonesia Construction Association in various areas in Aceh, such as Banda Aceh, Aceh Besar, Aceh Barat, Aceh Tengah, Aceh Tenggara, Simelue and Sabang. In this study, the population consisted of 104 respondents (Non-Small Contractors grades 5, 6 and 7). All of the respondents were involved in the LSMC project since 2016 to 2018.

Questionnaires were sent to all 104 respondents; however, only 100 questionnaires were completed, returned, and deemed usable. The 100 questionnaires were used in the final analysis, representing 96.15% rate of usable responses. The sample size was acceptable to be analyzed with G*power statistics to generalize the findings [12]. The data were then analyzed using Partial Least Square Structural Equation Modeling via SmartPLS. The PLS modeling was used to assess the research model appropriateness by measuring the variance explained (R^2). The R^2 was the primary evaluation criteria on the structural model in measuring the level and significance of the path coefficients.

3 Results and discussion

Fig. 1 shows the relationships between the LSMC determinants and contractor performance. In this study, LSMC was the construct which represented the effects of the six dimensions of LSMC determinants, namely scope of activity, performance indicator, payment, field engineering, requirement and project participant involvement. The hypothesis was tested by path coefficients (β), the squared multiple correlation (R^2), *t*-value and significance level. Table 1 shows the results of the significance level that was reflective to the effects of LSMC determinants, comprising the scope of activity (SA), performance indicator (PI), payment (PA), field engineering (FE), requirements (RE) and project participant involvement (PPI). The results indicated that LSMC determinants were a multi-reflective construct made up of six dimensions as shown in Table 1. The requirements were found to be the greater reflection of LSMC with $\beta=0.956$ at $p<0.01$.

In the contractor performance construct, the results indicated significant reflective effects of all dimensions, including financial performance ($\beta=0.967$, $t=150.356$, $p<0.01$), technical performance ($\beta=0.977$, $t=201.900$, $p<0.01$) and management performance ($\beta=0.958$, $t=95.755$, $p<0.01$). Finally, Table 2 illustrates that LSMC has a positive relationship with contractor performance at ($\beta=0.736$, $t=15.284$, $p<0.01$). It was assumed that LSMC determinants were considered to measure contractor performance and thus concluded that H1 was supported.

Table 1. Path Coefficient of the relationship between LSMC Determinants and Contractor Performance

	Standardized Beta (β)	Standard Error	T-Value (t)	P-Values
LSMC -> CP	0.7365	0.0484	15.2848	P<0.01
LSMC -> FE	0.8805	0.0373	23.5959	P<0.01
LSMC -> PA	0.9386	0.0137	68.5902	P<0.01
LSMC -> PI	0.9303	0.0129	72.1825	P<0.01
LSMC -> PPI	0.8601	0.0255	33.6467	P<0.01
LSMC -> RE	0.9565	0.0068	140.7383	P<0.01
LSMC -> SA	0.9405	0.0106	88.4183	P<0.01

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CP -> FP	0.9674	0.0064	150.3561	P<0.01
CP -> MP	0.9587	0.0100	95.7550	P<0.01
CP -> TP	0.9772	0.0048	201.9001	P<0.01

Figure 1 shows that the R^2 of contractor performance as the dependent variable was 0.546 which indicated that almost 55% of the variance in the contractor performance could be explained by the LSMC determinants construct. Cohen (1988) stated that the value of R^2 on the dependent variable is classified as 0.02=small, 0.13=moderate, and 0.26=substantial. The R^2 obtained in this study was 0.546 which was more than substantial. The Q^2 value of more than zero has predictive relevance to endogenous variable. The Q^2 of 0.541 was reflected as a good predictive relevance. The R^2 and Q^2 results indicated good predictive accuracy and relevance of the model.

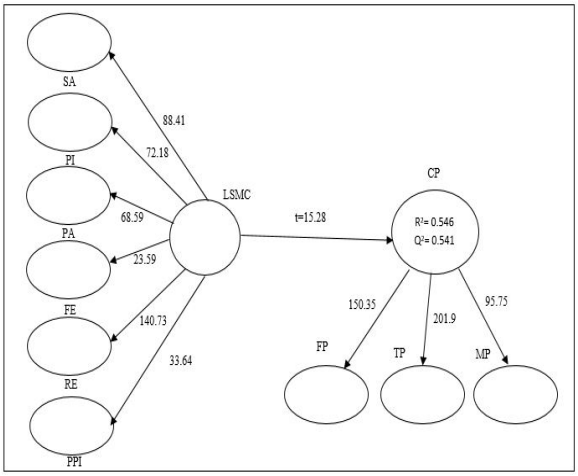

Figure 1. Summary of PLS analysis and findings of the relationship between LSMC and contractor performance.

Table 2. The squared multiple correlation (R^2) and predictive relevance (Q^2)

	R Square	Q Square
CP	0.5464	0.5417
FE	0.7759	0.7736
FP	0.9352	0.9346
MP	0.9192	0.9184
PA	0.8794	0.8782
PI	0.8650	0.8637
PPI	0.7372	0.7345
RE	0.9139	0.9130
SA	0.8827	0.8815
TP	0.9551	0.9546

Based on the findings, it was discovered that there was a significantly positive relationship between LSMC determinants and contractor performance. This indicated that LSMC determinants influenced the contractor performance of the contractor companies. However, the contractor performance could be enhanced if the contractors considered the LSMC determinants and operational capabilities to reflect contractor performance. The operational capabilities contained three dimensions, namely financial resources, technical knowledge and project manager competency.

4 Conclusions

LSMC determinants consisted of scope of activity, performance indicator, payment, field engineering, requirement and project participant performance. These determinants were found to significantly influence the contractor performance in Aceh, Indonesia. The present study also determined that project requirements were

highly influenced by LSMC. The findings found that the link between LSMC determinants and contractor performance was positively significant, indicating that LSMC determinants influenced the contractor performance of the construction companies in Aceh, Indonesia.

References

[1] I. Wijaya, V. Nurmalita, and M. A. Wibowo, "Analysis of Performance-Based Contracts (PBC) and Conventional Contracts Case Study: Semarang-Bawen Road Construction Project and Semarang-Solo Toll Road Construction Project.," *J. Civ. Eng. Work.*, vol. 3, no. 4, pp. 909–921, 2014.

[2] M. Hashem, M. . Mehany, and A. Guggemos, "Risk management for asphalt road construction and maintenance under performance-based contracts," *Int. J. Constr. Educ. Res.*, vol. 11, no. 4, pp. 292–315, 2015.

[3] S. Olander, "Performance-Based Contracts for Road Projects," *Constr. Manag. Econ.*, vol. 32, no. 5, pp. 487–488, 2014.

[4] M. Sultana, A. Rahman, and S. Chowdhury, "An overview of issues to consider before introducing performance-based road maintenance contracting," *World Acad. Sci. Eng. Technol.*, vol. 62, no. 2, pp. 350-355., 2012.

[5] R. Z. Tamin, A. Z. Tamin, and P. F. Marzuki, "Performance Based Work Contracts And Implementation Evaluation On National Roads," *Hpji J.*, vol. 2, no. 2, pp. 121–132, 2016.

[6] Indonesia Infrastructure Initiative, "Reforming the Implementation of Regional Road Maintenance. [Online]. [Accessed 3 November 2015]. Available from World Wide Web:," 2013. http//indii.co.id/images/dx_publication_file_2/7383/prakarsa-jul-2013-ina-versi-cetak.pdf (accessed Nov. 03, 2015).

[7] Indonesia Infrastructure Initiative (PII), "Infrastructure Asset Management," 2016. http//indii.co.id/images/dx_publication_file/10201/prakarsa-april-2016-bhs-20160425.pdf.

[8] A. S. Lubis, "Long Segment Road Preservation Concept," jakarta, Indonesia, 2015.

[9] A. Budilukito and A. T. Mulyono, "Contractors' Readiness to the National Road Preservation Policy in South Sumatra," *Hpji J.*, vol. 2, no. 2, 2016.

[10] Y. Sutantra, A. Mintardjo, and P. Nugraha, "A Study on the Implementation of Performance-Based Contracts on Freeways in East Java Province," *J. Civ. Eng. Prim. Dimens.*, vol. 5, no. 2, pp. 1–6, 2016.

[11] W. . Neuman, *Basics of social research*. Upper Saddle River, USA: Pearson Education, Inc. , Prentice Hall, 2004.

[12] L. Cohen, L. Manion, and K. Morrison, "Research Methods in Education," *Br. J. Educ. Stud.*, vol. 48, no. 4, pp. 446–446, 2000.