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Critical Success Factor Implementation of Land Value Capture on a Toll Road Assignment Scheme: SEM-PLS Approach

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ABSTRACT

The Trans-Sumatra Toll Road (TSTR) located in Indonesia operation which is under the management of State-Owned Enterprises (SOE) faces several challenges and requires alternative sources of financing and income, one of which is Land Value Capture (LVC)-based area development. This research aims to identify and analyze the Critical Success Factors needed to implement land value capture in the TSTR project. The results of this research obtained five success factors with the highest ranking and a model of the relationship between variables in implementing land value capture in SOE assigned toll road operations based on the consensus of the expert. Through literature studies, 40 success factors were grouped into five categories and 14 criteria to successfully implement land value capture on toll road-based infrastructure that experts validated. The validated success factors were processed through a series of expert assessments using the Delphi-Method questionnaire, resulting in five success factors with the highest ranking in each category. The relationships between variables were further obtained from PLS-SEM modeling and were analyzed. The analysis of the relationship model produced relationships between variables including Government Policy, Toll Road Developer Business Model, Asset/Property Management, Investment Supporting Environment, LVC Planning and Specific Project Conditions. The present study result may determine factors that can ensure the successful completion of toll road projects with SOE assignment scheme.

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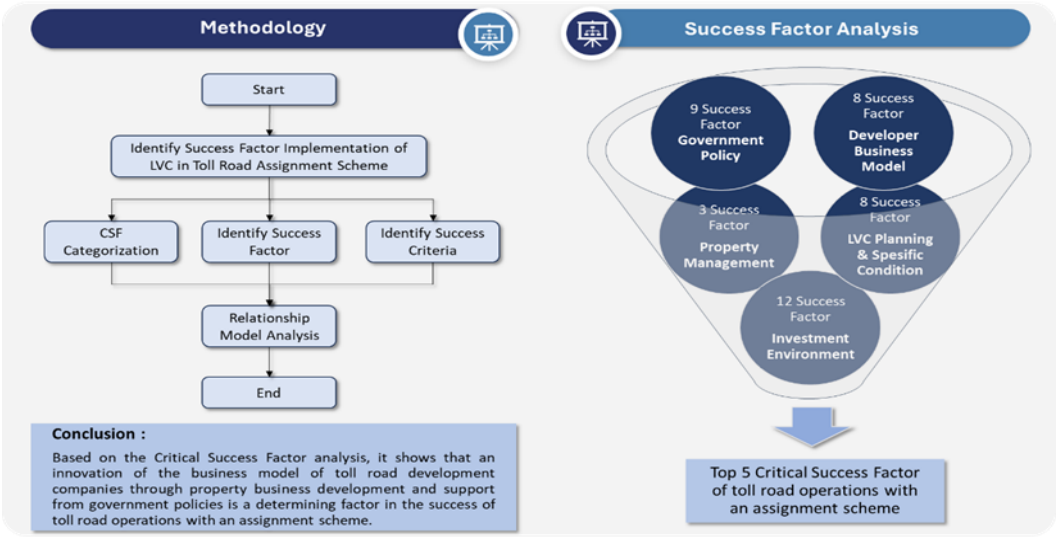
Graphical Abstract



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NOMENCLATURE

TSTR	Trans Sumatra Toll Road	*PPP*	Public Private Partnership
SOE	State-Owned Enterprises	*RII*	Relative importance index
LVC	Land Value Capture	*SD*	Standard Deviation
MTR	Mass Transit Railway	*MS*	Mean Score
CSF	Critical Success Factors	*TOD*	Transit Oriented Development
PLS-SEM	Partial Least Square – Structural Equation Modelling	*HK*	Hutama Karya

1. INTRODUCTION

Infrastructure development is one of the Indonesia's main development targets in 2020-2024 National Medium-Term Development Plan. One of the targets is the construction of 2,500 km of toll roads throughout Indonesia, 1,600 km of which are part of the Trans-Sumatra Toll Road (TSTR). TSTR is a mega project of toll road network that connects Sumatra Island from Lampung to Aceh, with a total length of 2,813 km, and a projected total investment cost of million US$ 38,297.

The construction of this toll road faces several challenges, where the TSTR is not financially feasible but economically feasible, making the project unattractive for toll road developers to invest in long-term operations. To overcome these challenges, the Indonesian government chose to implement the project with the SOE Assignment scheme. The assignment of SOE to TSTR is regulated through Presidential Decree Number 100 of 2014, Presidential Decree Number 117 of 2015 (1st amendment), and Presidential Decree Number 131 of 2022 (2nd amendment) concerning the Acceleration of Toll Road Development on Sumatra island. SOE assignments are designed to be implemented on toll roads that are projects economically feasible but not financially feasible due to government budget limitations.

In its implementation, the assigned TSTR Concession development company faced several challenges, including low financial viability, low average daily traffic, constraints on government budget allocation, and increasing concession company debt, resulting in declining company performance. To face these challenges, the TSTR Concession Company needed alternative sources of financing and income, one of which is area development based on Land Value Capture (LVC).

LVC is based on the principle of a virtuous value cycle, where value in the form of additional economic improvements created from infrastructure investments is then captured (either in part or in full) (1) through value capture mechanisms to recover the capital costs of the investment or reinvest in the land or area.

Figure 1 shows the Virtuous Value Cycle which provides a policy-based framework to create value that can increase economic growth, using a value capture mechanism and providing economic growth results that will be devoted to replacing the initial investment capital costs used in infrastructure projects (2). The implementation of the virtuous value cycle as an alternative source of income can reduce the dependence of toll road infrastructure on income originating from toll payments.

Through utilizing land value capture, TSTR concession companies can have additional sources of income apart from toll fees. In its application to the urban transit infrastructure of the Hong Kong MTR and Hyderabad Metro, the concession company is implementing LVC-based property development, integrated with transit infrastructure based on urban area development master plans that enable the company to generate alternative revenue streams, with the Hyderabad Metro and Hong Kong MTR respectively accounted for 45% and 38% of its total revenue (3).

The use of LVC is a great opportunity to become an alternative source of TSTR financing due to the economic improvements generated by infrastructure investment (2) and the principle of beneficiary pays, where infrastructure is financed by the beneficiaries (4).

As a large-scale infrastructure project, TSTR is expected to significantly increase connectivity, connect economic activity nodes, reduce transportation and logistics costs, and reduce travel time and distance (2). Currently, the implementation of LVC in Indonesia is not yet optimal (5), so it cannot be used as an alternative source of income and financing for toll road infrastructure.

A study of the Critical Success Factors (CSF) can identify things that need to be prioritized or require

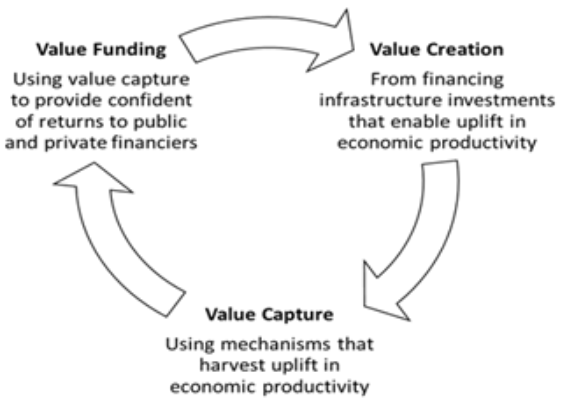

Figure 1. Virtuous Value Cycle Source: processed from ADB, 2021 [5]

special attention when implementing LVC on the TSTR. Modeling between the determining factors for success and the success of implementing land value capture can map the relationship between critical success factors and the success of implementing land value capture on the TSTR. Partial Least Square (PLS) can analyze cause and effect relationships and structural relationships based on latent variables and manifest variables in the application of land value capture on the Trans-Sumatra Toll Road with SOE Assignment. The advantage of using the PLS-SEM method is that it uses a small sample (6).

Based on literature studies regarding land value capture, it is known that there are several gaps i.e. no studies identify the critical success factors and success criteria in implementing land value capture especially on toll roads with the Assignment scheme and there is no research to develop a model of the relationship between critical success factors and the success criteria to implementation of land value capture mechanisms on SOE Assignment toll roads. To complement previous research gaps, in this research a Structural Equation Model regarding factors that influence the successful implementation of the land value capture mechanism in the Trans-Sumatra Toll Road Assignment was developed.

Through CSF identification and CSF land value capture modeling which have been successfully applied to the Trans-Sumatra Toll Road Assignment, it is hoped that it can encourage the successful implementation of land value capture as an alternative source of income on the Trans-Sumatra Toll Road. This paper aims to identify and model the influence of critical success factors on the success of implementing land value capture as an alternative source of financing for the Trans-Sumatra Toll Road. It is also hoped that the results of this research can be a reference in implementing LVC, especially on other SOE Assignment toll roads in Indonesia.

2. LITERATURE REVIEW

2. 1. Trans-Sumatera Toll Road as Assignment SOE Toll Road Scheme The construction of the Trans-Sumatera Toll Road is one of the largest mega construction projects in Indonesia and even the world with total financing of IDR 572 trillion. Its 2,813 km road length consists of 24 sections stretching from Bakauheni to Banda Aceh, which is divided into four construction stages. TSTR is regulated in Presidential Decree Number 100 of 2014 regarding the Acceleration of Toll Road Development in Sumatra, which was subsequently updated in Presidential Decree No. 117 of 2015 and Presidential Decree No. 131 of 2022.

The Assignment SOE scheme was chosen because the TSTR does not yet have financial viability, even though it has economic viability, which makes this project unattractive for private investment (7). According to the Head of the General Section of BPJT Mahbullah Nurdin (7), the assignment of the Trans-Sumatra Toll Road Concession to PT Hutama Karya (HK) as a Toll Road Business Entity was carried out to a SOE that was 100% owned by the government and had the greatest technical and strong financial capacity. Through the Assignment of SOE, HK as the Toll Road Developer was assigned to carry out toll road business concession which includes funding, technical planning, construction execution work and also operation and maintenance toll road.

2. 2. Land Value Capture (LVC) on Infrastructure Projects Recent studies in land value capture are mostly on transit infrastructure context in several highly populated cities such as Hyderabad, Hong Kong, Wuhan, and Guangzhou (3, 8). Based on the LVC best practices, researchers emphasize the pivotal role of government bodies in multi-level authorities in establishing policies in land value capture implementation (3, 5, 8, 9). In the case of urban transit infrastructure, successful LVC implementation highly depends on the business model of the transit agencies and its capability in asset and property management (3, 4, 10). Although LVC research has mostly been carried out on rail-based infrastructure, currently the related research of LVC on toll road infrastructure has begun to be carried out through the development of the Road Plus Property Developer business model framework (11).

Several studies also expressed the need for a favorable investment environment in the form of a supportive legal framework and regulation (3-5, 8, 12), zonation and spatial planning (3, 13), economic policies (13-15), good governance (13), political support (3, 4, 9, 12), and attractive financing package (8) in infrastructure financing involving private investment.

Specific project conditions and solid land value capture planning in terms of good value creation based on profitable and contextual business model (3, 8, 12), integrated property development with the main infrastructure (3), alignment with medium-to-long term government strategic objectives (3), high-quality operational services (8), beneficiary stakeholder support (4, 5, 8, 9) and potential application of a combination of LVC instruments (3, 8) are also several success criteria mentioned in the recent studies.

Based on the LVC best practices on transit infrastructures, these success factors need further studies in the context of toll roads in Indonesia, mainly on the SOE Assignment scheme that would likely utilize the financing scheme.

2. 3. Critical Success Factor (CSF) Implementation Land Value Capture on Assignment Toll Road Critical Success Factor (CSF) is an action, decision, condition, or situation that must go well to achieve the

desired goals of a project (15). In general, research related to CSF in the construction industry, including toll road projects shows that factors related to human resources are important factors from the owner and contractor perspective, while project characteristics are the most important factors from the consultant's perspective.

Based on previous research (16), the characteristics of critical success factors, including: the form of events that cannot be predicted but have significant risks and, involving the performance of key individuals, it can have a good or bad effect on the organization's ability to achieve its goals and involves critical operations, systems, or facilities that need to be monitored or subject to contingency plans. CSF have different CFSs in the context of toll road business assignment schemes for each country and project and depend on dynamic existing environmental conditions along with changes in policy and the industrial environment.

This is based on the benchmarking carried out through literature studies regarding best practices for implementing land value capture in transit infrastructure. The success factors are then grouped into five categories, including: Government Policy, Toll Road Developer Business Model, Asset/Property Management, Profitable Investment Environment, and Land Value Planning and Special Project Conditions.

2. 4. Relationship between Variables

2. 4. 1. The Relationship between Government Policy and the Successful Implementation of LVC Implementing LVC involving various government agencies at various levels across institutions requires a collaborative framework (8) and good coordination. Furthermore, the importance of government support in implementing LVC, whether in the form of financial support, zoning, or land acquisition, was emphasized (3). In addition, the need for implementing authorities, as well as the importance of preparing infrastructure investment packages in supporting LVC implementation was also emphasized (8).

2. 4. 2. The Relationship between Government Policy and the Successful Implementation of LVC Through the previous study (8), the role of the concession company's business model in implementing LVC, including competency/capability in the property market, long-term oriented contract preparation, economic growth-oriented development that aligns with transportation infrastructure, as well as cooperation in land acquisition with the government were identified. Other studies (3, 4) also identified the importance of toll road developer competency/capability in business model planning and asset management as a success factor in implementing LVC.

2. 4. 3. The Relationship between Government Policy and the Successful Implementation of LVC Studies that have been carried out before (9, 10) identified transparency in the implementation of LVC as a factor that supports the implementation of LVC. Meanwhile, other studies (3, 8) suggested asset management collaboration between concession companies and property developers as a success factor in implementing LVC. In connection with several studies (3, 8) also stated the importance of property developer competency or capability in LVC implementation areas as a factor that supports the success of LVC implementation.

2. 4. 4. The Relationship between a Supporting Investment Environment and the Successful Implementation of LVC Two studies (3, 8) have identified spatial planning, transportation, and zoning; as well as support for good macroeconomic conditions and economic growth as conditions that support the successful implementation of the LVC mechanism. One of the research (8) further revealed a financing package that includes land management around transportation infrastructure as a supporting factor for the successful implementation of LVC. Based on the other studies (5, 9), regulatory support in implementing LVC was expressed.

2. 4. 5. The Relationship between LVC Planning and Specific Project Conditions with the Successful Implementation of LVC The application of LVC to transportation infrastructure is closely related to the quality of the transportation infrastructure. This is supported by literature (4, 5, 8) that good value creation is needed in implementing the LVC mechanism as well as Li et al. (8) which reveals that quality infrastructure operational services can support the implementation of LVC.

3. RESEARCH METHODOLOGY

This research applied qualitative methods to develop success factors for implementing LVC on the Assignment SOE toll road. Currently, land value capture is widely used as an alternative financing for urban transport infrastructure. Based on the literature review, the author identified 40 success factors and 14 success criteria for implementing LVC in urban transport infrastructure. These success factors were then categorized into five categories consisting of X1-Government Policy (9 SF), X2-Toll Road Company Business Model (8 SF), X3-Asset/Property Management (3 SF), X4-Profitable Investment Environment (12 SF), and X5-Land Value Planning and Special Project Conditions (8 SF). Figure 2 presents the research model.

The obtained success factors, success criteria, and success factors categories were then validated through multiple rounds of Delphi Method questionnaires. This decision was due to the limited study of the LVC concept in Indonesia and the limited number of LVC experts on toll road infrastructure in Indonesia. Through the Delphi Method, the research aims to obtain a consensus among the experts in providing an assessment based on an anonymous iterative process with a small number of respondents. A recent study shows that the Delphi Method with sample sizes greater than or equal to five combined with 1-7 linear Likert Scale (17).

Figure 2 shows the six latent variables. Arrows between variables illustrate the cause-and-effect relationship between variables, for example: X1 (government policy) influences X2 (toll road company business model), X3 (asset/property management), X4 (favorable investment environment), X5 (project specific planning and conditions), and Y1 (successful implementation of land value capture).

The identified success factors, success factor categories, and success criteria were then validated using an expert judgment questionnaire in the context of SOE Assignment toll roads. The expert assessment questionnaire was given to five expert practitioners with at least 10 years of experience in infrastructure projects, infrastructure financing and investment, or public-private partnerships and occupied the position of manager or higher in their respective institutions, as shown in Table 1.

After obtaining valid data from each expert, the data were further tabulated and analyzed. Success factor items or invalid wording were eliminated when the majority of experts (three or more) did not agree with the success factor/success criteria. The success factors that have been validated were then ranked based on the expert's assessments according to their level of importance through a Delphi Method questionnaire round, to obtain expert consensus regarding the determining factors for success in LVC implementation. Critical success factors (CSF) are a number of actions, decisions, conditions, or

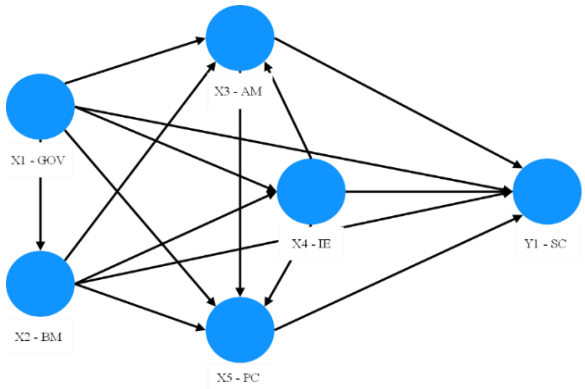

Figure 2. Research model

TABLE 1. Expert Data

Expert	Institution	Job Function	Experience
Expert 1	State Owned Enterprise	Director of Toll Road Company	30 Years
Expert 2	Consultancy Firm/ Private University	Senior Project Manager/ Lecturer	30 Years
Expert 3	Ministry of Public Works and Housing	Secretary of the Directorate General	22 Years
Expert 4	State Owned Enterprise	Director of Toll Road Company/ Head of Toll Road Procurement Unit	32 Years
Expert 5	State Owned Enterprise	Vice President of Strategic Planning	17 Years

circumstances that must be met to achieve success, both in the context of an organization and a project (15, 16). The CSF approach was used to provide an understanding of the business environment and the actions that need to be taken (16).

Before the second round of assessment, the experts were presented with the first assessment data, then asked to provide a re-assessment based on this data as a reference for the second round of assessment and so on. Consensus is considered achieved if all experts provide the same assessment as the previous assessment. The assessment uses a 7-point Likert scale, because the sensitivity is better to get a more accurate evaluation (18). The assessment of success factors was analyzed based on the relative importance index (RII), standard deviation (SD), and mean score (MS) (16). RII is calculated using Equation 1.

$$RII = \frac{Total\ point\ score}{A\ x\ N} (0 < \text{RII} \leq 1) \quad (1)$$

RII = Relative importance index
Total point score = summation of all ratings for a given factor
A = maximum rating possible, in this case 7
N = number of respondents for the factor

If there are success factors with similar RII values, ranking is done using the lower SD value. If the success factors also have similar SD values, then the ranking is carried out using the larger MS value. The results are the top five success factors from the five categories mentioned above as determining factors for the success of implementing LVC on toll road assignment of SOE in Indonesia based on expert consensus.

The CSF and success criteria obtained were then sent as a pilot survey questionnaire to 10 respondents to ensure clarity of survey indicators. A final questionnaire was then sent to respondents involved in toll road projects, transportation infrastructure, infrastructure financing and investment, and also Public-Private Partnership (PPP) projects to assess the importance of 23

critical success factors and 14 success criteria. The minimum sample requirements for this research are based on the PLS model which has five structural paths that lead to the implementation of LVC as an endogenous variable, thus requiring a minimum sample of 10 times the number of structural paths (50 samples) (19). Furthermore, data analysis and modeling were carried out using SmartPLS 4. The categories of success factors and application of LVC were used as latent variables, while the determining factors for success and success criteria were used as indicators in the PLS model.

The criteria adopted to assess the measurement model in Figure 2 are as follows:

a. Indicator reliability
   The acceptance criteria are outer loading values above 0.7. This is an iterative process, where the indicators with outer loading value below 0.7 will be eliminated (19).
b. Internal consistency
   The acceptance criteria of the constructs were based on the composite reliability value of above 0.7 and Cronbach's alpha of above 0.6. A high Cronbach's alpha value indicates the indicators have similar range and meaning (19)
c. Convergent validity
   Convergent validity are subtypes of validity that is tested to assess the construct validity (20). In order to achieve convergent validity, each construct should account for at least 50% of the average variance explained (AVE ≥0.5) (19).
d. Discriminant validity
   Discriminant validity is another sub type of validity used to assess the construct validity (20). By establishing discriminant validity, it is implied that a construct is unique and captures phenomena not represented by other constructs in the model. The assessment is carried out by examining the cross loadings of the indicators.
   An outer loading value on an associated construct should be greater than all of its loadings on other constructs (19).

The criteria adopted to assess the structural model in Figure 2 are as follows:

a. R-squared
   R-squared or coefficient of determination evaluates the variation of the dependent variables (endogeneous) that were explained by the independent variables (exogeneous) and one of the most common method used to measure the inner model (18, 19). Based on theoretical concepts, R^2 value of <0.3 indicates weak, ≥0.3-0.6 as moderate, and >0.6 as substantial relationship between variables.
b. Path coefficient
   Path coefficient value describes the magnitude of the direct influence among latent variables in the SEM model. The path coefficient value ranges from -1 to +1. A value close to -1 indicates a negative direct relationship between latent variables, while a value close to +1 indicates a positive relationship (18). P value of <0.05 shows significance of the relationship between latent variables.

4. RESULTS AND DISCUSSION

This study identified 40 success factors and 14 criteria for successful implementation of land value capture. Based on the 40 identified success factors, they were grouped into 5 success factor categories consisting of X1 - Government Policy (9 success factors), X2 - Toll Road Company Business Model (8 success factors), X3 - Asset/Property Management (3 success factors), X4 - Favorable Investment Environment (12 success factors), and X5 - Land Value Planning and Specific Project Conditions (8 success factors).

The identified success factors, success factor categories, and success criteria were then validated using an expert judgment questionnaire in the context of SOE Assignment toll roads. The identified success factors were then ranked based on expert assessments through a series of Delphi Method questionnaires to obtain the determinants of success based on expert consensus. This consensus was reached after four rounds of the Delphi Method questionnaire, due to several changes in each round of assessment by the experts involved. The top five success factors in each category are the factors that most significantly contribute to the implementation of land value capture on the Trans-Sumatra Toll Road as a SOE Assignment project (20). The success factors validated and ranked in five categories are presented in Table 2, while the success criteria are presented in Table 3.

Based on the results of the analysis of the Critical Success Factor rankings that determine the success of toll road operations using the assignment scheme in accordance with Table 2 above, the top 5 (five) rankings are as follows:

TABLE 2. Ranked validated success factor and categories on LVC implementation

Success Factor Categories	Success Factor	Relative Importance Index (RII)	Rank	Reference
X1 - Government Policy	X1.8 Concession agreements that are clear and properly describe the obligations of the government and private parties	**0.94**	**1**	(3)

	X1.4 Good division of authorities between government agencies	**0.89**	**2**	(5)
	X1.1 Collaboration and coordination framework between stakeholders	**0.89**	**3**	(3, 16)
	X1.2 Government support (financial, zoning, and land acquisition)	**0.86**	**4**	(3, 16)
	X1.5 Preparation of transportation infrastructure investment packages	**0.86**	**5**	(16)
	X1.3 LVC implementing agency authority	0.83	6	(16)
	X1.9 Long-term development vision	0.83	7	(3)
	X1.6 Technical and managerial competency/capability of government institutions	0.83	8	(5)
	X1.7 Risk mitigation plan	0.83	9	(3, 5, 18)
X2 - Toll Road Company's Business Model	X2.5 Toll Road Company's competency/ capability in planning business models	**1.00**	**1**	(3, 4)
	X2.1 Toll Road Company's competency/ capability in the property market (real estate) and its development process	**0.91**	**2**	(16)
	X2.7 Toll Road Company's competency/ capability in monetizing accessibility as an asset	**0.91**	**3**	(19)
	X2.3 Toll Road Company's that are oriented towards economic growth in harmony with transportation infrastructure and land development, through collaboration with property developers	**0.89**	**4**	(16)
	X2.6 Toll Road Company's competency/ capability in asset management	**0.89**	**5**	(3)
	X2.2 Long-term income-oriented LVC contract arrangement	0.83	6	(16)
	X2.8 Toll Road Company's competency/ capability in aligning stakeholder interests in various project phases	0.83	7	(3)
	X2.4 Land acquisition cooperation and land development revenue sharing with the government	0.77	8	(16)
X3 - Asset/ Property Management	X3.3 Property developer competency/ capability	**0.94**	**1**	(3, 16)
	X3.1 LVC implementation transparency	**0.89**	**2**	(18, 19)
	X3.2 Asset management collaboration with property developers	**0.80**	**3**	(3, 16)
X4 - Favorable Investment Environment	X4.4 Availability of supporting regulations	**0.94**	**1**	(5, 18)
	X4.7 Supporting legal framework	**0.91**	**2**	(4, 5, 20)
	X4.8 Clear and fair regulations and agreements in sharing costs, benefits, and risks (cost, benefit, risk sharing) between stakeholders	**0.91**	**3**	(3, 20)
	X4.10 Healthy and profitable economic policies	**0.91**	**4**	(21, 22)
	X4.11 Good governance	**0.89**	**5**	(21)
	X4.5 LVC scheme transparency	0.83	6	(5, 16)
	X4.12 Public/ private sector commitment and responsibility	0.83	7	(21)
	X4.1 Supporting spatial, transportation, and zoning planning	0.83	8	(3, 16)
	X4.6 Strong political support	0.83	9	(3, 4, 18)
	X4.2 Supportive macroeconomic conditions and good economic growth	0.83	10	(3, 16)
	X4.9 Stable political system	0.80	11	(21, 22)
	X4.3 Financing package that includes land management around the transportation infrastructure	0.77	12	(16)
X5 - Land Value Capture Planning and Specific Project Conditions	X5.5 Profitable business model	**0.91**	**1**	(3, 18)
	X5.7 The application of LVC is supported by strategic objectives and regional and national long-term development plans	**0.91**	**2**	(3)
	X5.3 Quality transportation infrastructure operational services	**0.91**	**3**	(16)
	X5.2 Beneficiary stakeholder support	**0.89**	**4**	(4, 5, 16, 18)

	X5.8 LVC-based property development has integration with the main transportation infrastructure	**0.89**	**5**	(3)
	X5.4 Contextual LVC that fits the regional context and meets needs (including property, industrial estate, and tourism)	0.86	6	(18)
	X5.1 Good value creation	0.83	7	(4, 5, 16)
	X5.6 Potential application of a combination of LVC instruments	0.83	8	(3, 16)

TABLE 3. Five Highest Ranked Critical Success Factors in LVC implementation

ID	Critical Success Factor	RII	Rank	Description
X2.5	Toll Road Company's competency/ capability in planning business models	**1,00**	**1**	Business Model Improvement
X1.8	Concession agreements that are clear and properly describe the obligations of the government and private parties	**0,94**	**2**	Government Policy
X3.3	Property developer competency/ capability	**0,94**	**3**	Business Model Improvement
X4.4	Availability of supporting regulations	**0,94**	**4**	Government Policy
X5.5	Profitable business model	**0,91**	**5**	Business Model Improvement

TABLE 4. Success criteria of LVC implementation

Successful LVC Implementation	Success Criteria	Reference
Y1 – Successful LVC Implementation	Y1.1 Improving project feasibility without increasing toll (maintaining the affordability of PPP projects, subsidizing the lack of toll-based revenue)	(18)
	Y1.2 Increasing property values around transportation infrastructure (creating value, encourages the value cycles)	(3)
	Y1.3 Become an additional source of income during the construction and operational-maintenance period	(3-5)
	Y1.4 LVC instruments as an adequate and stable source of income	(16)
	Y1.5 Improving market efficiency by better linking costs (charged) and benefits of developing transportation infrastructure	(3)
	Y1.6 Increasing daily traffic volume	(3)
	Y1.7 Reducing dependence on government (and SOE) financing	(3)
	Y1.8 Enabling completion of projects that were not previously possible	(3)
	Y1.9 Access resources (financial, expertise, innovation) from private sector partners (property developers)	(3)
	Y1.10 LVC as a risk sharing mechanism	(3)
	Y1.11 Job creation	(3)
	Y1.12 Encouraging business growth and economic development	(3)
	Y1.13 Applying the beneficiary principle (benefit-received principle), in which value capture is applied to the incremental value beneficiaries	(3, 5)
	Y1.14 Contributing to development of the LVC implementation area	(5, 18)

After the critical success factors and the success criteria were finalized, a pilot survey was conducted to ensure the clarity of the survey indicators, resulting in no adjustment required to the questionnaire. This study received 56 questionnaires; 6 responses did not meet the respondent criteria, resulting in 50 appropriate responses to be used in the model. The PLS model is presented in Figure 3.

Structural equation modeling (SEM) was used to examine the hypothesized model based on Figure 3. The measurement model in this study consists of 37 indicators/ measurement in six construct/ latent variables, as shown in Figure 3.

Table 5 shows the result of the measurement model assessment. The shown indicators on Table 5 were reduced based on the indicator reliability assessment. The iterative assessment was carried out three times and eliminated 12 unreliable indicators, resulting in 25 reliable indicators. Table 6 shows the result of R-squared value among variables. Table 7 shows the path

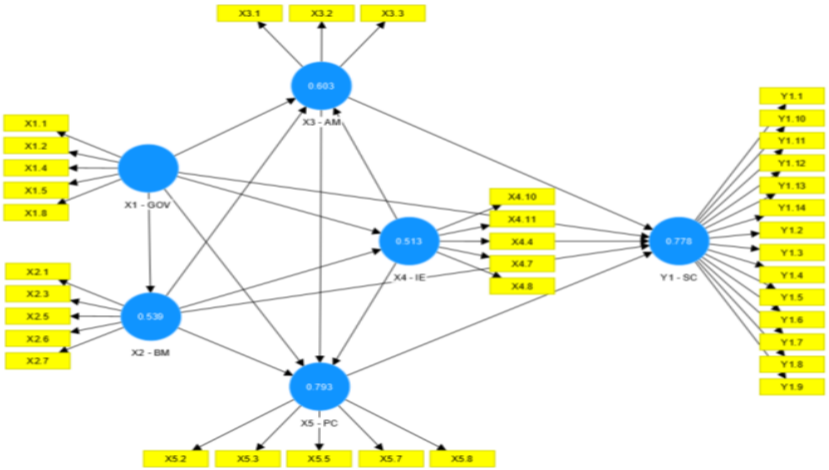

Figure 3. Partial Least Square Model

TABLE 5. Measurement Model Assessment Result

Latent Variables	Indicators	Outer Loading	Composite Reliability	Cronbach's Alpha	Average Variance Extracted (AVE)
Government Policy (GOV)	X1.2	0.779	0.872	0.807	0.630
	X1.4	0.822			
	X1.5	0.778			
	X1.8	0.795			
Toll Road Company's Business Model (BM)	X2.5	0.785	0.902	0.835	0.754
	X2.6	0.914			
	X2.7	0.901			
Asset/ Property Management (AM)	X3.1	0.754	0.836	0.709	0.631
	X3.2	0.716			
	X3.3	0.902			
Favorable Investment Environment (IE)	X4.4	0.905	0.919	0.868	0.791
	X4.7	0.855			
	X4.10	0.908			
Land Value Capture Planning and Specific Project Conditions (PC)	X5.2	0.728	0.914	0.882	0.681
	X5.3	0.842			
	X5.5	0.800			
	X5.7	0.881			
	X5.8	0.866			
Successful Land Value Capture Implementation (SC)	Y1.4	0.720	0.906	0.879	0.580
	Y1.5	0.739			
	Y1.9	0.745			
	Y1.10	0.764			
	Y1.11	0.738			
	Y1.12	0.745			
	Y1.14	0.868			

TABLE 6. R-Squared

Latent Variable	R^2	Result
X1 - GOV		
X2 - BM	0.374	Moderate
X3 - AM	0.597	Moderate
X4 - IE	0.399	Moderate
X5 - PC	0.769	Substantial
Y1 - SC	0.721	Substantial

coefficient value of the model, resulting in three negative results on the hypothesis testing on H1d (X1→X5), H3 (X3→Y1), and H4a (X4→X3). These 3 paths were then eliminated to determine the relationship between influential variables in the model to represent the relationship between the critical success factors on implementing land-value-capture-based SOE assignment toll road project in Indonesia. The result of the second path coefficient evaluation is shown in Table 7.

This study results in 18 critical success factors in five categories and seven success criteria in successful LVC implementation on SOE-assignment Trans Sumatera Toll Road. Figure 4 is the final model with R2 value in each construct, path coefficient, and p value. On each indicator among the six constructs are the indicator loading and p value.

Government policy has a pivotal role in implementing land value capture as an alternative financing scheme on the SOE assignment Trans Sumatera toll road. The existence of government support in terms of financial, zoning, and land acquisition support (X1.2) has a key role in the successful implementation of land value capture in Hong Kong, Guangzhou, and Hyderabad (3, 8). Zoning support would optimize the value capture process in the LVC catchment area throughout the Trans-Sumatera Toll Road. The LVC catchment area needs to be studied further because the development of toll road infrastructure has a more significant impact on increasing accessibility compared to transit infrastructure through its function as logistics distribution routes. On the other hand, land acquisition is one of the issues in infrastructure provision, with a contribution of 29% to the cost of procuring/providing national strategic projects in Indonesia.

Regulatory aspects and division of authority are some of the challenges in infrastructure financing in Indonesia [5] due to overlapping regulations at various levels of government. This emphasizes the importance of good division of authority between government agencies (X1.4) in implementing land value capture. An example of the division of authority in regional development in Indonesia is in the Jakarta MRT transit-oriented-development area (TOD), where Mass Rapid Transit Jakarta (a regionally-owned-enterprise) as the main

TABLE 7. Path Coefficients results for hypothesis (1)

Hypothesis	Paths	Path Coefficients	P Value	Result
H1	X1 - GOV -> Y1 - SC	0.271	0.099	Positive, insignificant
H1a	X1 - GOV -> X2 - BM	0.612	0.000	Positive, significant
H1b	X1 - GOV -> X3 - AM	0.413	0.008	Positive, significant
H1c	X1 - GOV -> X4 - IE	0.106	0.545	Positive, insignificant
H1d	X1 - GOV -> X5 - PC	-0.042	0.789	Negative, insignificant
H2	X2 - BM -> Y1 - SC	0.118	0.670	Positive, insignificant
H2a	X2 - BM -> X3 - AM	0.490	0.001	Positive, significant
H2b	X2 - BM -> X4 – IE	0.562	0.003	Positive, significant
H2c	X2 - BM -> X5 - PC	0.356	0.025	Positive, significant
H3	X3 - AM -> Y1 - SC	-0.028	0.834	Negative, insignificant
H3a	X3 - AM -> X5 - PC	0.204	0.127	Positive, insignificant
H4	X4 - IE -> Y1 – SC	0.169	0.284	Positive, insignificant
H4a	X4 - IE -> X3 – AM	-0.067	0.699	Negative, insignificant
H4b	X4 - IE -> X5 – PC	0.491	0.000	Positive, significant
H5	X5 - PC -> Y1 – SC	0.449	0.029	Positive, significant

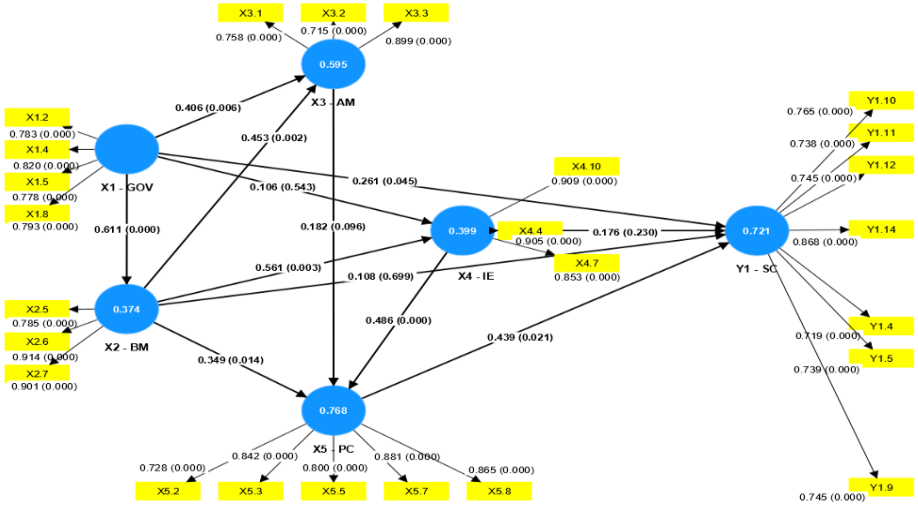

Figure 4. Final model with path coefficient, loadings, R^2, and p value

operator is given the authority to manage the TOD area. Determining authority in regional development requires an understanding between the parties involved so that the government plays a role in preparing and enforcing a memorandum of understanding between relevant institutions in developing land value capture-based areas on SOE-assignment toll roads. A clear division of authority can prevent conflicts between toll road companies and government institutions in managing the value capture process in the catchment areas.

Another form of government support is a sound investment package (X1.5) on infrastructure investment that allows LVC implementation as an alternative financing scheme. The clarity of the concession agreement (X1.8) is also a critical success factor in implementing land value capture on the SOE-assignment Trans-Sumatera toll road. The agreement clarity on LVC-based infrastructure is a must, due to the various parties involved such as government institutions, state-owned enterprises, and property developers.

In implementing land value capture on SOE-assignment toll roads, the toll road company's business model as the concession company needs to include the function of sustainable area development as a new source of income and to increase average daily traffic. The Regional development may have a lengthy time framework, so the toll road company requires a competency/ capability in asset management (X2.6) to maximize recurring income from property development in the LVC catchment area as a long-term business portfolio. The business model applied by Trans-Sumatera toll road company for the Bakauheni – Terbanggi Besar section must be based upon the monetization of increased accessibility from toll road investment (X2.7), as well as facilitating regional economic growth based on the existing potential (X2.5). Currently, the region has various potentials, such as industrial areas in South Lampung Regency and Central Lampung Regency, agriculture-related product industry in South Lampung Regency and East Lampung Regency, and tourism-and-maritime-based industry in South Lampung Regency.

Another construct required to successfully implement LVC is asset/ property management. LVC-based area development is based on the joint creation and sharing of land value increments principle (3) and hence requires transparency in its implementation (X3.1), especially regarding the distribution of roles and benefits received. In general, granting land concession rights from the government to the private sector as property developers has a negative public prejudice (3).

Case studies of LVC implementation in Hyderabad and Guangzhou (3, 8) revealed the importance of property developer competence in area development (X3.3), where concession companies in both cities already have competency in area/property development. Another case study in Hong Kong reveals the importance of asset management collaboration between concession companies and property developers (X3.2). As a concession company, Hong Kong MTR cooperates with property developers as a risk mitigation measure in developing the area by accessing the competence and resources of property developer partners in the fields of finance, expertise, and innovation (3, 12). Such asset management collaboration has been developed on the Bakauheni–Terbanggi Besar section to develop Bakauheni Harbor City as an integrated tourism area of 214 ha by involving a joint venture between the Lampung provincial government and the state-owned companies in various sectors, such as sea transportation, construction, and tourism.

The supportive investment environment construct consists of the availability of regulations and legal

frameworks (X4.4, X4.7), as well as healthy and profitable economic policies (X4.10). In general, LVC-based regional development involves private-sector investment. A supportive investment environment attracts private investment in the development, as well as providing a guarantee for private investment. Currently, several regulations are related to the authority and incentives for regional development in Indonesia, mainly on TOD.

Though there are extended development rights for Trans-Sumatera toll road company to further develop the region near the toll road right-of-way based on Presidential Decree No 131 of 2022, the decree has not included land value capture as an alternative source of infrastructure financing (2). Private sector investment in LVC-based regional development requires sound and profitable economic policies to attract private sector participation. In Indonesia, the Coordinating Ministry for Economic Affairs has an integral role in economic policy-making, as well as coordinating various government institutions in drafting regulations related to LVC-based regional development to meet the development target in the National Medium-Term Development Plan (2).

LVC planning and specific project conditions are other constructs influencing the successful land value capture implementation on the TSTR as an SOE assignment project with well planning and controlling. A construction project requires tools that can be used for project planning and control in order to provide high performance (23).

On its implementation, LVC required support from beneficiaries (X5.2), as the value-capturing process is imposed on beneficiaries of the value creation based on toll road investment and LVC-based regional development. Opposition from beneficiaries in terms of land parcels acquisition, zoning adjustments, and the imposition of new types of taxation, may hinder the value capture process. LVC implementation on transportation infrastructure must be based on the quality of operational services (X5.3), as the toll road infrastructure and the fulfillment of minimum service standards influence the average daily traffic and value uplift on the LVC catchment area. A profitable business model (X5.5) proposed by the toll road company is another critical success factor required to attract investors to the LVC-based regional development.

The proposed business model for TSTR needs to consider the regulatory support from the government, the toll road company's regional development capability, regional resource potential, and investment environment. Another critical success factor is the support and alignment of the LVC-based regional development with regional and national long-term development plans (X5.7).

Lesson learnt on Hong Kong MTR reveals the role of the Hong Kong government's strategic decision to further increase the integration of mixed-use development areas in the LVC catchment area (3). Steps that can be taken by toll road companies as the concessionaire are to align the regional development with the government's strategic objectives stated in the National Medium Term Development Plan, obtain zoning support, and accommodate regional economic growth based on existing potential in the region. LVC-based property development integrated with the toll road (X5.8) encourages a simultaneous increase in value between the toll road as the main infrastructure, the developed region, and the catchment area. By integrating LVC-based regional development and toll road, the toll road company provides a clearer increase in value for the beneficiaries.

Based on the structural equation model, there are seven success criteria for successful LVC implementation on the SOE-assignment-based Trans-Sumatera toll road. One of the success criteria is an adequate and stable source of income for concession companies (Y1.4) to serve as a source of income and return on investment, both for government investment and toll road companies as the concessionaire. To become a stable source of income, the toll road company needs to collaborate with the government to implement various LVC instruments based on area development by the toll road company and imposing taxes to the beneficiaries in the catchment area by the government authorities. Another success criterion for implementing LVC is risk mitigation for the toll road company (Y1.10), as the toll road company faces low financial viability, depends on government financing, and has low average daily traffic. Through collaboration with property developers, toll road companies obtain access to financial resources, expertise, and property developer innovation (Y1.9), thereby reducing the financial burden and risks in property development.

LVC-based regional development is based on the increased accessibility through the availability of toll road services and existing regional potential that further drive the business growth, and economic and industry development in the region (Y1.12).

5. CONCLUSION

This research has identified Critical Success Factors that influence the implementation of land value capture in toll road with the SOE assignment scheme. By conducting an assessment and gap analysis, it can be seen that it is necessary to identify the top five of Critical Success Factors that must be paid attention to by toll road developer companies. After that, relationship modeling

can also be carried out regarding the factors that influence the success of implementing the land value capture mechanism and use it to identify potential improvements and as a lesson for toll road operations with other assignment schemes in the future.

The results of the Critical Success Factor analysis, it shows that an improvement/innovation of the business model of toll road development companies through property business development and support from government policies is a determining factor in the success of toll road operations with an assignment scheme. The following are the top 5 (five) Critical Success Factors that determine the success of toll road operations using an assignment scheme:

1. Business Entity's capability in planning a business model.
2. A clear concession agreement that clearly describes the obligations of the government and the private sector.
3. Property development competencies and capabilities.
4. Availability of supporting regulations.
5. Profitable business model.

The structural equation model produces 18 determinants of success into five construct categories. Based on the path coefficient, government policy has the most significant influence on the success of implementing land value capture for the TSTR SOE assignment. This study also shows that government policies significantly impact other sectors, especially toll road companies' business models.

This research is limited to case studies of toll road development companies with SOE assignment schemes in Indonesia. Therefore, further research needs to be developed for larger data samples. The limitation of this research is to analyze the gap between critical success factors in achieving successful toll road operations but does not discuss the inhibiting factors in achieving success. Further research is needed to determine the best LVC and regional development instruments to be applied on toll roads with the SOE assignment scheme in Indonesia.

6. AUTHOR'S NOTE

The authors declare that this article is free from plagiarism and has no conflicts of interest regarding its publication.

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Persian Abstract

چکیده

جاده عوارضی ترانس سوماترا (TSTR) واقع در عملیات اندونزی که تحت مدیریت شرکت‌های دولتی (SOE) قرار دارد، با چالش‌های متعددی مواجه است و به منابع مالی و درآمد جایگزین نیاز دارد که یکی از آنها مبتنی بر جذب ارزش زمین (LVC) است. توسعه منطقه هدف این تحقیق شناسایی و تجزیه و تحلیل عوامل موفقیت حیاتی مورد نیاز برای اجرای ثبت ارزش زمین در پروژه TSTR است. نتایج این تحقیق پنج عامل موفقیت با بالاترین رتبه را به دست آورد و مدلی از رابطه بین متغیرها در اجرای تصرف ارزش زمین در عملیات تخصیص عوارض راهداری شرکت های دولتی بر اساس اجماع متخصصین به دست آمد. از طریق مطالعات ادبیات، ٤٠ عامل موفقیت در پنج دسته و ١٤ معیار برای اجرای موفقیت‌آمیز ثبت ارزش زمین در زیرساخت‌های مبتنی بر جاده‌ای که کارشناسان اعتبارسنجی کردند، گروه‌بندی شدند. فاکتورهای موفقیت تایید شده از طریق یک سری ارزیابی کارشناسان با استفاده از پرسشنامه دلفی-متد پردازش شدند که منجر به پنج عامل موفقیت با بالاترین رتبه در هر دسته شد. روابط بین متغیرها بیشتر از مدل سازی PLS-SEM به دست آمد و مورد تجزیه و تحلیل قرار گرفت. تجزیه و تحلیل مدل رابطه روابط بین متغیرهایی از جمله سیاست دولت، مدل کسب و کار توسعه دهنده جاده عوارضی، مدیریت دارایی/املاک، محیط حمایت از سرمایه گذاری، برنامه ریزی LVC و شرایط پروژه خاص را ایجاد کرد. نتایج مطالعه حاضر ممکن است عواملی را تعیین کند که می‌توانند از تکمیل موفقیت‌آمیز پروژه‌های جاده‌ای با عوارض با طرح تخصیص SOE اطمینان حاصل کنند.