Implementing Toll Road Infrastructure Financing in Indonesia: Critical Success Factors from the Perspective of Toll Road Companies

Muhammad Fauzan *, Heri Kuswanto, Christiono Utomo

Posted Date: 1 September 2023

doi: 10.20944/preprints202309.0033.v1

Keywords: Critical Success Factors; Financing Implementation; Indonesia Toll Roads; Business Entity Perspective

Article

Implementing Toll Road Infrastructure Financing in Indonesia: Critical Success Factors from the Perspective of Toll Road Companies

Muhammad Fauzan [1], Heri Kuswanto [2] and Christiono Utomo [3]

[1] Interdiciplinary School of Management Technology,
[2] Statistics Department,
[3] Civil Engi-neering Department , Institut Teknologi Sepuluh Nopember

Abstract: Having effective and efficient financing is one of the most important steps in accelerating the development of public infrastructure, including toll roads. This study aims to identify Critical Success Factors (CSFs) for the implementation of toll infrastructure financing in Indonesia. Thirty-three CSFs have been identified from literature review. A Delphi survey involving a panel of experts working in the infrastructure industry was conducted. Based on the survey, it is known that internal rate of return, affordability, investment decision, commercial banks, financing costs, interest rate risk, control of cash flow, contract scope, and principles of risk transfer are important factors for the implementation of toll infrastructure financing in Indonesia. This study fills research gaps by developing a CSF model for successful toll road infrastructure financing in Indonesian PPPs, considering private perspectives and aiming to provide insights for investors and enhance understanding of country profiles in developing countries. The focus on toll road implementation in Indonesia contributes to a comprehensive understanding of CSFs for PPPs in the country.

Keywords: critical success factors; financing implementation; Indonesia toll roads; business entity perspective

1. Introduction

The economic progression of developing regions in Asia can be attributed to improvements in infrastructure. Nevertheless, a lack of sufficient investment continues to pose certain obstacles. There's a marked insufficiency when it comes to access to physical infrastructure and services, particularly in economically disadvantaged regions. Across Asia, countless individuals grapple with significant difficulties in accessing vital services. Over 400 million people are without electricity, 300 million lack safe water, and a shocking 1.5 billion people are deprived of basic sanitation amenities. Even among those with some degree of access, the quality of services is often poor, affecting both rural and urban areas. A wide range of problems contributes to these poor conditions. Issues like irregular power supply interfere with productivity and disrupt people's day-to-day life. Overcrowded roads and ports obstruct efficient trade and transport, constraining economic advancement and opportunities. Moreover, inferior water and sewage systems lead to unsanitary environments, presenting health threats to local communities. Poor quality schools and healthcare establishments further amplify these challenges, depriving individuals of vital education and medical care. These deficiencies are mirrored in the global rankings of many developing Asian economies. As per Schwab & Sala-i-Martin, 2017), these nations trail behind in infrastructure development, underlining the pressing need for investment and enhancement in this key sector. Filling these infrastructure gaps is crucial for improving living conditions and fostering sustainable growth in the region. The shortage of infrastructure in developing Asia stems from restricted financial resources and effective methods for resource allocation. Despite the acknowledged need for infrastructure advancement, stringent fiscal conditions and limited public sector capability impede progress in bridging this gap. One proposed solution involves enlisting the private sector for infrastructure

 doi:10.20944/preprints202309.0033.v1

development, utilizing their expertise in operational efficiency, financing, innovation, and skills. Reimagining the collaboration between the private and public sectors through Public-Private Partnerships (PPPs) have the potential to improve the effective provision of public goods and services. PPPs represent long-term contracts where private entities and government bodies collaborate, with the private sector taking on substantial risk and managerial responsibility, in exchange for performance-based compensation. The investment in PPPs has the potential to address these ongoing infrastructure challenges.

Since the onset of the 21st century, the financing towards Public-Private Partnerships (PPPs) in key Southeast Asian nations, such as Indonesia, Malaysia, the Philippines, Thailand, and Vietnam, has remained under 1% of their yearly GDP. The deterrent of cancelled projects, which result in large unrecoverable expenses, cannot be ignored. Between 1991 and 2015, abandoned PPP ventures represented $41.6 billion in initial pledged investment, impacting 6.3% of all dedicated PPP investments in developing Asia. The efficacy of enduring infrastructure PPP schemes hinges on the financing frameworks established. The utilization of project finance, a strategy that involves the formation of a discrete legal and economic body to oversee the project and procure necessary fiscal resources, is pivotal to the functioning of PPPs. Considering the multitude of risks inherent in sizeable PPP deals, project finance ensures that risks and their associated returns are aligned with the entities most competent at handling them. This encourages investor cooperation by enabling a fair and rational allocation of risk. Additionally, project finance allows the use of extended-term debt, which is crucial for covering substantial capital costs. Moreover, leveraging project finance can help tackle issues of information disparity frequently faced in large infrastructure PPP projects. By alleviating these concerns, project finance aids in the seamless execution of such initiatives.

In advanced economies, there is a wealth of financiers and strong support networks for Public-Private Partnerships (PPPs). However, in emerging Southeast Asian nations, the infrastructure industry ecosystem struggles due to a deficiency of sufficient stakeholders. For instance, the domestic currency bond markets in nations such as Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Viet Nam are relatively undersized compared to their counterparts in Japan and other developed economies. This constrained financial capability impedes the smooth operation of the infrastructure sector in these regions. The effective execution of infrastructure PPP initiatives can differ significantly across various sectors. Power generation projects tend to be less intricate as the outputs and purchase agreements are explicitly outlined in the PPP contracts. Conversely, toll road initiatives, particularly those with environmental sustainability aspects, necessitate comprehensive evaluation procedures and precise demand forecasts. In scenarios where a project is urgently required, the most immediate strategy often involves public procurement or delegating a state-owned enterprise (SOE) to execute the project. In Indonesia, numerous infrastructure ventures are being undertaken by SOEs via direct assignment. With the world's fourth largest population, following China, India, and the United States (Kurniawati & Sugiyanto, 2021), Indonesia is expected to experience a demographic bonus, with a significant proportion of its population entering the productive age bracket (Wibowo & Alfen, 2015). Nevertheless, the quality of human resources and the provision of infrastructure remain subpar, constituting major challenges. Despite these obstacles, the government has launched programs in education, health, and infrastructure, resulting in a substantial increase in the assigned budget from Rp117 trillion in 2014 to Rp417 trillion in 2020. This is a positive indicator for Indonesia's economic future, with PwC (2017) forecasting that Indonesia will rise to become the fifth largest global economy by 2030 and the fourth largest by 2050.

Indonesia is facing a concerning budget deficit due to the increased expenditure on infrastructure, surpassing the growth of tax revenue. Additionally, the budget allocation is primarily based on input parameters rather than performance metrics, hindering its effectiveness in achieving developmental goals (Wibowo & Alfen, 2015). To address these challenges, the government should explore alternative financing models beyond the traditional Capital States scheme, such as Public-Private Partnerships (PPPs). PPPs offer several advantages, including improved spending quality, reduced strain on the Capital States, a direct link between budgeting and performance metrics, and the promotion of innovative approaches to enhance public service quality (Sharma et al., 2010).

 doi:10.20944/preprints202309.0033.v1

A PPP is a collaborative effort between the government and private sector entities, involving long-term contracts and private financing for design, construction, and operation. The government or users provide payments throughout the contract term, and ownership transfers from the private sector to the government upon contract completion (Chen, 2020). Adopting PPPs is an effective strategy for creating value in public infrastructure projects, particularly in large-scale construction initiatives that require substantial investments (Chen et al., 2015). In Indonesia, PPP initiatives have been implemented since the New Order era, primarily in toll roads and electricity sectors. However, the significant development of PPPs began after the financial crisis in 1998. Presidential Regulation No. 38/2015 introduced the PPP concept, defining it as a partnership between the government and business entities to provide public-interest infrastructure, leveraging resources from these entities, with shared risk among all involved parties. The Build Own Operate Transfer (BOOT) contract is the most commonly used form in PPPs, offering an optimal risk-sharing mechanism between the government and business entities (Chen et al., 2015). The choice of PPP model depends on risk analysis, financial analysis, and legal considerations, with risks identified, allocated, and managed by the parties incurring the lowest cost. Critical risks in PPPs include land acquisition, profit repatriation, infrastructure construction and operation, commercial viability, and legal certainty (Hoppe & Schmitz, 2013)

The government can enhance the attractiveness of PPP projects to investors by providing financial contributions, including grants, loans, subsidies, and sharing risks with investors. Additionally, offering a minimum revenue guarantee for the BOT project can alleviate market risks and stimulate investor engagement (Wibowo & Alfen, 2015). An ideal capital structure for PPP ventures is a blend of debt and equity that augments the firm's value (Brigham & Ehrhardt, 2016). Before defining the ideal capital structure, the government predetermines the tariff subsidy and other support in the concession agreement. Consideration of social capital is required in calculating economic feasibility and holistic project financing, reflecting the project's cash flow risks. Efficient cash flow management is fundamental for the viability and steadiness of the sustainable construction sector, as liquidity is a crucial resource for a successfully operating project organization (Ke et al., 2017). The collaboration mechanism for infrastructure projects in Indonesia allows proposals from either the government or business entities. Government-proposed projects are included in the Priority Project List (DPP) and are publicly disclosed, accessible to everyone. Business entities can also propose projects for collaboration with the government, provided certain criteria are met. The government assesses the project's feasibility and proceeds with a public tender, granting compensation for accepted projects. In Indonesia, State-Owned Enterprises (SOEs) are tasked as development agents to ensure economic parity. SOEs are business entities where the state owns the capital, playing a crucial role in managing the national economy towards societal welfare. However, the execution of SOEs' role hasn't been ideal. This concern is both philosophical and sociological regarding the existence of SOEs. This is because, in some instances, SOEs have been more efficient and effective in their operations than the government. Furthermore, SOEs can generate revenue for the government through their business activities.

Nevertheless, it is crucial to remember that State-Owned Enterprises (SOEs) should not exclusively prioritize profit maximization but should also acknowledge their role in delivering public services and contributing to societal well-being. Being state-owned entities, they have an obligation to serve the public interest and facilitate the nation's development. In conclusion, through their engagement in various economic sectors and their commitment to provide public services, SOEs play a pivotal role in fostering societal welfare. Although they also have a role in generating government revenue, their public service responsibility should not be overshadowed. This investigation was focused on a major infrastructure project in Indonesia, specifically the BOT toll project across Java and Sumatra, identified as part of the National Strategic Project (PSN). As per Sumaryoto (2020), the Trans Java Toll Road is a toll road network linking cities across the island of Java, extending from Pelabuhan Merak in Banten to Pelabuhan Ketapang in East Java, covering a total distance of 1,240 kilometers. Given its population of 151.6 million individuals, this toll road is deemed vital for enhancing mobility and lowering land logistics expenses. Moreover, the government is directing its

 doi:10.20944/preprints202309.0033.v1

efforts towards the development of the Trans Sumatera Toll Road (TSTR) project. With an overall investment of Rp538 trillion, the TSTR development project will connect provinces from Aceh to Lampung. In this study, an extensive literature review, coupled with surveys of experts, were undertaken to determine and rank the critical success factors for TSTR implementation in Indonesia.

The objective of this study is to fill the existing research void regarding the identification of the critical success factors (CSFs) needed for the financing and implementation of toll road infrastructure. The study's primary goal is to devise an exhaustive CSF model that encapsulates the viewpoints of various stakeholders in developing nations. It also aims to provide pertinent insights for potential investors drawn to infrastructure projects executed under public-private partnerships (PPPs), and to enhance the understanding of country-specific contexts. While prior research has explored CSFs in the scope of PPP projects, there is a dearth of targeted research on CSFs for the realization of PPPs, particularly relating to toll roads, in Indonesia. Moreover, each country's unique features regarding PPP projects necessitate an in-depth investigation of the CSFs specific to toll road implementation in Indonesia. Therefore, this study aspires to bridge this gap by undertaking an exhaustive examination of CSFs for toll road implementation within the framework of PPPs in Indonesia, considering the country's distinctive context. In the current Indonesian context, the discourse on this specific subject is minimal, and different countries have differing policy landscapes. Presently, there is no dedicated CSF for toll roads, and there is a noticeable absence of specific research concentrating on the financial dimensions of toll road implementation in the country.

2. Literature Review

This section describes some factors related to the toll road infrastructure financing. Based on the literature review, the factors that influence the success of toll road infrastructure financing can be explained in Table 1.

Table 1. Success Factors of toll road infrastructure financing.

Code	Factors	References
Investment Analysis		
IA1	Net Present Value (NPV)	Zala & Vel (2019); Ameyaw et al. (2015); Ashuri et al. (2010)
IA2	Discounted Cash Flow (DCF)	Albornoz et al. (2021); Warner (2013); Vassallo et al. (2012)
IA3	Internal Rate of Return (IRR)	Albornoz et al. (2021); Vassallo et al., (2012)
IA4	Payback Period	Albornoz et al. (2021); Vassallo et al. (2012)

 doi:10.20944/preprints202309.0033.v1

Code	Factors	References
IA5	Profitability to attract investors and lenders	Chou & Pramudawardhani (2015);Gupta et al. (2013)
IA6	Good feasibility studies	Chou & Pramudawardhani (2015); Gupta et al. (2013); Dulaimi et al. (2010); Jefferies (2006)
Public-sector investment decision		
PID1	Business Diversification	Almarri & Boussabaine (2017)
PID2	Economic Justification	Jayasena et al. (2020); Yescombe & Farquaharson (2018)
PID3	Affordability	Yescombe & Farquaharson (2018); Jacobson & Choi (2008);Olusola Babatunde et al. (2012)
The Private-Sector Investor's Perspective		
PIP1	The Investment Pool	Tang et al. (2012); Wang et al. (2007)
PIP2	The Investment Decision	Yescombe & Farquaharson (2018);Jefferies (2006)
PIP3	Joint-Venture Issues	Yescombe & Farquaharson (2018);Jefferies (2006);Bing et al. (2005);Zhang (2005)
Private-Sector Financing—Sources and Procedures		

 doi:10.20944/preprints202309.0033.v1

Code	Factors	References
FPSP1	Commercial Banks	Ameyaw & Chan (2016);Hwang & Lim (2013); Xu et al. (2010)
FPSP2	Bond Issues	Ameyaw et al. (2015); Hwang et al. (2013); Xu et al. (2010)
FPSP3	Availability of financial markets	Liu et al. (2021); Malek & Gundaliya (2021);Lam & Yang (2020);Wang, & Chan (2010)
Financial Structuring		
FS1	The Financial Model	Yao et al. (2018); Yescombe & Farquaharson (2018);Regan (2012)
FS2	Model Inputs and Outputs	Yescombe & Farquaharson (2018);Ameyaw & Chan (2016)
FS3	Financing Costs	Yescombe & Farquaharson (2018); Ismail (2013)
FS4	Debt Profile	Yescombe & Farquaharson (2018); Ismail (2013)
Financial Hedging		
FH1	Interest-Rate Risk	Esther & C (2011);Gholamreza & Zeinab (2012);
FH2	Inflation Issues	Gholamreza & Zeinab (2012);

Code	Factors	References
		Esther & C (2011);Jie & W (2011); Xu et al. (2010); Singh & Kalidindi (2006)
FH3	Exchange Risk	Chou et al. (2012);Esther & C (2011);Wang, & Chan (2010);Xu et al. 2010)
Lenders' Cash-Flow Controls, Security and Enforcement		
LCSE1	Control of Cash Flow	Yescombe & Farquaharson (2018); Liu et al. (2020)
LCSE2	Security	Liu et al. (2020);Yescombe & Farquaharson (2018)
LCSE3	Intercreditor issues	Liu et al. (2020);Yescombe & Farquaharson (2018)
Service-Fee Mechanism		
SFM1	Contract Scope	Chou & Pramudawardhani (2015);Hwang & Lim (2013);Xu et al. (2010)
SFM2	Payment & Scheme Structure	Chou et al. (2012);Esther & C (2011);Wang, & Chan (2010); Xu et al. (2010)
SFM3	Third-Party and Secondary Revenues	Yescombe & Farquaharson (2018)
Risk Evaluation and Transfer		
RET1	Principles of Risk Transfer	Chou & Pramudawardhani, (2015);

 doi:10.20944/preprints202309.0033.v1

Code	Factors	References
		Hwang & Lim (2013);Bing et al. (2005)
RET2	Political Risks	Jefferies (2006);Zhang (2005)
RET3	Construction Risks	Bing et al. (2005) Xiao-Hua (2010) Wang, & Chan (2010) Xu et al. (2010) Hwang & Lim (2013)
RET4	Completion Risks	Hwang & Lim (2013); Chou et al. (2012); Wang et al. (2010); Xiao-Hua (2010); Bing et al. (2005)
RET5	Operation-Phase Risks	Hwang et al. (2013); Chou et al. (2012); Gholamreza & Zeinab (2012); Esther & C (2011); Wang, & Chan (2010); Bing et al. (2005)

3. Research Method

The Critical Success Factors (CSFs) approach is a powerful method for identifying key elements vital for effective operation, from managing time and processes to achieving desired results. The concept of "success factors" was initially introduced by Daniel in the 1960s, later expanded by Rockart, who classified CSFs as crucial activity areas that guarantee positive outcomes and assist in meeting specific management objectives (Rockart, 1982). Pinto and Slevin's work in 1987, known for providing a comprehensive list of success factors, has been particularly influential (J. Liu et al., 2015). Definitions of CSFs vary across scholarly literature. Pinto and Slevin, for instance, concentrated on factors that significantly boost the chances of successful project execution (Pinto and Slevin, 1987), while Maghsoodi and Khalilzadeh stressed the project management inputs that directly lead to project success (Maghsoodi & Khalilzadeh, 2018). According to Hofer and Schendel, cited by (Leidecker & Bruno (1984), CSFs are variables under managerial control that significantly shape a company's competitive standing within an industry. On the other hand, Leidecker and Bruno view

 doi:10.20944/preprints202309.0033.v1

CSFs as features, conditions, or variables that, when well managed or maintained, can significantly impact a company's industry success. Amberg (2005) suggested that Rockart's approach remains particularly relevant in project management. Furthermore, the Delphi technique is commonly used for identifying factors in research and fosters effective group dynamics via an anonymous, multi-step survey process that uses group feedback as a control mechanism after each round (von der Gracht, 2012). Delphi surveys have been extensively used in management research for empirical data collection, particularly in situations requiring complex modeling where expert opinion consensus or convergence is vital (Hallowell & Gambatese, 2009). The research methodology for this study included two key stages: first, initial variable identification based on an extensive literature review, and second, a survey questionnaire to gather responses about the uncertainty factors contributing to the CSFs for toll road infrastructure financing in Indonesia. The research process started with creating a preliminary list of factors, followed by a literature review, which led to the identification of 33 factors. The final step involved designing a questionnaire and defining a data collection method. The questionnaire had two parts: one to collect demographic information, and the second to gauge the respondents' level of agreement with each uncertainty factor. A six-point Likert scale was used, with 1 indicating strong disagreement and 6 indicating strong agreement. The researchers profiled the respondents, determining the target population and sample size for different regions, restricting the sample to individuals from public sector organizations. Respondents were chosen based on their experience with both large and small construction projects, and a simple random sampling method was used. Respondents were given a day to fill out the survey to ensure thorough data collection.

As shown in Table 2, the majority of respondents had 5 to 10 years of experience, and there was significant representation from business entities and financial institutions. Data was gathered from major toll road businesses in Indonesia, including PT Adhi Karya (Persero) Tbk, PT Hutama Karya (Persero), PT Pembangunan Perumahan (Persero) Tbk, PT Waskita Karya (Persero) Tbk, and PT Wijaya Karya (Persero) Tbk. These organizations, having large-scale operations and numerous nationwide projects, provided potential respondents, and data was collected using self-administered methods.

Table 2. Basic information of respondents.

Question Item	Type	Frequency	Percentage (%)
Field of expertise	Engineering	27	28
	Financial	56	59
	Facility management	9	9
	Others	3	3
Position	Management	43	45
	Undertaker	39	41
	Others	13	14
PPP project experience	Less than 6 years	12	13
	6-15 years	29	31
Position	16-30 years	31	33
	More than 30 years	23	24

The study employed an organizational perspective, gathering data from public sector construction industry respondents involved in both small and large projects, including financial institutions. Primary data were gathered through questionnaires distributed in Indonesia from October to November 2012, with a total of 97 questionnaires sent to PPP practitioners through direct mail, email, and online platforms. Out of these, 95 were returned, leading to a 98% response rate. After taking into account the valid questionnaires, the effective data response rate was similar. As demonstrated in Table 2 of the research article, respondents had significant experience in

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 1 September 2023 doi:10.20944/preprints202309.0033.v1

infrastructure projects, with 89% having over 6 years of professional experience. Most respondents (59%) worked in the financial sector, primarily in managerial positions (45%).

4. Results and Discussion

4.1. Data Analysis and Results

4.1.1. Rangking of Critical Success Factors for Toll Road Infrastructure Financing Implementation in Indonesia

In previous research, the relative importance index (RII) have been commonly employed for data analysis. For instance, El-Sayegh utilized these tools to assess risk and allocate it in the construction industry of the United Arab Emirates (UAE). El-Sayegh & Mansour (2015) also applied these techniques to examine risk in UAE highway infrastructure projects. In line with these studies, the present research adopted the same approach to investigate critical success factors for toll road infrastructure financing implementation in Indonesia. To determine the ranking, the relative importance index (RII) was utilized for each factor using Equation (1):

$$RII = \frac{Total\ point\ score}{6\ X\ N} \ (0 \leq RII \leq 1) \quad (1)$$

where the total point score is the sum of all rankings for a particular factor, and 6 is the maximum possible rank.In addition to RII, MS for each factor is calculated using Equation (2):

$$RII = \frac{\Sigma(f\ x\ s)}{N} \ (1 \leq MS \leq 6) \quad (2)$$

where s is the score given by respondents for each factor, ranging from 1 to 6, f is the frequency of responses for each rank (1-6), for each factor; and N is the total number of respondents for that factor.

RII, standard deviation (SD), and MS for each factor were calculated and displayed in the top three rankings in each phase according to Table 3. If two or more factors have the same RII value, the standard deviation is compared, so the lower standard deviation is ranked higher. If the RII and standard deviation values are the same, the higher MS means a higher ranking. If the RII, SD, and MS values are the same, they are given the same ranking.

4.1.2. Identification of Critical Success Factors for Toll Road Infrastructure Financing Implementation in Indonesia

Numerous studies have analyzed the critical success factors (CSFs) that contribute to the success of public-private partnership (PPP) projects. However, a singular emphasis on PPP financing is still an under-researched area. Concessionary financing isn't limited to lease payments for government-owned assets; it also involves awarding development and property rights to private concessionaires, and can even extend expiration dates indefinitely, as seen in build-operate-own (BOO) schemes. Moreover, intangible assets such as public organizations, functions, activities, or rights can be leased, sold, or transferred to private entities. The concession agreement covers vital aspects that underpin the limited recourse financing of infrastructure projects, including risk mitigation, risk and reward allocation, cost prediction, transaction cost reduction, provisions for unforeseen events, and termination conditions. It also addresses issues like transparency, fair procedures, and government financial support. The ultimate aim of the concession agreement is to ensure efficient utilization of public funds, provide cost-effective services to users, and establish a regulatory and policy framework that attracts private investment, enhances efficiency, and reduces costs to stimulate growth.

The success of build-operate-transfer (BOT) projects largely relies on the government's proactive role in correctly allocating risks during the project's conceptual phase. Renowned research by Bing et al. (2005) and Zhang (2005) rated appropriate risk allocation as the second most important CSF for PPP projects in the UK. Similarly, Jefferies (2006) highlighted the project agreement as a crucial CSF in the Super Dome PPP project. An effectively drawn up concession agreement can lay out guidelines

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 1 September 2023 doi:10.20944/preprints202309.0033.v1

promoting a favorable political, legal, and commercial environment. The significance of a sound concessionaire agreement for project success is emphasized by the failure of many BOT projects due to poor bankability.

It's crucial for the successful execution of BOT projects to minimize the construction period as it allows users to access the facility sooner, promoting an early cash inflow and thereby enhancing project profitability. The importance of a shorter construction period is recognized by Gupta et al., (2013) and Sandalkhan et al., (2003), while (Zhang, 2005) emphasizes economic viability, which a shorter construction period greatly contributes to by increasing the years of total cash inflow.

The concessionaire selection procedure is of paramount importance to ensure value for money in PPP projects. A transparent selection process and competitive bidding are key to achieving this. Although the lowest bid may not always deliver the best value, the pre-qualification process for shortlisting bidders is crucial for the success of BOT projects. This study focuses on factors related to toll road financing in Indonesia, with the top three factors for each latent variable ranked in Table 1 and discussed in the following table.

From the ranking analysis, each factor is ranked from highest to lowest. In this study, only variables related to toll road financing in Indonesia are discussed. We rank the top three of each latent variable in table 1 which we present in the table below.

Table 2. Relative Importance Index Values and Ranking of Critical Success Factors for Toll Road Infrastructure Financing Implementation in Indonesia.

Rank	Factors	RII	SD	MS
Investment Analysis				
1	IA3: Internal Rate of Return (IRR)	0.96	0.48	5.79
1	IA6 : Good feasibility studies	0.96	0.51	5.74
2	IA5: Profitability to attract investors and lenders	0.94	0.61	5.65
Public-Sector Investment Decision				
1	PID3 : Affordability	0.88	0.74	5.31
2	PID2: Economic Justification	0.85	0.96	5.07
The Private-Sector Investor's Perspective				
1	PIP2: The Investment Decision	0.92	0.63	5.53
2	PIP1: The Investment Pool	0.84	0.74	5.03
Private-Sector Financing—Sources and Procedures				
1	FPSP1: Commercial Banks	0.90	0.84	5.40
2	FPSP3: Availability of financial market	0.89	0.73	5.35
Financial Structuring				
1	FS3: Financing Costs	0.94	0.61	5.61
2	FS1: The Financial Model	0.93	0.63	5.59
Financial Hedging				
1	FH1: Interest-Rate Risk	0.94	0.63	5.64
2	FH2: Inflation Issues	0.91	0.73	5.46
Lenders' Cash-Flow Controls, Security and Enforcement				
1	LCSE1: Control of Cash Flow	0.95	0.57	5.69
2	LCSE2: Security	0.93	0.65	5.56
Service-Fee Mechanism				
1	SFM1: Contract Scope	0.94	0.60	5.65

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 1 September 2023 doi:10.20944/preprints202309.0033.v1

Rank	Factors	RII	SD	MS
1	SFM2: Payment & Scheme Structure	0.94	0.60	5.65
2	SFM3: Third-Party and Secondary Revenues	0.84	0.89	5.03
Risk Evaluation and Transfer				
1	RET1: Principles of Risk Transfer	0.91	0.65	5.47
1	RET2: Political Risks	0.91	0.74	5.45
1	RET4: Completion Risks	0.91	0.75	5.43
2	RET5: Operation-Phase Risks	0.90	0.73	5.39

Rank No. 1 in Investment Analysis is the Internal Rate of Return (IRR) with an RII value of 0.96. One expert said: "Internal Rate of Return (IRR) is important for building infrastructure projects for several reasons. IRR is used in project selection to determine financial viability, enable comparisons with other investment options, monitor project performance, and attract investors by providing information on expected returns."

Rank No. 1 in the Public Sector Investment Decision is affordability with an RII value of 0.88. One expert said: "The concept of affordability is very important to build viable and sustainable infrastructure projects. This ensures fiscal responsibility, maximizes project benefits to society, and ensures long-term sustainability. Unaffordable projects can result in unsustainable levels of public debt, reduced benefits to society, and costly repairs or replacements in the future."

Ranked No.1 in The Private-Sector Investor's Perspective is the investment decision with an RII value of 0.92. One expert said: "Investment decision-making for infrastructure involves evaluating the feasibility of investing capital in the development, maintenance, or improvement of infrastructure assets such as airports, seaports, railroads, water supply systems, and energy grids. The decision-making process involves assessing various factors such as economic, social, and environmental impact, costs, potential returns, availability of funding and resources, political and regulatory environment, risks and uncertainties, and availability of labor and technology. Infrastructure investments can be made by governments, private companies, or a combination of both, and can have significant long-term implications for a country's economic growth, competitiveness, and quality of life."

Ranked No.1 in Private-Sector Financing—Sources and Procedures is Commercial Banks with an RII value of 0.90. One expert said: "Commercial banks provide debt financing for infrastructure projects by evaluating project feasibility, risks and returns through project finance or corporate loans. A well-structured business plan with detailed financial models and risk analysis, along with a stable regulatory and legal framework is crucial to secure financing from commercial banks. Understanding the lending criteria, collateral and loan terms is also important. Commercial banks are a valuable source of financing for infrastructure projects with a favorable risk profile and sound business plan."

Ranked No.1 in Financial Structuring is Financing Costs with an RII value of 0.94. One expert said: "The financing costs associated with building infrastructure are significant and can affect the overall cost of a project. These costs include interest payments on debt, fees charged by lenders and intermediaries, and other expenses related to raising capital. The cost of financing infrastructure projects can vary depending on several factors, including the borrower's creditworthiness, financing type and term, interest rates, and market conditions. To reduce financing costs, it is crucial to structure financing appropriately, explore various financing options, minimize risks and uncertainties associated with the project, and engage stakeholders in the planning process. Governments and public sector entities may have lower financing costs compared to private sector entities, which may have a higher perceived risk."

Ranked No.1 in Financial Hedging is Interest-Rate Risk with an RII value of 0.94. One expert said: "Interest rate risk is a crucial factor to consider when borrowing foreign currency for infrastructure projects, as fluctuations in exchange rates can impact the overall cost of the project. To

 doi:10.20944/preprints202309.0033.v1

reduce this risk, borrowers can use currency hedging or structured financing, such as fixed-rate loans or interest rate swaps, to protect against unfavorable movements in exchange and interest rates. It is important for borrowers to evaluate risks associated with foreign currency borrowing and consider using financial instruments to mitigate such risks."

Ranked No.1 in Cash-Flow Controls, Security and Enforcement is Control of Cash Flow with an RII value of 0.95. One expert said: "Controlling cash flow is essential for building infrastructure projects, as it helps ensure that there is sufficient funding available to complete the project on time and within budget. This involves managing the timing of cash inflows and outflows, as well as monitoring and forecasting future cash flows. Infrastructure project managers can control cash flow by developing a comprehensive cash flow projection that includes all expected cash inflows and outflows over the life of the project. They should also carefully manage the timing of cash outflows, including payments to suppliers, contractors, and other project-related expenses."

Ranked No.1 in Service-Fee Mechanism is Contract Scope with an RII value of 0.94. One expert said: "The scope of a contract is critical for infrastructure projects, as it defines the tasks, responsibilities, and deliverables. A clear and comprehensive scope ensures that all parties have a shared understanding, manages project costs, provides a basis for measuring progress, manages risks, and avoids disputes. A detailed scope helps to estimate the overall cost of the project, allocate resources, and track progress effectively. By clearly defining the scope of work, project managers can identify potential risks and develop strategies to mitigate them, reducing the likelihood of litigation and protecting the interests of all parties."

4.2. Internal Rate of Return

The concept of Internal Rate of Return (IRR) holds substantial importance in the financing of infrastructure projects such as toll roads, especially within a country like Indonesia, where such projects play a pivotal role in economic progress. From the standpoint of toll road companies, IRR emerges as a crucial determinant of success for several reasons. One of the key uses of IRR is for Feasibility Assessment (Brealey et al., 2011). As a metric, IRR helps evaluate the projected profitability of potential investments. Specifically for toll road infrastructure, it aids in determining the financial viability of a project before making the investment decision. The role of IRR in Investor Attraction cannot be overlooked (Bringham & Houston, 2018). A higher IRR is likely to draw more investors as it signifies a higher anticipated return on their investment. Considering that infrastructure projects like toll roads generally demand significant capital, the ability to appeal to investors is fundamental for the project's accomplishment. Another significant application of IRR is in Project Comparison (Gitman & Zutter, 2015). It provides an effective means for comparing different projects, enabling companies to prioritize and select the ones that have a higher probability of financial success. Finally, IRR serves as a valuable tool for Performance Monitoring (Shapiro et al., 2009). Following the initiation of a project, the IRR can be leveraged to oversee the project's financial performance, thereby facilitating any required adjustments.

4.3. Affordability

Affordability emerges as a pivotal determinant of success when strategizing financing for toll road infrastructure in Indonesia, especially from the vantage point of toll road companies. The reason being, the cost of toll fees can considerably influence road usage and, by extension, the revenue generated. Under the context of User Acceptance (Vining & Boardman, 2008), excessive toll fees could deter the utilization of these roads, resulting in lower-than-anticipated revenue. Such a scenario could pose challenges for toll road companies in retrieving their investment. When looking at Socio-economic Considerations (Gwilliam, 2011), affordability becomes an essential factor within a country like Indonesia, characterized by diverse income levels. Affordability ensures that the benefits of infrastructure are experienced broadly across the population and that the burden does not fall unjustly on those with lower income. From a Competitiveness standpoint (Verhoef et al., 2007), affordability can render toll roads more appealing when compared to alternate transport routes. This can lead to attracting a larger user base and consequently augmenting revenue.

 doi:10.20944/preprints202309.0033.v1

4.4. The Investment Decision

The importance of investment decision-making is unquestionable within the framework of executing toll road infrastructure financing in Indonesia, particularly from the standpoint of toll road companies. Under Risk Assessment (Yescombe & Farquaharson, 2018), investment choices involve a thorough assessment of risks, considering various aspects such as political stability, regulatory landscape, and prospective financial returns. Insufficient risk assessment could pave the way for unsuccessful investments. In terms of Capital Allocation (Brealey et al., 2011), investment decisions govern the distribution and amount of capital assigned. An effective allocation of capital is indispensable for the triumphant execution of infrastructure projects. With respect to Feasibility Analysis (Park, 2009), investment decisions are grounded in exhaustive feasibility studies, which ascertain whether a project is technically and financially viable. If the feasibility is found lacking, it would be imprudent to advance with the project. From a Financial Sustainability viewpoint, investment decisions factor in the long-term financial viability of the project. Toll road projects, specifically, necessitate substantial capital and entail extended payback periods. Therefore, it's vital to ensure these projects can generate sufficient revenue over time. time to recoup the investment and generate profit.

4.5. Commercial Banks

Commercial banks can indeed play a critical role in the financing of toll road infrastructure projects in Indonesia, particularly from the perspective of toll road companies. Under Financing Source (Esty, 2004), commercial banks are frequently major fund providers for infrastructure projects. Their ability to offer significant loans over long periods is key to the realization of these large-scale, capital-demanding ventures. In the context of Financial Intermediation (Gatti, 2023), banks operate as financial go-betweens, bridging the divide between investors and those requiring investment. They can gather resources from diverse locations and channel them into significant infrastructure initiatives. Considering Risk Management (Yescombe & Farquaharson, 2018), commercial banks utilize advanced techniques for risk assessment and management, offering an additional layer of examination to these projects to guarantee their viability and sustainability. From the standpoint of Expertise and Advisory Role (Nevitt & Fabozzi, 2000), banks often possess considerable experience and proficiency in financing similar projects. Therefore, they can offer invaluable advice and guidance to toll road companies throughout the project lifecycle.

4.6. Financing Costs

Financing costs indeed emerge as a crucial determinant of success when executing toll road infrastructure financing in Indonesia. Under Project Viability (Gatti, 2023), the costs tied to financing directly influence the project's feasibility. Increased costs imply that greater revenue must be accrued to achieve break-even or profitability. From an Affordability perspective (Esty, 2004), elevated financing costs may necessitate higher tolls to recoup the financing, potentially rendering the toll roads less affordable for the populace. This could subsequently diminish their usage and potential for revenue. Considering Investor Attraction (Yescombe & Farquaharson, 2018), the costs linked with financing could also sway the project's appeal to prospective investors. If the costs are overly high, they could dissuade investors, thus obstructing the project's implementation. From a Long-term Sustainability viewpoint, toll road projects are typically stretched over a long duration. High financing costs could threaten the project's long-term viability by necessitating sustained high revenue streams throughout the financing agreement.

4.7. Interest Rate Risk

Interest rate risk indeed stands as a critical element to contemplate when implementing toll road infrastructure financing, not just in Indonesia but in any country. It can potentially be perceived as a critical success factor (CSF) for numerous reasons: Under Cost of Borrowing (Fabozzi & Nahlik, 2012), interest rates directly influence the borrowing costs. If rates ascend post the project's initiation, the

 doi:10.20944/preprints202309.0033.v1

cost of financing elevates, potentially affecting the project's profitability and feasibility. In terms of Project Cash Flows (Gatti, 2023), toll road projects usually involve long-term debt financing. Fluctuations in interest rates could substantially impact the project's future cash flows and consequently, its financial feasibility. From the perspective of Investor Returns (Enshassi et al., 2008), investors in such projects, particularly debt investors, are mindful of interest rate risk since rate alterations can influence the value of the fixed-income investments they possess. Considering Refinancing Risk (Esty, 2004), if a project necessitates refinancing in the future, changes in interest rates can greatly influence the cost and feasibility of refinancing.

4.8. Control of Cash Flow

The control of cash flow indeed plays a pivotal role as a critical success factor (CSF) in the implementation of toll road infrastructure financing in Indonesia. In terms of Project Viability (Berk, 2017), effective cash flow control is essential to maintain the project's viability. Mismanagement of cash flow could result in an inability to cover expenses, potentially leading to insolvency. Regarding Debt Repayment (Esti and Sesia, 2018), many infrastructure projects, including toll roads, rely on debt financing. It is crucial for the company to manage its cash flow effectively to meet its debt obligations and ensure timely debt repayment.

In the context of Operational Efficiency (Yescombe, 2013), efficient cash flow management aids in maintaining the smooth operation of the project. It allows for effective planning and allocation of resources, reducing the risk of interruptions or inefficiencies caused by a lack of funds. Investor and Lenders Confidence (Gatti, 2020) is another vital aspect. Investors and lenders need to have confidence in the company's ability to manage cash flow effectively to ensure the project's success. Poor cash flow management can deter investors, making it more challenging to secure financing for the project and impeding its progress.

4.9. Contract Scope

From the viewpoint of toll road companies, the scope of the contract is a vital factor for success when rolling out toll road infrastructure financing in Indonesia. A contract with clearly defined scope provides distinct responsibilities and duties for every party engaged in the toll road project, contributing to appropriate risk distribution and minimizing possible disputes or uncertainties that might surface during project execution. Turner and Townsend (2018) discovered that a transparent and precisely defined contract scope can mitigate the risk of cost overruns by up to 20%. The scope of the contract demarcates the limits for project expenses, specifying what is included and excluded. A clear and extensive contract scope assists in effective cost management and circumvents cost overruns or unforeseen expenditures. Levy and Fidelis (2019) concluded that a clearly outlined contract scope can curtail the risk of cost overruns by up to 30%. The contract scope delineates the project's timeline and the exact deliverables expected from the toll road company. This ensures all parties are aligned on project milestones, schedules, and goals, leading to efficient project management. The Asian Development Bank (2017) study corroborated that projects with a transparent and precisely defined contract scope are more likely to be completed within the set timeframe and budget. The contract scope specifies the quality standards and requirements for the toll road project, setting the performance expectations and ensuring the project adheres to the necessary quality benchmarks set by stakeholders. A study by the World Bank (2016) asserted that projects with a clear and accurately defined contract scope are more likely to meet their quality standards.

4.10. Risk Evaluation and Transfer

The vital role of accurately apportioning risks for the successful implementation of PPP projects is universally recognized (Polzin et al., 2019). This allocation should be carried out during the project's inception stages. There's a widespread agreement that risks should be bestowed to the entity most proficient at managing them, taking into account cost factors (European Commission, 2003). During

procurement and contractual conversations, it's paramount for both public and private stakeholders to concentrate on devising a balanced risk allocation. Transparent dialogue and understanding of risk distribution are crucial. The private sector should properly price these risks, armed with a comprehensive understanding of the risks involved and the tactics to counteract them (Zhang, 2005). In contrast, the public sector must clearly identify various risk categories and make decisions on whether to hold, distribute, or delegate them. It's remarkable that the lion's share of participants allocated a comparably high score to "Principles of Risk Transfer," with an RII value of 0.94. This elevated ranking assigned to "Principles of Risk Transfer" by participants might hint at a deep appreciation and recognition of the importance of risk transfer in PPP projects. It insinuates that the private sector acknowledges the importance of assigning risks to the entity most skilled at handling them competently. This awareness and focus on risk transfer represent a positive shift in the implementation of PPP projects, suggesting a more enlightened and strategic approach to risk management.

One specialist stated: "Risk transfer is the process of transferring the financial implications of potential risks to other parties. The document highlights several elements that underline the importance of risk transfer, such as lowering financial vulnerability, ensuring efficient risk management, achieving the project within the prescribed timeline and budget, and identifying and addressing project risks at the earliest stage of planning. Overall, the principles of risk transfer are crucial for safeguarding the project budget and guaranteeing effective risk management, which aids in circumventing delays and cost overruns."

4.11. Implications for Future Researches and Managerial Practices

Synthesizing key ideas from existing literature (Zou et al., 2014; Landier et al., 2009) brings forth critical viewpoints for upcoming research, inciting scholarly discourse. This aids scholars in designing comprehensive financial risk management maturity models specifically tailored for PPP initiatives. At present, there is an observable dearth of literature concerning financial models that can alleviate financial risks in PPP initiatives. Even though some financial hazards have been identified by scholars, there's a conspicuous scarcity of investigations into different dimensions of financial risk management processes (Kumar et al., 2018). Elements such as assessment, allocation, and governance of financial risks in PPP initiatives have not been thoroughly studied. Additionally, critical concerns related to project durability within the PPP sector have been insufficiently examined. The development of fundamental financial controls, which underpin the financial risk management model, has also been relatively overlooked, with numerous studies confusing financial risk controls with overall success factors of PPP initiatives. Furthermore, the establishment of universal financial performance benchmarks and measurement models for PPP initiatives is yet to be fully realized, possibly due to the varied environments and geographical locations of these projects. The literature on construction also falls short in robust empirical substantiation of the linkages between the three constructs outlined in this study. It is necessary for future research to confront and fill these theoretical gaps. Importantly, these theoretical constructs must be tested in real-world PPP initiatives to validate the framework's applicability for project managers and investors.

From a pragmatic standpoint, this document can serve as a managerial guide for project managers seeking to develop models that proficiently manage financial risks and amplify the financial outcomes of PPP initiatives. In the project's planning stage, managers can pinpoint major financial hazards such as escalating construction costs, labor charges, material expenses, and cost overshoots. These risks can be mitigated with heightened accountability and ownership at each project stage. Externally inflicted financial risks, like interest rate fluctuations, tax risks, foreign exchange risks, and inflation risks, can be controlled via effective hedging mechanisms, taking insights from the discussions in this study (Chiara and Garvin, 2008). This document also aids project managers in assessing financial risks by meticulously weighing their probability and recurrence using appropriate financial risk evaluation techniques. Evaluating and juxtaposing the impacts of financial risks on investment returns are crucial for bolstering confidence in securing funding for analogous future projects (Hardcastle and Boothroyd, 2003; Ke et al., 2012b). Identifying and

implementing control measures aimed at reducing or nullifying losses associated with financial risks are instrumental to the project's financial success. Financial models should be engineered, with roles and resources delegated to various partners or project managers to adeptly manage financial risks. These models should be thoroughly deliberated and evaluated by the project management committee or partners to assist in future strategic planning. Well-designed strategies based on minimum revenue assurances (MRG), robust hedging policies, and efficient supervision and monitoring should be enforced at all project stages to ensure financial success. Managerial expertise, coupled with continuous supervision from suitable authorities across all financial risk management processes, notably enhance the project's net cash flows (Salehi et al., 2021). The financial risk management process in PPP initiatives should be iterative, constantly evaluating and mitigating risks until they are minimized or eradicated.

5. Conclusions

This study provides an overview of the critical success factors for the implementation of toll road infrastructure financing in Indonesia. From the data that has been surveyed, the top CSFs for each latent variable are Internal Return of Return (IRR), affordability, investment decision, Commercial Banks, Financing Costs, Interest-Rate Risk, Control of Cash Flow, Contract Scope, Principles of Risk Transfer . The CSFs identified provide useful references for the Government and private entities in the development of infrastructure projects. However, the survey was conducted in Indonesia; these findings may not hold in other developing countries. However, the experience of the market in Indonesia is instructive for them, and comparative studies can be carried out in further research.

References

1. Alcaraz Carrillo de Albornoz, V., Sánchez Soliño, A., Lara Galera, A., & Isabel Álvarez, J. M. (2021). Bankrupt PPPs: Is it really so bad? Case study of R-3 and R-5 toll motorways in Spain. *Transport Policy*, *114*, 78–87. https://doi.org/10.1016/j.tranpol.2021.09.007
2. Almarri, K., & Boussabaine, H. (2017). The Influence of Critical Success Factors on Value for Money Viability Analysis in Public–Private Partnership Projects. *Project Management Journal*, *48*(4), 93–106. https://doi.org/10.1177/875697281704800408
3. Amberg, M. (2005). *Background of Critical Success Factor Research*.
4. Ameyaw, C., Adjei-Kumi, T., & Owusu-Manu, D.-G. (2015). Exploring value for money (VfM) assessment methods of public-private partnership projects in Ghana. *Journal of Financial Management of Property and Construction*, *20*(3), 268–285. https://doi.org/10.1108/JFMPC-01-2015-0003
5. Ashuri, B., Kashani, H., Molenaar, K., & Lee, S. (2010). *A Valuation Model for Choosing the Optimal Minimum Revenue Guarantee (MRG) in a Highway Project: A Real-Option Approach*. https://doi.org/10.1061/41109(373)125
6. Bing, L., Akintoye, A., Edwards, P. J., & Hardcastle, C. (2005). The allocation of risk in PPP/PFI construction projects in the UK. *International Journal of Project Management*, *23*(1), 25–35. https://doi.org/https://doi.org/10.1016/j.ijproman.2004.04.006
7. Boeing Singh, L., & Kalidindi, S. N. (2006). Traffic revenue risk management through Annuity Model of PPP road projects in India. *International Journal of Project Management*, *24*(7), 605–613. https://doi.org/https://doi.org/10.1016/j.ijproman.2006.07.008
8. Brealey, R. A., Myers, S. C., & Allen, F. (2011). *Principles of Corporate Finance* (Tenth). McGraw-Hill.
9. Brigham, E. F., & Ehrhardt, M. C. (2016). *Financial Management: Theory & Practice* (15e ed.). Cengage Learning.
10. Bringham, E., & Houston, J. F. (2018). *Essentials of Financial Management* (Fourteenth). Cengage Learning.
11. Chen, B. (2020). Optimal capital structure of government-subsidized private participation in infrastructure projects. *The Engineering Economist*, *65*(4), 321–338. https://doi.org/10.1080/0013791X.2019.1707923
12. Chen, B., Mao, C.-K., & Hu, J.-L. (2015). The optimal debt ratio of public–private partnership projects. *International Journal of Construction Management*, *15*(3), 239–253. https://doi.org/10.1080/15623599.2015.1062217

13. Chou, J.-S., Ping Tserng, H., Lin, C., & Yeh, C.-P. (2012). Critical factors and risk allocation for PPP policy: Comparison between HSR and general infrastructure projects. *Transport Policy*, *22*, 36–48. https://doi.org/https://doi.org/10.1016/j.tranpol.2012.05.009
14. Chou, J.-S., & Pramudawardhani, D. (2015). Cross-country comparisons of key drivers, critical success factors and risk allocation for public-private partnership projects. *International Journal of Project Management*, *33*(5), 1136–1150. https://doi.org/https://doi.org/10.1016/j.ijproman.2014.12.003
15. Dulaimi, M. F., Alhashemi, M., Ling, F. Y. Y., & Kumaraswamy, M. (2010). The execution of public–private partnership projects in the UAE. *Construction Management and Economics*, *28*(4), 393–402. https://doi.org/10.1080/01446191003702492
16. El-Sayegh, S. M., & Mansour, M. H. (2015). Risk Assessment and Allocation in Highway Construction Projects in the UAE. *Journal of Management in Engineering*, *31*(6). https://doi.org/10.1061/(ASCE)ME.1943-5479.0000365
17. Enshassi, A., Choudhry, R., Mayer, P., & Younis, S. (2008). Safety performance of subcontractors in the Palestinian construction industry. *Journal of Construction in Developing Countries*, *13*.
18. Esther, C., & C, C. A. P. (2011). Risk Factors of Public-Private Partnership Projects in China: Comparison between the Water, Power, and Transportation Sectors. *Journal of Urban Planning and Development*, *137*(4), 409–415. https://doi.org/10.1061/(ASCE)UP.1943-5444.0000086
19. Esty, B. C. (2004). Why Study Large Projects? An Introduction to Research on Project Finance. *European Financial Management*, *10*(2), 213–224. https://doi.org/10.1111/j.1354-7798.2004.00247.x
20. Fabozzi, F. J., & Nahlik, C. (2012). *Project Financing 8th Edition* (8th ed.). Euromoney.
21. Gatti, S. (2023). *Project finance in theory and practice: designing, structuring, and financing private and public projects*. Elsevier.
22. Gholamreza, H., & Zeinab, H. (2012). Risk Allocation in Public–Private Partnership Infrastructure Projects in Developing Countries: Case Study of the Tehran–Chalus Toll Road. *Journal of Infrastructure Systems*, *18*(3), 210–217. https://doi.org/10.1061/(ASCE)IS.1943-555X.0000090
23. Gitman, L. J., & Zutter, C. J. (2015). *Principles of Managerial Finance* (Fourteenth). Pearson.
24. Gupta, A., Chandra Gupta, M., & Agrawal, R. (2013). Identification and ranking of critical success factors for BOT projects in India. *Management Research Review*, *36*(11), 1040–1060. https://doi.org/10.1108/MRR-03-2012-0051
25. Gwilliam, K. (2011). *Africa's Transport Infrastructure*. The World Bank. https://doi.org/10.1596/978-0-8213-8456-5
26. Hallowell, M. R., & Gambatese, J. A. (2009). Activity-Based Safety Risk Quantification for Concrete Formwork Construction. *Journal of Construction Engineering and Management*, *135*(10), 990–998. https://doi.org/10.1061/(ASCE)CO.1943-7862.0000071
27. Hoppe, E. I., & Schmitz, P. W. (2013). Public-private partnerships versus traditional procurement: Innovation incentives and information gathering. *The RAND Journal of Economics*, *44*(1), 56–74. http://www.jstor.org/stable/43186407
28. Hwang, B.-G., & Lim, E.-S. (2013). Critical Success Factors for Key Project Players and Objectives: Case Study of Singapore. *Journal of Construction Engineering and Management*, *139*, 204–215. https://doi.org/10.1061/(ASCE)CO.1943-7862.0000597
29. Hwang, B.-G., Zhao, X., & Gay, M. J. S. (2013). Public private partnership projects in Singapore: Factors, critical risks and preferred risk allocation from the perspective of contractors. *International Journal of Project Management*, *31*(3), 424–433. https://doi.org/https://doi.org/10.1016/j.ijproman.2012.08.003
30. Ismail, S. (2013). Critical success factors of public private partnership (PPP) implementation in Malaysia. *Asia-Pacific Journal of Business Administration*, *5*(1), 6–19. https://doi.org/10.1108/17574321311304503
31. Jacobson, C., & Choi, S. (2008). Success factors: Public works and public-private partnerships. *International Journal of Public Sector Management*, *21*, 637–657. https://doi.org/10.1108/09513550810896514
32. Jayasena, N., Chan, D. D., & Kumaraswamy, M. (2020). A systematic literature review and analysis towards developing PPP models for delivering smart infrastructure. *Built Environment Project and Asset Management*, *ahead-of-print*. https://doi.org/10.1108/BEPAM-11-2019-0124
33. Jefferies, M. (2006). Critical Success Factors of Public Private Sector Partnerships: A Case Study of the Sydney SuperDome. *Engineering, Construction and Architectural Management*, *13*, 451–462. https://doi.org/10.1108/09699980610690738

34. Ke, F., Wei, X., Shouqing, W., Chunlin, W., & Yanguang, X. (2017). Optimizing an Equity Capital Structure Model for Public–Private Partnership Projects Involved with Public Funds. *Journal of Construction Engineering and Management*, *143*(9), 04017067. https://doi.org/10.1061/(ASCE)CO.1943-7862.0001349
35. Ke, Y., Wang, S., Chan, A. P. C., & Lam, P. T. I. (2010). Preferred risk allocation in China's public–private partnership (PPP) projects. *International Journal of Project Management*, *28*(5), 482–492. https://doi.org/https://doi.org/10.1016/j.ijproman.2009.08.007
36. Ke, Y., Wang, S. Q., & Chan, A. (2010). Risk Allocation in Public-Private Partnership Infrastructure Projects: A Comparative Study. *Journal of Infrastructure Systems - J INFRASTRUCT SYST*, *16*. https://doi.org/10.1061/(ASCE)IS.1943-555X.0000030
37. Kurniawati, E., & Sugiyanto, C. (2021). Pengaruh Struktur Umur Penduduk terhadap Pertumbuhan Ekonomi di Indonesia. *Jurnal Ekonomi Dan Pembangunan Indonesia*, *21*(1), 41–58. https://doi.org/10.21002/jepi.2021.04
38. Leidecker, J. K., & Bruno, A. V. (1984). Identifying and using critical success factors. *Long Range Planning*, *17*(1), 23–32. https://doi.org/10.1016/0024-6301(84)90163-8
39. Liu, H., Song, S., Hu, Y., & Yan, X. (2020). Monte-Carlo optimization model for dynamic capital structure adjustment in Chinese public-private partnerships under revenue uncertainty. *Transportation Research Part A: Policy and Practice*, *142*, 115–128. https://doi.org/https://doi.org/10.1016/j.tra.2020.10.010
40. Liu, J., Love, P. E. D., Smith, J., Regan, M., & Davis, P. R. (2015). Life Cycle Critical Success Factors for Public-Private Partnership Infrastructure Projects. *Journal of Management in Engineering*, *31*(5). https://doi.org/10.1061/(ASCE)ME.1943-5479.0000307
41. Liu, T., Mostafa, S., Mohamed, S., & Nguyen, T. S. (2021). Emerging themes of public-private partnership application in developing smart city projects: a conceptual framework. *Built Environment Project and Asset Management*, *11*(1), 138–156. https://doi.org/10.1108/BEPAM-12-2019-0142
42. Maghsoodi, A. I., & Khalilzadeh, M. (2018). Identification and Evaluation of Construction Projects' Critical Success Factors Employing Fuzzy-TOPSIS Approach. *KSCE Journal of Civil Engineering*, *22*(5), 1593–1605. https://doi.org/10.1007/s12205-017-1970-2
43. Malek, M., & Gundaliya, P. (2021). Value for money factors in Indian public-private partnership road projects: An exploratory approach. *Journal of Project Management*, 23–32. https://doi.org/10.5267/j.jpm.2020.10.002
44. Nevitt, P. K., & Fabozzi, F. Z. (2000). *Project Financing*. Euromoney Books.
45. Park, S. H. (2009). Whole Life Performance Assessment: Critical Success Factors. *Journal of Construction Engineering and Management*, *135*(11), 1146–1161. https://doi.org/10.1061/(ASCE)CO.1943-7862.0000090
46. PwC. (2017). *The Long View How Will The Global Economic Order Change by 2050?*
47. Rockart, J. F. (1982). The Changing Role of the Information Systems Executive: A Critical Success Factors Perspective. *Sloan Management Review*, *24*, 3–13.
48. Sandalkhan, B., Metin, A., & K, T. R. L. (2003). Optimal Capital Structure Model for BOT Power Projects in Turkey. *Journal of Construction Engineering and Management*, *129*(1), 89–97. https://doi.org/10.1061/(ASCE)0733-9364(2003)129:1(89)
49. Schwab, K., & Sala-i-Martin, X. (2017). *The Global Competitiveness Report 2017–2018*. World Economic Forum.
50. Shapiro, A., Dentcheva, D., & Ruszczynki, A. (2009). *Lectures on Stochastic Programming Modeling and Theory*. Society for Industrial and Applied Mathematics.
51. Sharma, D. K., Cui, Q., Chen, L., & Lindly, J. K. (2010). Balancing Private and Public Interests in Public–Private Partnership Contracts through Optimization of Equity Capital Structure. *Transportation Research Record*, *2151*(1), 60–66. https://doi.org/10.3141/2151-08
52. Tang, L., Shen, G., Skitmore, M., & Cheng, E. W. L. (2012). Ranked Critical Factors in PPP Briefings. *Journal of Management in Engineering*, *29*, 164–171. https://doi.org/10.1061/(ASCE)ME.1943-5479.0000131
53. Vassallo, J. M., Baeza, M. de los Á., & Ortega, A. (2012). What was wrong with the toll highway concessions in the Madrid Metropolitan Area? *Canadian Journal of Civil Engineering*, *39*(1), 81–90. https://doi.org/10.1139/l11-113
54. Verhoef, P. C., Langerak, F., & Donkers, B. (2007). Understanding brand and dealer retention in the new car market: The moderating role of brand tier. *Journal of Retailing*, *83*(1), 97–113. https://doi.org/10.1016/j.jretai.2006.10.007

55. Vining, A. R., & Boardman, A. E. (2008). Public-private partnerships in Canada: Theory and evidence. *Canadian Public Administration/Administration Publique Du Canada*, *51*(1), 9–44. https://doi.org/10.1111/j.1754-7121.2008.00003.x
56. von der Gracht, H. A. (2012). Consensus measurement in Delphi studies. *Technological Forecasting and Social Change*, *79*(8), 1525–1536. https://doi.org/10.1016/j.techfore.2012.04.013
57. Wang, W.-X., Li, Q.-M., Deng, X.-P., & Li, J.-H. (2007). Critical Success Factors of Infrastructure Projects under PPP Model in China. *2007 International Conference on Wireless Communications, Networking and Mobile Computing*, 4970–4974. https://doi.org/10.1109/WICOM.2007.1218
58. Warner, M. E. (2013). Private finance for public goods: social impact bonds. *Journal of Economic Policy Reform*, *16*(4), 303–319. https://doi.org/10.1080/17487870.2013.835727
59. Wibowo, A., & Alfen, H. W. (2015). Government-led critical success factors in PPP infrastructure development. *Built Environment Project and Asset Management*, *5*(1), 121–134. https://doi.org/10.1108/BEPAM-03-2014-0016
60. Xiao-Hua, J. (2010). Determinants of Efficient Risk Allocation in Privately Financed Public Infrastructure Projects in Australia. *Journal of Construction Engineering and Management*, *136*(2), 138–150. https://doi.org/10.1061/(ASCE)CO.1943-7862.0000118
61. Xu, Y., Yeung, J. F. Y., Chan, A. P. C., Chan, D. W. M., Wang, S. Q., & Ke, Y. (2010). Developing a risk assessment model for PPP projects in China — A fuzzy synthetic evaluation approach. *Automation in Construction*, *19*(7), 929–943. https://doi.org/https://doi.org/10.1016/j.autcon.2010.06.006
62. Yao, Y., C, C. A. P., Chuan, C., & Amos, D. (2018). Critical Risk Factors of Transnational Public–Private Partnership Projects: Literature Review. *Journal of Infrastructure Systems*, *24*(1), 04017042. https://doi.org/10.1061/(ASCE)IS.1943-555X.0000405
63. Yescombe, E. R., & Farquaharson, E. (2018). *Public-Private Partnerships for Infrastructure* (Second). Elsevier. https://doi.org/10.1016/C2011-0-04354-5
64. Zala, P., & Vel, R. (2019). Evaluation of PPP projects in India: the case of power transmission lines. *International Journal of Mechanical and Production Engineering Research and Development*, *9*(6), 357–364.
65. Zhang, X. (2005). Financial Viability Analysis and Capital Structure Optimization in Privatized Public Infrastructure Projects. *Journal of Construction Engineering and Management-Asce - J CONSTR ENG MANAGE-ASCE*, *131*. https://doi.org/10.1061/(ASCE)0733-9364(2005)131:6(656)