

Analysis of Construction Critical Success Factors (CSF) for Public-Private Partnership (PPP) for Sports Infrastructure in Qatar Using Relative Importance Index

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Abstract

Public-Private Partnership (PPP) is a unique procurement method that tends to increase in the recent period due to its sustainable approach. Its main feature is to create a partnership between public and private stakeholders to improve the project's delivery time, cost, and quality perspectives and consider the project fund requirements. The paper focuses on and assesses the construction-related critical success factor (CSF) to answer which CSF is important when applying PPP procurement methodology from stakeholders' perspectives and the recommendation to be considered when adapting such a unique and complex procurement method for sports infrastructure assets. Five CSF were identified from previous publications on the same field under a systematic literature review. An online survey was used to collect the professional's view on the importance of the identified factors—the relative Importance Index method used to hierarch them based on the survey results and determine their importance level. The results show that the hierarchy of the construction-related factors supports the study hypothesis. The factors had been classified accordingly with a set of recommendations, as explained later in the paper.

Keywords

Critical Success Factors (CSF), Public-Private Partnership (PPP), Relative Importance Index (RII), Sustainable procurement.

1. Introduction

The construction industry is vital to a country's infrastructure development and growth. About 10% and 30% of a country's gross domestic product (GDP) is contributed by the industry (Hampson et al., 2014). However, this industry faces significant challenges when it comes to delivery on time, with the required quality from one side, which the private party will contribute, and funding consideration for the public party. Eventually, the project's success is determined by its value for money. Moreover, a smooth, sustainable development is one primary goal that all countries aim to achieve in their policy and plan, which requires a unique way of thinking and better expertise utilization and access to new resources to develop new and unique projects.

One of the solutions proposed to improve the delivery of the project is by redefining the relationship among stakeholders by using Public-private partnership as a project procurement method. The PPP has attracted much interest in recent decades, expanding rapidly worldwide (Dulaimi et al., 2010; Regan et al., 2010). In the late 1990s, the PPP scheme drew increasing attention (Osei-Kyei & Chan, 2015).

The private partner is responsible for constructing the project according to the agreed-upon specifications and efficiency in the PPP context. Essentially, construction can begin as soon as the financing is finalized. The construction

schedule is usually incorporated into the concession duration of most PPP contracts. This is always done to ensure that the project is finished on schedule and, most importantly, the investor is adequately compensated for construction and execution delays. Moreover, the private partner is often obligated by the partnership agreement to use more local content and expertise. The construction of a PPP project is expected to increase job opportunities for local commuters, artisans, and artisans, so investors are encouraged to use more local content at this point. (Osei-Kyei & Chan, 2018).

On the other side, the PPP is a complex way to procure lengthy projects and requires more specialized resources to conclude one project than traditional procurement methods, such as Design, Bid Build or Design and Build. Hence, a thorough study and analysis of the project are needed by both the private party regarding investment and the public party when it comes to commitments.

1.1 Research Objectives

This paper aims to identify and analyze the critical success factors required when a PPP procurement method is adapted to the project's construction stage. Accordingly, it will hierarch them and give recommendations based on their importance. This will enable both private and public parties and all project stakeholders to understand the in-depth challenges that arise and why it is crucial so that policymakers can consider them when procuring a project under this module. Once these factors are well defined, their impact is understood, and their importance is known, project stakeholders can find several ways to tackle each one of them depending on the project type, location, project criteria, value of money, among other factors. The study hypothesizes whether the identified factors are of high importance when using PPP or not and their weight and rank based on the survey.

2. Literature Review

Past research on infrastructure definition, Public-Private Partnership and public sector investment, Infrastructure Asset Management and Urbanization, Sustainable Procurement, and Construction Critical Success Factors for PPP will be the subject of the primary debate.

2.1 Infrastructure definition

Basic facilities and services are examples of "infrastructure." Its primary goal is to make the community/society more comfortable. In general, the term "infrastructure" refers to whole systems or facilities (such as highways and railroads), equipment (such as rolling stock), plants (such as independent power generation and wastewater treatment plants), and social infrastructures (such as hospitals, schools, and sports stadiums).

Infrastructure can be classified as either economic or social. The assets of public infrastructure may be divided into numerous categories. Sports infrastructure (the subject of this article) is a form of social infrastructure asset that frequently sees PPP developments using private capital.

2.2 The public-private partnership

The public-private partnership (PPP) model has shown to be a viable choice for expanding infrastructure projects. (2020, Chen et al.). A Public-Private Partnership (PPP) is a way for acquiring and delivering public assets, such as public works that are subject or dedicated to public use or that are naturally accompanied or linked with the provision of public services.

Infrastructure PPPs are contracts in which the private partner is responsible for developing and managing new infrastructure. In contrast, A Service PPPs are contracts in which the private partner is responsible for managing existing infrastructure or only provides or operates public services, such as education or emergency services.

The PPP can also be used to execute capital-intensive projects or extra investment in an existing asset. This refers to "major upgrading or refurbishment," which is a component of asset reuse or urbanization. The study focuses on public procurement since public organizations are some of the largest procurement bodies. Sustainable public procurement is a strategy that public organizations may use to satisfy their demands for products and services in terms of cost and societal value, and decreased environmental harm (Tiwari et al., 2019).

A PPP is a long-term agreement between the government and a private party(s) for the construction (or significant modification or repair) and maintenance of a public asset, according to a World Bank definition from 2014 under

which the private party bears the majority of the risk and management responsibility throughout the contract's life cycle, as well as providing a large amount of the money on its own expense, with pay tied to the asset's or service's performance. In other terms, the public-private partnership (PPP) model provides public infrastructure and/or services.

2.3 Sustainable Procurement

The importance of the construction market to the three pillars of sustainable development, namely economic growth, social transformation, and effective environmental conservation, cannot be understated. These three criteria should be examined at the early stages of a project since a project can be most successfully affected and monitored throughout its life cycle. The acquisition of defined things to encourage the sustainable use of resources is referred to as sustainable procurement. When contrast to green procurement, which focuses on purchasing efficient and recyclable materials, sustainable procurement spans a broader agenda. As a result, instead of focusing just on economics, sustainable procurement considers social, environmental, and other relevant aspects.

The formulation of rules or a framework that is fair, transparent, and acceptable to the public is required for the implementation of sustainable public procurement [(Meehan and Bryde, 2011); (Sönnichsen and Clement, 2020)].

2.4 Construction CSF

Critical success factors (CSFs) are the few critical areas of activity where favourable results are required for management to achieve his or her objectives. (Rockart, 1980). One of the critical objectives for a private party to engage his assets and resources is construction in the PPP module; thus, five factors have been identified.

Starting with effective subcontractor selection as the first aspect in this category, subcontractors play a critical part in projects; hence the correct selection is critical to project success.

The second component is a well-defined constructing time, which must be practical and doable to fulfil public sector demand while remaining within the private sector's capabilities. Otherwise, the PPP initiative is doomed from the start.

The third factor is mainly concerned with investors. Only consistent and effective project performance monitoring will allow them to comprehend what has been done and what concerns require immediate attention to ensure its success. As a result, monitoring is essential for identifying potential problems and working toward appropriate solutions among all stakeholders, ensuring that all project stakeholders and shareholders are on the same page.

Regardless matter whether the procurement choice is PPP or conventional procurements, safety is a top priority. The fourth factor in this cluster was chosen as an effective safety management strategy through the construction and operating phases. There is a total Cost of Quality in each tender price. Quality receives considerable attention from the private sector in the PPP structure since it is tied to performance and operation. In other words, the private party will not be compensated until the facility is up and running. Furthermore, service delivery is linked to a payment deduction mechanism; thus, an effective quality management plan during the construct and operation phases was chosen as the fifth factor since quality is an essential and significant component. The criteria and their references from the literature study are summarised in Table 1 to discover the significant factors to the topic research summarised below; a thorough investigation was conducted.

Table 1. CSF References

No.	CSF	References
1	Effective subcontractor selection	Errasti et al., (2007), Zhang, X. (2005a), Jefferies, M., et al. (2002)
2	Well defined construction period	Ozdoganm, I.D. et al. (2000), Chan et al. (2010), Jacobson C., Choi, S.O. (2008)
3	An effective project performance monitoring	Li et al. (2005), Partnerships UK (2006), Meng et al. (2011)
4	An effective safety management plan	J Liu et al. (2014), Fung et al. (2010), Carter G. & Smith D. (2006)
5	An effective quality management plan	Dixon et al. (2005), Meng et al. (2011), Ng et al. (2012)

In Summary, the study hypothesis assumes that the below five critical success factors are important and have a high impact on the procurement method decision using PPP. More specifically, the following factors had been shortlisted based on the literature review, and they will be tested for their importance:

- Effective subcontractor selection
- Well defined construction period
- Consistent and effective project performance monitoring
- An effective safety management plan
- An effective quality management plan

3. Methods

The study adopted and selected a methodology appropriate for identifying and ranking the CSF for PPP projects and suggest the central area of improvement accordingly. The steps followed in this research are starting with the problem statement, literature review, research design and hypothesis, qualitative data collection, data analysis, proposed improvement, validation, conclusion, and future research. Figure (1) below provides information step by step of the research methodology.

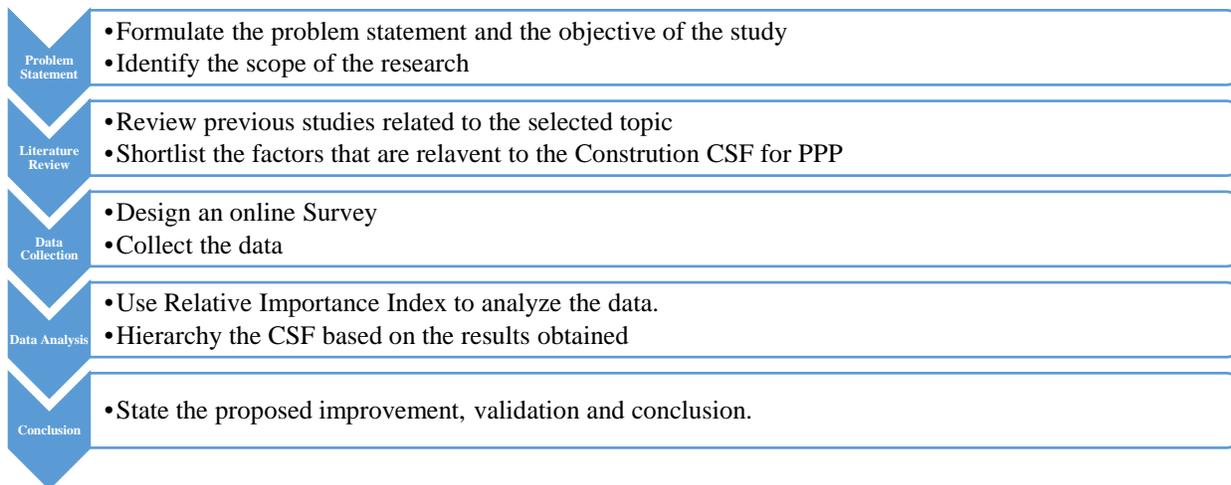


Figure 1. Research Methodology

4. Data Collection

The data was gathered via a global online survey conducted between December 2020 and January 2021 on the Survey Monkey platform. The importance of the replies ranges from low to extremely important. To let the analysis go more efficiently, this was eventually adjusted to a scale of 1 to 5. According to Elsherbeny (2020), a five-point Likert scale assessing the relevance of contributing variables and performance groups is generally sufficient to discern performance discrepancies. Table (2) illustrates the response sample and scaling used in the online survey.

The part of the survey used in this study has two attributes about General Questions and Construction CSF. The selected general questionnaires representing the respondent profiles were three relating to the Organization, Area of expertise, and years of experience. The CSF was the five factors identified in the literature review.

Table 2. Response sample and scaling

Not Important	Low important	Moderate Important	High Important	Extremely Important
1	2	3	4	5

The desired amount of respondents was 150. The questionnaire received a total of 275 entries, with 214 of them being complete responses that were utilized in the analysis.

5. Results and Discussion

5.1 Descriptive Analysis - Respondent's profile

Out of 214 respondents, 135 responses came from the Private Sector, representing 63.08%; 51 responses came from the Public Sector, representing 23.83%; 27 responses came from semi-government entities representing 12.62%; and lastly, one response came from Non-profit Organization under others category. Figure (2) below shows the Organizations of the respondent's distribution.

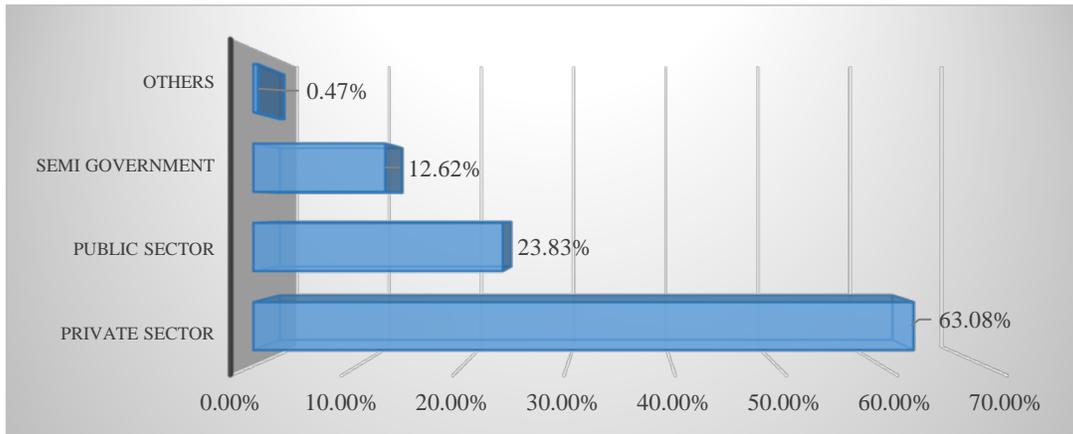


Figure 2. Organization

In addition, 129 responses came from project construction management expertise, accounting for 60.28 %; 66 responses came from Design and Engineering expertise, accounting for 30.84 %; and other expertise responded, including Legal Management, Facility Management, Finance, and Account Management, with their responses distributed as shown below (3).

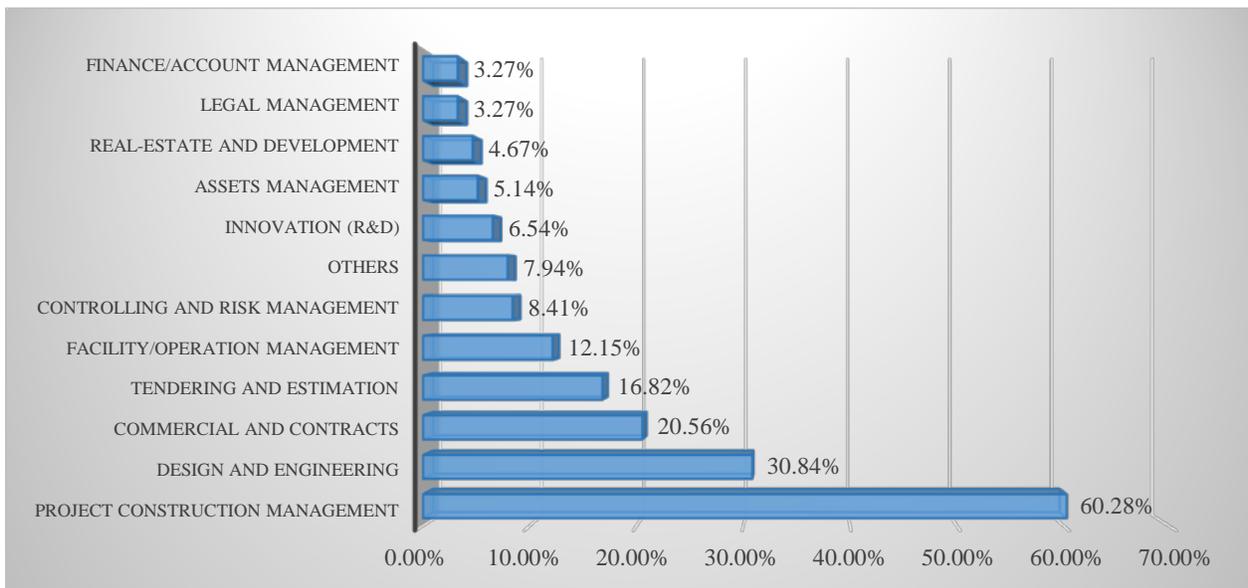


Figure 3. Area of Experience

In the general section, the survey gathered the respondent's years of experience. With 30.37 % of responses, respondents had between 11 and 15 years of experience, followed by 19.16 % with more than 25 years of experience,

and 18.32 % with 16 to 20 years of experience. The survey's findings reveal that respondents had extensive experience profiles, as illustrated in Figure 4.

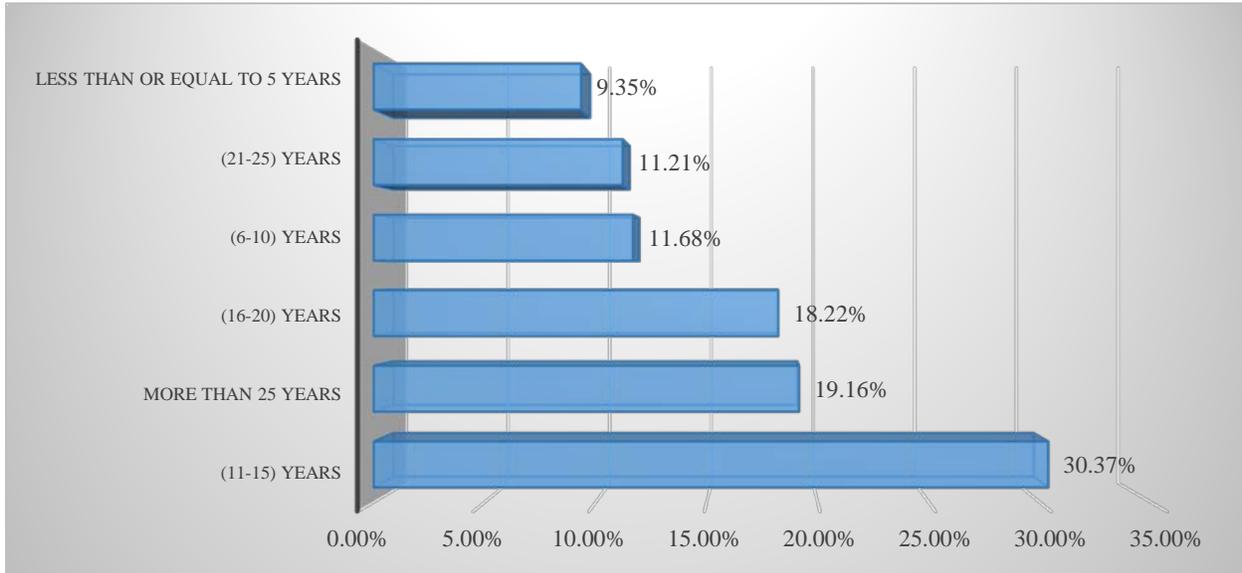


Figure 4. Years of Experience

5.2 Descriptive Analysis – Construction CSF

To ease the illustration and demonstration of information in data analysis, each CSF was given a code, as shown in Table 3.

Table 3. CSF coding

CSF	Code
Effective subcontractor selection	C1
Well defined construction period	C2
An effective project performance monitoring	C3
An effective safety management plan	C4
An effective quality management plan	C5

Out of the 214 completed responses collected in the survey, the findings show that all indicators fall into the High Importance Category, with responses ranging from 125 (58.41%) to 97 (45.33%), as shown in Table 4. Figure 5 demonstrates the Construction CSF responses distribution obtained from the survey for the 214 responses.

Table 4. CSF Responses

Factor	C1		C2		C3		C4		C5	
High Important	114	53.27%	108	50.47%	125	58.41%	97	45.33%	113	52.80%
Extremely Important	56	26.17%	53	24.77%	52	24.30%	70	32.71%	60	28.04%
Moderate Important	35	16.36%	46	21.50%	31	14.49%	42	19.63%	31	14.49%
Low Important	7	3.27%	6	2.80%	5	2.34%	4	1.87%	8	3.74%
Not Important	2	0.93%	1	0.47%	1	0.47%	1	0.47%	2	0.93%

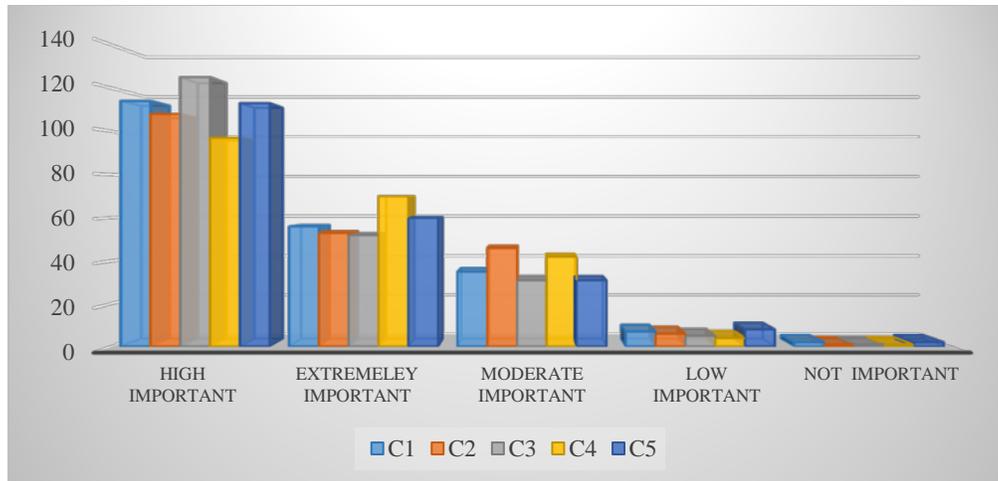


Figure 5. Construction CSF responses distribution

The Relative Importance Index (RII) will be used for Data analysis which determines the relative importance of the quality factors involved. The Likert five points scale used is equal to the value of W, weighting given to each factor by the respondent.

The RII Value will be calculated using the following formula:

$$RII = \sum x_n x / (A * N)$$

Where: x: Scale of the responses (1 to 5)
 n: Number of responses per scale
 A: Number of scale measures
 N: Total number of responses (214)

RII ranges from 0 to 1, and the more that result is approaching 1, the higher the importance level would be. According to Rooshdi et al. (2018), the RII ranking is as follows:

- 0.8 ≤ RII ≤ 1 is considered High.
- 0.6 ≤ RII ≤ 0.8 is considered High-Medium.
- 0.4 ≤ RII ≤ 0.6 is considered Medium.
- 0.2 ≤ RII ≤ 0.4 is considered Medium-Low.
- 0 ≤ RII ≤ 0.2 is considered Low.

The data were analyzed as shown in Table 5, where the whole 214 responses were used, and the number of scale measures was 5.

Table 5. RII Analysis

Factor	Likert Scale Point					N	Responses		RII
	NI	LI	MI	HI	EI		Min.	Max.	
C1	2	7	35	114	56	214	1	5	0.80093
C2	1	6	46	108	53	214	1	5	0.79252
C3	1	5	31	125	52	214	1	5	0.80748
C4	1	4	42	97	70	214	1	5	0.81589
C5	2	8	31	113	60	214	1	5	0.80654

The ranking of the factors resulted from the analysis is shown in table (6) below, illustrating the professionals' opinions on the selected subject. An effective safety management plan was ranked first with 0.816 RII, followed by An effective project performance monitoring as second importance in the ranking with 0.808 RII. An effective quality management plan was ranked third with 0.807 RII. The fourth-ranked CSF was Effective subcontractor selection with 0.801 RII. At last, Well defined construction period was ranked fifth with 0.79 RII.

The results show that the hypothesis is supported for the first four CSF, with high importance status, while the fifth CSF has an RII of 0.79, which is below 0.8; hence, it considered as high-medium importance as shown in Table 6.

Table 6. Construction CSF Ranking

Factor	RII	Rank	Status
An effective safety management plan	0.815888	1	High
An effective project performance monitoring	0.807477	2	High
An effective quality management plan	0.806542	3	High
Effective subcontractor selection	0.800935	4	High
Well defined construction period	0.792523	5	High-Medium

5.3 Proposed Improvements

The proposed improvements can be adapted in the future, expanding the subject study data to include more CSF than construction CSF only. Several CSF were identified during the literature review, but they were not related to the subject study; hence, they were not selected, such as Stakeholder, Design, Legal, Finance, Operation related critical success factors.

Another proposed improvement is related to the relations between the factors and the groups where RII considers the response of each factor in isolation of other factors. Accordingly, other methods can address this issue, such as Structural Equation Modelling, which analyses the interrelation between the factors themselves and the groups' factors.

6. Conclusion

A public-private partnership is a unique method of procurement that has advantages in allocating the risk to the party that can manage it best. Moreover, the private party can access private party resources and financial resources to assess reutilizing the public party financial resources to more critical infrastructures, despite its sustainability goals for both private and public parties. Still, it is more demanding in terms of requirements as it involves a more complex contract and finance mechanism, among other factors.

The construction industry acknowledges that safety is essential, and people's lives are the first ranked CSF. Delivering a project despite its success in terms of time, cost, and quality parameters do not mean that it has succeeded as human lives take precedence. Accordingly, following safety regulations became a legal requirement that must be followed strictly to ensure success in all directions.

The project can be determined either as success or failure by its performance reporting, such as the S-Curve reporting tool. Given that the nature of PPP projects is susceptible to scope, time, and cost, failure to perform will lead to disputes and legal cases between the investors, the SPV, and the public party. Accordingly, monitoring the performance of all project stakeholders is the second-ranked critical success factor under the construction stage, which can be expanded to other stages such as operation and maintenance.

One of the crucial factors in constructing PPP projects and traditional PPP projects is the effective quality plan, as the private party invests directly in the project. The investment is along with term investment in construction and operation stages where additional quality requirements might lead to over expenses which means that the project will not meet its financial obligations. In contrast, lower quality will lead to abortive works when it comes to the operation and maintenance of the project.

The choice of subcontractor (for specific duties) can make the difference between project success and failure. These subcontractors are high-impact stakeholders that must be adequately handled by examining their SWOT (Strength,

Weakness, Opportunity, and Threat) and defining the optimal scope combination that can be provided between them and the primary contractor.

The project life cycle is governed by several factors, one of which is the construction duration. The project's technical feasibility will feed the project's commercial feasibility. Undermining the value of the building stage, such as failing to track performance, may result in project losses, as well as potential disagreements and legal action.

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Biography

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