

Identifying Critical Success Factors of Public Private Partnership Projects in Türkiye

Elif Durna¹ , Beliz Ozorhon² , Semih Çağlayan^{3*} 

¹ Boğaziçi University, Dept. of Civil Engineering, Istanbul, Türkiye, elifdurna87@gmail.com

² Boğaziçi University, Dept. of Civil Engineering, Istanbul, Türkiye, beliz.ozorhon@boun.edu.tr

^{3*} Sakarya University of Applied Sciences, Dept. of Civil Engineering, Sakarya, Türkiye, semihcaglayan@subu.edu.tr

*Corresponding Author

ARTICLE INFO

ABSTRACT

Keywords:

Public Private Partnerships
Construction Industry
Critical Success Factors
Factor Analysis
Project Management



Article History:

Received: 29.07.2023

Accepted: 30.10.2023

Online Available: 27.02.2024

Public private partnerships (PPPs) have become increasingly common as a result of states' shifting roles in infrastructure services from service providers and operators to policymakers and regulators. PPPs have been established as a prominent technique of public service procurement in both developed and developing countries. PPPs give the parties the opportunity to split the costs and risks of providing a public service or building a public infrastructure. Successful project management is crucial, especially in light of PPP projects' size and complexity. This study investigates the critical success factors (CSFs) of PPP investments in developing countries. In this regard, 23 CSFs were selected based on a thorough literature review, and a questionnaire survey was run to examine the impact of those factors on PPP performance. The information is gathered from 82 different companies in Türkiye that represent both the public and private sectors. The statistical analysis results show that favorable legal framework, detailed and clear project identification, and extensive cost-benefit assessment are the most significant drivers of success. Additionally, factor analysis is used on the data to investigate and identify underlying correlations between the factors, as well as to categorize them into fewer, more focused, and more thorough factors. The results of factor analysis suggest five dimensions; namely project finance, project management, operational factors, procurement, and organizational factors. The study's findings are anticipated to benefit both the public sector in its focus on legal concerns to permit better operation and the contractors in its examination of their capacity to manage big projects more effectively.

1. Introduction

The state's role in providing infrastructure services has undergone some changes in the last quarter of the 20th century as a result of changes and interactions in economic, social, and political meaning; this transformation involves moving from the state's understanding as a service producer and operator to that of a policy maker and regulator [1]. Public-private partnerships (PPPs), which account for the majority of capital project spending in the public sector, rose to prominence as a result of the search for novel methods of project procurement [2]. PPPs enable the public and private sectors to jointly bear the

risks and benefits. A PPP is described as a “contractual arrangement between a public sector agency and a for-profit private sector developer, whereby resources and risks are shared for the purpose of delivery of a public service or development of public infrastructure” by the National Council for Public-Private Partnership [3].

Numerous empirical and non-empirical research have been undertaken on various PPP features in light of the growing interest in PPP since the late 1990s [4]. Relationship management, risk management, and financing models have all received the greatest attention among these. The

need to successfully complete PPP projects is essential because of their complexity. Finding the critical success factors (CSFs) was the subject of a different set of studies [5–9]. The critical success factors were identified for various PPP projects such as build-own-operate-transfer, build-operate-transfer, transfer-operate-transfer from different parts of the world including Australia, United Kingdom, China, and India. Studies on CSFs are more recent than those on other studies on PPPs, but they are still quite important, particularly in developing countries where PPPs are heavily invested in.

The literature has identified a number of variables that affect capital project success [10]. When applied to public projects, it is critical to identify those critical aspects that may help lead to a profitable outcome for the stakeholders [11]. This study's main goals are to (i) identify the CSFs and quantify their impact on PPP success in Türkiye, a developing country, and (ii) investigate the underlying characteristics of the CSFs. In order to create CSFs for construction projects, a thorough assessment of the literature was undertaken. These factors were then modified to create a distinct set of CSFs for PPPs. Then, a questionnaire survey was created and distributed to Turkish construction industry specialists. In order to understand the industry's practices and perceptions about PPP adoption, the collected data were evaluated. The underlying causes of PPP success were categorized using factor analysis. The results of this study are anticipated to serve as a roadmap for the public and private sectors in terms of financing and managing prosperous PPP initiatives.

1.1. The role of PPPs in construction

The contract value of PPP projects, which include privatization, has risen rapidly in the 1990s, reaching its greatest level (107 billion US dollars) in 1997, according to World Bank data for developing countries. The annual sum continued to increase once more and reached the record level in 2010 (186.4 billion US Dollars) after declining to 48.7 billion US Dollars in 2002. In total, 5783 PPP projects in the energy, transportation, telecom, and sewage sectors have received funding, with a combined cost of 2.026

billion US dollars. The total number of PPP projects completed in the European Union between 1990 and 2013 was 1626, or 67 per year on average. The total project value was 310.57 billion euros, or 12.94 billion euros per year on average, and the projects were in the transportation, environment, education, healthcare, general public services, and public order and safety sectors [12].

The PPP experience in various nations was described by Gurgun and Touran [13], who also highlighted Türkiye's potential for PPP initiatives as a developing country. Practices of cooperation between the public and private sectors in Türkiye extend back to the time of the Ottoman Empire. Public service concessions were given legal status in 1910, and the first application of PPP - in its current form - to the production of electricity came in 1984. Public infrastructure investment is crucial in Türkiye as the country strives to rank among the top ten largest economies in the world by 2023, the year of the 100th anniversary of the Turkish Republic. In the 1980s, a model of development led by the private sector was embraced. Public investments in industry thus declined, while infrastructure projects took center stage in the central investment budget. Concession, Build-Operate-Transfer (BOT), Build-Operate (BO), Build-Lease-Transfer (BLT), and Transfer of Operating Rights (TOR) are the PPP models now in use. Examining the contract value by year reveals that after 2012, there was a significant uptick. PPP contract value reached 46.14 billion USD at the end of 2013. When PPP projects in Türkiye that are in operation and under construction are combined, the total value reaches 87.5 billion USD for 167 projects in the urban infrastructure, healthcare, energy, seaport, airport, and marina sectors [1].

Various factors have been defined as assisting the successful delivery of projects in many studies. Chua et al. [10] and Morledge and Owen [11] have pointed out that determining those key components, which may directly affect the profitable conclusion for the stakeholders is crucial. In their study, Osei-Kyei and Chan [14] reported that most of the studies on the CSFs of PPP projects had concentrated on developed countries including Australia, United Kingdom,

Singapore, and Hong Kong. Studies on the USA market have mainly focused on other areas such as improving value for money, risk management, financial viabilities, and relationship management [15]. However, less is known about the developing countries. CSFs have been identified for Lebanon [16], China [17], and India [18]. A couple of studies have focused on other countries such as Malaysia [19] and Uganda [20]. Even though a number of studies have addressed the situation for Türkiye [21-29], few of them have focused on the critical success factors of key performance indicators. Considering the high potential of PPPs and fewer number of studies in the developing countries, this study aims to determine the CSFs in Türkiye, as a significant example, where there is a vast amount of investment on PPPs.

1.2. Critical success factors of PPPs

Tang et al.'s [4] analysis of the literature revealed many PPP study types. They categorized the studies in their paper as either empirical or non-empirical. While the non-empirical studies concentrate on funding, project success factors, risks, and the concession period; the empirical research are more concerned with risks, relationships, and finance. The CSFs of PPPs in developing countries are the subject of this study. Without putting much focus on project type, the majority of the literature discusses characteristics that contribute to the success of building projects in general (Table 1). Most studies on project delivery systems focused on design-bid-build projects.

2. Method

The methodology is composed of three parts: (i) literature review, (ii) questionnaire design, and (iii) descriptive statistics.

2.1. Critical success factors of PPPs

To list the success determinants for PPP projects, a thorough literature analysis was done. A preliminary list of 73 criteria was created. Three experts - two experienced civil engineers and a professor of civil engineering - participated in a pilot study. The goal of the pilot study was to prevent repetition of factors with similar

meanings and create a compact final list. In this direction, participants of the pilot study identified the factors with overlapping meanings in the initial list. These factors were either merged or removed. Through conversations with the experts, the original 73 criteria were reduced to 23 factors. There are no overlaps in the final list of components, which is displayed in Table 2.

2.2. Questionnaire design

An appropriate method for examining the CSFs of PPP projects in Türkiye from the perspectives of both public and private sector actors is a questionnaire survey. The questionnaire is divided into three sections: Part 1 covers general information about the respondents; Part 2 covers CSFs of PPP; and Part 3 covers projects the respondents have (if any have) done. Experts from the private, semi-public, and public sectors, including owners, project managers, consultants, contractors, financiers, and operators in the construction industry, were the target audience. The Turkish Contractors Association was mostly used to recruit survey participants. A total of 82 fully completed questionnaires out of the 365 that were sent out were returned for the online survey, yielding a response rate of 22%.

The profile of respondents is shown in Figure 1. Most of the respondents are engineers and architects. Majority of the respondents are employed by large companies with more than 200 employees. Just 32% of the organizations have participated in PPP projects. The average age of the respondents is 34, and they have an average of 10.96 years of industry experience. 22 PPP initiatives have so far involved the respondents in some capacity. The procurement types for PPP projects are listed in Table 3. Out of 22 cases, 45% of the projects are obtained through a BOT agreement. TOR comes in second place with a share of 18% and 4 cases. In the "other" category, which includes revenue sharing, 4 examples have been implemented with a share of 18%, and BO and BLT models have 2 cases with a share of 9%. Based on their project construction costs and operation NPV, the majority of the instances can be categorized as medium and large size; only three transportation projects can be categorized as mega projects (>1 billion USD). Most projects take 1-2 years or less

to develop, 1-3 years to build, and 20–25 years to operate under the control of private contractors.

Table 1. Critical success factors mentioned in certain studies

Critical Success Factors	Sources
Structure of the project organization	[30-33]
Project manager capabilities and experience	[30-31, 34-37]
Executive commitment of project management	[31-32, 35-41]
Commitment to planning and control	[31-32, 34-35, 38, 41-42]
Project team motivation and goal orientation	[33-36, 38, 41]
Scope and work definition	[34-35, 38, 43]
Control systems	[32, 34, 36, 42]
Technical uncertainty and risk management	[34-35, 38]
Client consulting	[35-36, 38]
Communication and relationship	[32, 35-39, 43]
Client acceptance	[36, 38]
Monitoring and feedback	[34-36, 38, 42, 44-45]
Achieving design and environmental objectives	[32, 35]
Benefit to the customer	[44-45]
Simple, flexible, phased stage/gate process	[32, 43]
Competency of the contractor	[34, 36, 38, 41]
Adequate funding for the entire project	[35, 42]
Thorough contract documentation	[31, 35, 43]
A stable political and economic environment	[34, 38]
Competitive procurement process	[32, 36, 40, 43]
An appropriate legal framework	[34, 38, 43]
A strong and good private consortium	[32, 35, 37, 39, 41-42]
Qualified project management consultants	[30, 34, 36]
Value for money analysis	[35, 38]
Return on investment for lenders and sponsors	[35, 38, 44-45]
An effective approval procedure	[32, 43]
Realistic planning and implementation	[31, 34, 41-42]
Risk and liability assessment	[34-35, 38]
Presence of international financial institutions	[34]

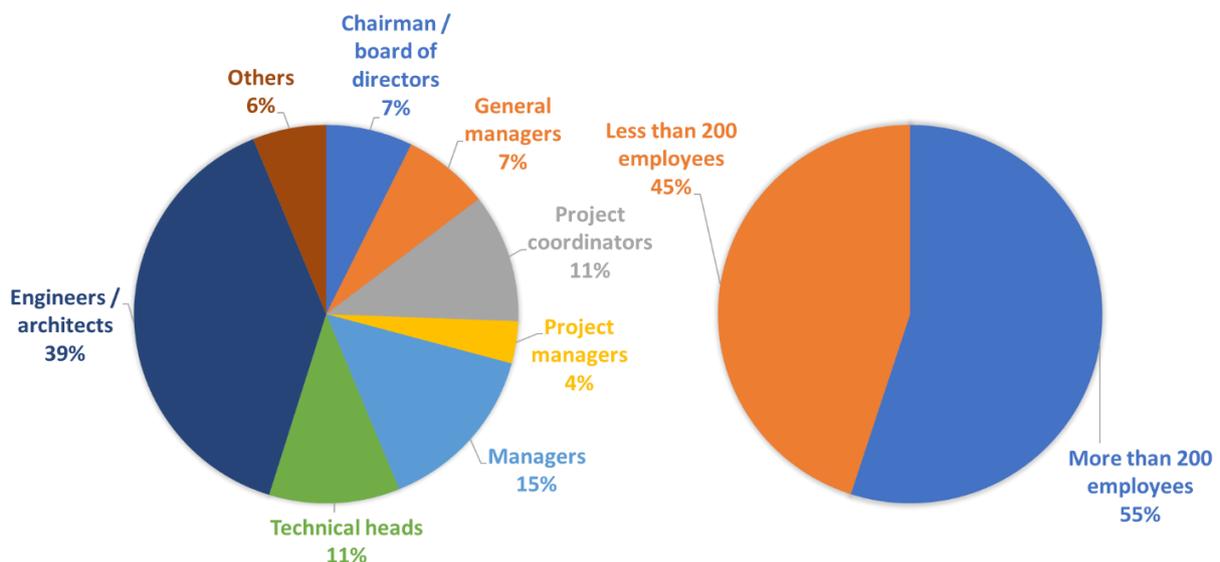


Figure 1. Profile of respondents

Table 2. List of critical success factors

#	Variable	Sources
V1	Strong Private Consortium	[5, 46-54]
V2	Detailed Cost and Benefit Analysis	[35-36, 55]
V3	Solid Investment Climate	[28, 54]
V4	Inspiring Financial Package	[5, 17, 27, 35, 37, 55]
V5	Political and Economic Stability	[17, 26]
V6	Favorable Legal Framework	[27, 33, 54]
V7	Executive Support from Public and Private Sectors	[17, 22-23, 25-29, 54, 56]
V8	Optimal Stakeholder Relations and Communication	[26-29, 34, 52-53, 56-57]
V9	Effective Procurement Process	[22, 25, 54]
V10	Rational and Practical Project Manager	[21-22, 26-28, 32, 57]
V11	Successful Client Consultation	[26, 29, 56]
V12	Wide Client Acceptance	[26, 29, 56, 58]
V13	Competent Client and Contractor	[5, 17, 26-29, 37, 53, 56]
V14	Comprehensive Technical Feasibility	[26, 29, 53-54, 56]
V15	Dedicated and Skilled Project Team	[25-27, 29, 32, 37, 56]
V16	Detailed and Clear Project Identification	[17, 21, 25-26, 29, 34, 56]
V17	Achieving Design Objectives	[25, 27, 35-36, 55]
V18	Proper and Systematic Project Control	[23, 25, 27, 33, 53]
V19	Regular Monitoring and Feedback	[26-27, 29, 56]
V20	Extensive Risk Analysis and Risk Sharing	[17, 25, 37, 54, 59]
V21	Strong Public Entit	[54]
V22	Complete Project Management Methodologies	[24, 28, 60-61]
V23	Simple Organizational Structure	[21-24, 27, 34, 61-62]

Table 3. PPP project procurement arrangement by sector

Sector	Type				
	BOT	BLT	BO	TOR	Other
Hospital	2	2	1	0	0
Power & Energy	1	0	0	0	0
Highway	3	0	1	0	0
Airport	2	0	0	0	0
Industrial Plants & Urban Infrastructure	1	0	0	1	0
Railways	0	0	0	3	1
Other	1	0	0	0	3
Total (22 projects)	10	2	2	4	4

2.3. Descriptive statistics

The importance of each of the 23 CSFs was rated by the respondents on a five-point Likert scale. The followings are the meanings of the scores: According to the scale, 1 indicates “Not Significant,” 2 “Fairly Significant,” 3 “Significant,” 4 “Very Significant,” and 5 “Extremely Significant.” The data were subjected to various statistical analyses, including factor analysis using SPSS, analysis of

variance (ANOVA), mean ranking, descriptive analysis, reliability tests using Cronbach's alpha, and reliability tests using mean scores. The study's findings suggested that, in accordance with Nunally's [63] recommendations, a Cronbach's alpha score of 0.873- which is higher than 0.7- is appropriate. Based on 82 responses, Table 4 provides the descriptive statistics.

The results point to the most important drivers of success as a favorable legal framework (V6),

detailed and clear project identification (V16), and detailed cost and benefit analysis (V2); while less important factors include successful client consultation (V11), simple organizational structure (V23), and wide client acceptance (V12).

Table 4. Descriptive statistics

Variable	Priv. Client		Publ. Client		Contractor		Total		F	Sig. (%5)
	Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank		
V6	4.52	1	4.75	1	4.13	8	4.33	1	2.047	0.136
V16	4.48	2	4.42	6	4.23	1	4.33	2	0.450	0.639
V2	4.30	6	4.58	3	4.21	2	4.29	3	0.258	0.773
V13	4.39	3	4.50	5	4.17	6	4.28	4	0.228	0.797
V14	4.39	4	4.75	2	4.06	10	4.26	5	0.565	0.571
V15	4.26	10	4.25	9	4.19	4	4.22	6	0.099	0.906
V4	4.30	7	3.92	15	4.13	7	4.15	7	2.428	0.095
V10	4.26	9	4.25	8	4.06	9	4.15	8	0.240	0.788
V3	3.87	16	4.33	7	4.17	5	4.11	9	0.314	0.732
V18	4.35	5	4.00	14	3.96	12	4.07	10	0.048	0.953
V5	4.00	12	4.50	4	3.94	13	4.04	11	0.525	0.593
V19	4.00	13	4.17	12	4.02	11	4.04	12	0.713	0.493
V1	3.52	20	4.17	11	4.19	3	4.00	13	1.608	0.207
V8	4.26	8	4.00	13	3.83	15	3.98	14	0.953	0.390
V17	4.09	11	3.92	16	3.91	14	3.96	15	0.062	0.940
V21	3.96	14	3.58	20	3.74	17	3.78	16	2.076	0.132
V22	3.70	18	3.75	19	3.77	16	3.74	17	0.065	0.937
V7	3.78	17	3.83	17	3.68	18	3.73	18	0.176	0.839
V20	3.57	19	4.25	10	3.64	19	3.71	19	0.244	0.784
V9	3.91	15	3.75	18	3.47	20	3.63	20	2.210	0.116
V11	3.43	21	3.50	21	3.34	21	3.39	21	0.613	0.544
V23	3.26	22	3.25	22	3.34	23	3.30	22	0.215	0.807
V12	3.04	23	3.08	23	2.94	22	2.99	23	0.499	0.609

3. Results and Discussion

The results of this study and those of earlier studies can be compared to demonstrate how the CSFs differ based on the country. Additionally, the ranks of the factors may vary depending on the respondents. “legal framework” has been rated as the most significant aspect in this study (4.33). According to Cheung et al. [64], this factor was discovered to be the most important CSF for PPP projects carried out in Hong Kong and China (4.06-4.36, respectively); yet, it was placed eighth (2.98) and ninth (3.63) in Singapore [65] and the UK [53], respectively.

There are eleven primary laws in force to establish five PPP models, as there is no one PPP law in Türkiye due to several line ministries' attempts to introduce various legislations for the use of identical PPP models in their respective sectors [66]. The Turkish government's Tenth

Development Plan mentions the need for a stronger judicial system. In the UK, which was one of the first countries to use PPPs and has made significant progress in resolving its legal challenges, “strong and good private consortium” was ranked first, while Türkiye came in fourth.

“Detailed and clear project identification” (4.33) is another crucial feature. Might and Fisher [30], Ashley et al. [34], Pinto and Slevin [38], Pinto and Prescott [55], Pinto and Covin [35], Clarke [43], Qiao et al. [17], and Jamali [16] all made reference to this factor. However, its impact hasn't been measured in prior research. The importance of “appropriate project identification” for BOT projects in China was highlighted by Qiao et al. [17]. According to Jefferies [67], creating a precise project brief is associated with project success in Australia. Compared to the conventional procurement

approach, PPP projects place a greater emphasis on the need for precise project identification. Due to the way business is done in Türkiye, specifications for projects frequently alter even after the bidding process.

“Detailed cost and benefit analysis” (4.29) is the third most crucial component. According to Cheung et al. [64], it was ranked fifth (3.95) in the UK [53], thirteenth in both Hong Kong (3.65) and China (3.79). The Turkish building industry clearly benefits from it, although mean values in other countries are generally low. Due to the fact that costs and benefits are derived from predictions that are predicted across time periods ranging from three to thirty years throughout the project development stage [6], how uncertainty is handled in such assessments is of utmost importance.

Türkiye is a developing country with an unstable political and economic climate, and interest rates, which directly affect project costs, can change significantly. The climate for investing is made unstable by this circumstance, which raises the risk for the investors. Potential investors strive to protect themselves by extending the operational duration in order to manage the higher level of risks.

Previous research by Li et al. [53], Cheung et al. [64], and Hwang et al. [65] have demonstrated that distinct success variables are crucial to PPP projects in the construction industry in both developing and wealthy nations. The CSFs for PPP/PFI projects in the UK construction industry were examined by Li et al. [53], and it was discovered that “a strong and good private consortium,” “appropriate risk allocation,” and “available financial market” were extremely important.

These all have financial implications, and unlike Türkiye, there are no political or legal obstacles to PPPs in the UK. The main CSFs, according to Cheung et al. [64], are “favorable legal framework”, “proper risk distribution and risk sharing”, “strong and good private consortium”, commitment and “responsibility of public and private sectors”. Similar to Türkiye, China and Hong Kong also experience legal difficulties while implementing PPP projects, and the duties

and obligations of both public and private partners are not clearly defined. In a different study, Hwang et al. [65] investigated the CSFs for PPP projects in Singapore from the viewpoint of contractors and highlighted “well-organized public agency”, “appropriate risk allocation”, and “strong private consortium” as crucial factors in project success. Similar to the UK, Singapore's building industry is more dependent on financial concerns.

CSFs appear to vary for each party when the results are analyzed in depth based on the survey respondents (private clients, public clients, and contractors). From the perspective of the private clients, favorable legal framework (4.52), detailed and clear project identification (4.48), and competent client and contractor (4.39) are crucial for the successful delivery of PPP projects in Türkiye; however, for the public client, favorable legal framework (4.75), comprehensive technical feasibility (4.75), detailed cost and benefit analysis (4.58), detailed and clear project identification (4.23), and competent client and contractor (4.39) are crucial.

“Favorable legal framework” was cited as the top CSF by respondents from the private and public client sectors. On the other side, the contractors placed it eighth. Despite the observed ranks discrepancies between the three groups, all three groups' mean values are relatively high (above 4). This indicates that it is crucial to the successful completion of a PPP project in the eyes of both clients and contractors. The foundation of sustained private sector participation is the legal and political environment; as a result, the client must have a clear knowledge of the evaluation that has to be conducted and the conclusions that need to be drawn. For this reason, clients place a higher value on favorable legal frameworks. A clear and solid legal foundation is necessary for the contracts and agreements to be bankable. Additionally, it is anticipated that the creation of an efficient system would help to guarantee the continuity of PPP policies and implementations [64]. Establishing a legal and regulatory framework is crucial to improving the appeal of PPP project investments for private partners.

“Detailed and clear project identification” was the second CSF that both the contractors and private clients rated highly. This CSF was ranked second and first by contractors and private clients, respectively, but only sixth by public clients while having a high mean score (4.42). These findings demonstrate the significance of this element for all parties. The disparity in rankings may be due to the viewpoint of the public and private sectors rather than that of the client and contractor. Objectives must be defined and agreed upon with a shared understanding by all parties. When the project's objectives are specified clearly at the outset, success can be measured more precisely, and the project will stay within its designated boundaries and not deviate too far from the original plan [17, 30, 34–35, 38, 55].

Private clients, public clients, and contractors placed “competent client and contractor” fifth, third, and sixth, respectively. One with goals This aspect was shown to be extremely important for the public clients (4.5). The clients should assess the various credentials of potential subcontractors and choose that are similar to their own, experience working on PPP projects, technical expertise in the areas needed, an appropriate management style, and reliability and financial credibility. Choosing qualified contractors has a beneficial impact on the project's outcome [17].

Private clients, public clients, and contractors scored “comprehensive technical feasibility” fourth, second, and tenth, respectively. Respondents from the private and public clients gave this CSF reasonably high ratings, with mean scores of 4.39 and 4.75, respectively, and 4.06 for the contractors. This conclusion suggests that although contractors have not given it the same weight as clients, this component is very important for a project's success. This may be because the customer has a responsibility to oversee the project's financial audit, but it is more crucial for the client to base its investment decisions on trustworthy feasibility studies. There must be a clear need for the services to be supplied since, given the market conditions, the level of demand for the products and services to be offered is crucial to PPP projects' long-term viability.

It is essential to getting the private sector to approve a PPP project as a result [68]. Some PPP law provisions charge the government with predicting market demand in order to ensure a certain amount of income to the contractor in the event that pre-specified levels of services are provided, regardless of the degree of demand realized in the market. A thorough investigation must be used prior to defining the minimal demand/revenue because the study's sequential steps have an impact on the project's size, cost, and revenues [66].

The private clients, the public clients, and the contractors scored “detailed cost and benefit analysis” sixth, third, and second, respectively. Private clients placed it sixth, although the average score is still very high (4.3). Cost-benefit analysis is obviously important for all stakeholders. Before a project is put through the procurement process, the public client should carefully evaluate all of the alternative options that are advantageous to the government and end users [53].

However, clients and contractors have different perspectives on thorough, reasonable cost-benefit analyses because, unlike clients, contractors are only profit-driven and assume all financial risks in a PPP project. As a result, cost-benefit analyses have a direct impact on contractors' initial attitudes toward the project.

The private clients ranked “strong private consortium” twenty, the public clients eleven, and the contractors third. This result demonstrates that contractors believe a strong private consortium is crucial to the success of PPP projects (4.19). On the other hand, particularly private consumers rated it poorly, indicating just a medium level of relevance with a mean value of 3.52. Due to the connection between project viability and the private consortium participants' eligibility and financial capacity, stakeholders evaluate each participant's strong and weak points and, if deemed appropriate, join forces to form consortia that combine and capitalize on each participant's individual strengths. Additionally, it is crucial for partners to get along well because they must share the project's risks and advantages [5, 46–47, 69–71]. A project is more likely to be

completed effectively if it has the correct partners and shared objectives [6].

“Wide client acceptance” was identified as the least significant factor (less than 3.00). In a long-term partnership contract each party must appreciate and respect each other’s goal; in other words, the project itself, apart from being technically implementable, must satisfy different participants’ objectives as well. The objectives of the government are those of reduction in financial restraints, public finance limitations, provision of public goods and services (detailed by specific project), achievement of value for money, while the private sector’s objectives are profit generation and market penetration, however the objectives of the communities are to receive better services or occupy a better environment. The fierce competition for cost-effectiveness in Türkiye could be the main reason behind the lack of appreciation of the other’s goals.

The goal of factor analysis is to investigate and uncover hidden connections between the variables, and to categorize them into a smaller number of more focused but thorough variables. Table 5 presents the correlation matrix for the 23 variables. The population correlation matrix might not be an identity matrix, according to the big value of the sphericity test statistics (Barlett test of sphericity = 1301.78) and the small significance level that goes along with it (p.000). According to the correlation matrix, all of the variables have a significant correlation at the 5% level, indicating that none of the variables need to be dropped for the principal component analysis. The KMO statistic has a value of 0.710, which is suitable for factor analysis, in Kaiser's opinion [72].

A couple of studies have conducted factor analysis to explore the main components for CSFs of PPPs. Sanni [73] identified three factors explaining 59.72% of the variance. The factors were identified as leadership focus, risk allocation and economic policy, and projects feedback. In a similar way, Dithebe et al. [74] found three factors that account for 69.00% percent of of the variance. The factors were determined as public cooperation, project

viability, and policy and legislation enhancement.

In this study, a five-factor solution with eigenvalues greater than 1.000 was produced via principal component analysis, accounting for 68.15% of the variance. Table 6 displays the factor grouping based on varimax rotation. Only one of the factors is assigned to each variable, and the loading on each factor is greater than 0.50. As can be seen, “inspiring financial package” is not one of the components.

The components were named based on the intersection of the meanings of the factors under that component. It is possible to interpret the five components as follows: Factor 1 stands for project financing; Factor 2 for project management; Factor 3 for operational aspects; Factor 4 for procurement; and Factor 5 for organizational factors.

Factor 1- Project Finance:

16.12% of the overall variations in the CSFs are explained by this component. Project financing includes sound investment climate, extensive risk analysis and risk sharing, strong private consortium, political and economic stability, and detailed cost and benefit analysis.

Numerous factors contribute to the project financing component, including sound climate environment (4.11) and extensive risk analysis and risk sharing (3.71). The highest loadings are for these two sub-factors, which have significance values of 0.808 and 0.765, respectively. This shows that the financial market is crucial for the growth of PPP projects because it depends heavily on share and debt contributions. The best party to handle the risks is chosen to receive the risks, according to the concept of appropriate risk allocation. The management of PPP project implementation is made simple by this type of allocation system. In summary, creating a sound finance structure is crucial for project success [53]. Before committing to a project, the private sector should fully understand the risks involved and ensure that risks are managed effectively [17, 37]. The government should make sure that mechanisms are in place to control risks in all circumstances.

Strong private consortium and stable political and economic environment are the other two high loading sub-factors with significance values of 0.634 and 0.632, respectively. This recommends that private businesses should research the strengths and shortcomings of other players and, where appropriate, team up to form a consortium that can leverage and capitalize on their particular strengths [5, 52, 46–47, 51–52, 69–70]. The presence of a stable political and economic climate is crucial for project financing. This encourages both domestic and foreign investors to participate in PPP projects, and the availability of financially stable partners who share the same objectives will increase the number of PPP projects that are most likely to be successfully implemented [17, 35, 53].

Detailed cost and benefit analysis is identified as the third most important factor for a PPP project (4.33). It has a significant loading of 0.599 and a rather high loading in terms of project finance. The public client should make sure that the whole project feasibility study is completed before a project is put up for procurement and that all viable solutions that are advantageous to the government and end users are considered [53]. Project financial analysis is seen differently by the public and private sectors [49]. Cost-benefit analysis would therefore be preferable for project evaluation. The alternative that maximizes the gap between benefits and costs to society as a whole is found using a cost-benefit analysis [44-45, 54]. PPPs offer a wide range of potential project finance choices. Cost-benefit analysis is not intended to distinguish between different funding choices; rather, it is used to support decisions about resource allocation [49]. Although Turkish contractors and public clients ranked this criterion third, it was not deemed essential in earlier studies. This may be due to disparities in cultural perceptions and customs between the nations.

Factor 2- Project Management:

15.088% of the total variances in the critical success factors can be attributed to the project management factor. This category contains five elements: rational and practical project manager, favorable legal framework, competent client and

contractor, executive support from public and private sectors, regular monitoring and feedback. Two essential elements in project management are a rational and practical project manager, as well as favorable legal framework with a significance of 0.765. The most important factor in creating PPPs is having a supportive legal environment. Its mean value is 4.33, which is high. Bennett [75] stated that the foundation for sustainable private sector participation in urban infrastructure services is an enabling regulatory, legal, and political environment. All projects acquired under the PPP are based on a wide variety of law blended together, including planning and environment, employment, corporate commercial, construction, finance, and insurance [76]. In Türkiye, there is no coherent law on PPP; instead, there are different legislations like BOT laws. The government ought to release a number of formal PPP procurement guidelines that lay out the entire procurement process in detail and specify what evaluations and choices must be made at each stage. A successful project also requires a favorable legal framework, according to Dvir et al. [36] and Kerzner [42]. Türkiye has a sporadic selection of PPP laws available.

There is a growing need for a legal framework as PPPs become more significant. Infrastructure provision is challenging in Türkiye. It is necessary to have a solid understanding of PPP models and to put models established on reliable principles into practice in order to fast close this investment gap. Therefore, creating a uniform PPP law is part of the government's growth plans. Although one-way ANOVA study revealed this component to be the most important element for the Turkish construction sector, it was only briefly highlighted in the literature.

The need for a rational and practical project manager (4.15) to assure project delivery on time, within acceptable standards, and within a predetermined budget is another significant sub-factor. The influence of a project manager's experience on a project's success or failure was looked at by Rubin and Seelig [77]. Success was determined by technical performance. They concluded that, in contrast to the size of the previously, a project manager's prior experience had little bearing on the project's performance. In

other investigations, this characteristic has also been identified as a crucial element [30–31, 35–37, 41, 53, 56, 78].

Table 5. Correlation matrix

Variables	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17	V18	V19	V20	V21	V22	V23	
V1	1.00																							
V2	0.34	1.00																						
V3	0.51	0.47	1.00																					
V4	-0.02	0.19	0.29	1.00																				
V5	0.25	0.44	0.59	0.18	1.00																			
V6	-0.04	0.22	0.07	0.04	0.31	1.00																		
V7	0.08	0.35	0.19	0.01	0.41	0.42	1.00																	
V8	0.11	0.32	0.20	-0.03	0.28	0.40	0.27	1.00																
V9	0.06	0.29	0.24	0.18	0.35	0.24	0.32	0.14	1.00															
V10	-0.01	0.29	0.08	0.06	0.21	0.54	0.41	0.47	0.07	1.00														
V11	-0.01	0.14	0.05	0.06	0.15	0.21	0.39	0.12	0.38	0.40	1.00													
V12	0.04	0.26	0.08	0.09	0.38	0.03	0.42	0.01	0.49	0.09	0.64	1.00												
V13	0.02	0.30	0.20	-0.01	0.38	0.45	0.40	0.49	0.10	0.70	0.32	0.16	1.00											
V14	0.25	0.71	0.39	0.23	0.51	0.46	0.23	0.60	0.36	0.43	0.14	0.09	0.43	1.00										
V15	0.10	0.46	0.28	-0.12	0.42	0.30	0.23	0.46	0.22	0.68	0.14	0.11	0.62	0.53	1.00									
V16	0.27	0.54	0.38	0.01	0.37	0.15	0.20	0.50	0.33	0.37	0.17	0.17	0.37	0.50	0.71	1.00								
V17	0.04	0.32	0.04	-0.08	0.20	0.49	0.35	0.58	0.05	0.65	0.21	0.01	0.48	0.49	0.59	0.58	1.00							
V18	0.33	0.66	0.31	0.11	0.38	0.22	0.36	0.45	0.28	0.38	0.04	0.01	0.21	0.62	0.37	0.52	0.50	1.00						
V19	0.38	0.41	0.43	0.03	0.32	0.42	0.18	0.51	0.04	0.49	0.14	-0.19	0.44	0.57	0.50	0.40	0.52	0.58	1.00					
V20	0.34	0.58	0.53	0.09	0.55	0.16	0.41	0.06	0.27	0.12	0.13	0.22	0.11	0.38	0.28	0.32	0.10	0.49	0.40	1.00				
V21	0.18	0.33	0.41	0.06	0.50	0.17	0.43	0.20	0.24	0.25	0.36	0.37	0.21	0.14	0.34	0.56	0.29	0.38	0.30	0.48	1.00			
V22	0.14	0.23	0.28	-0.07	0.38	0.24	0.45	0.06	0.29	0.33	0.35	0.35	0.19	0.08	0.36	0.47	0.49	0.37	0.22	0.45	0.67	1.00		
V23	0.33	0.28	0.32	-0.04	0.21	0.07	0.17	0.15	0.18	0.20	0.09	0.10	-0.03	0.12	0.40	0.58	0.29	0.31	0.24	0.52	0.47	0.61	1.00	

Table 6. Rotated component matrix

Common Factors	Variables	Components				
		1	2	3	4	5
Project Finance	Solid Investment Climate	0.808				
	Extensive Risk Analysis and Risk Sharing	0.765				
	Strong Private Consortium	0.634				
	Political and Economic Stability	0.632				
	Detailed Cost and Benefit Analysis	0.599				
Project Management	Rational and Practical Project Manager		0.765			
	Favorable Legal Framework		0.765			
	Competent Client and Contractor		0.735			
	Executive Support from Public and Private Sectors		0.567			
	Regular Monitoring and Feedback		0.518			
Operational Factors	Detailed and Clear Project Identification			0.783		
	Dedicated and Skilled Project Team			0.684		
	Comprehensive Technical Feasibility			0.664		
	Optimal Stakeholder Relations and Communication			0.644		
	Achieving Design Objectives			0.575		
Procurement	Wide Client Acceptance				0.882	
	Effective Procurement Process				0.714	
	Successful Client Consultation				0.681	
Organizational Factors	Complete Project Management Methodologies					0.779
	Simple Organizational Structure					0.722
	Strong Public Entity					0.612
Initial Eigenvalues		7.851	2.666	2.283	1.760	1.114
Percentage of Variance		16.120	15.088	14.972	11.380	10.589
Cumulative Percentage of Variance		16.120	31.207	46.180	57.560	68.149
Kaiser-Meyer-Olkin Measure (KMO) of Sampling Adequacy:			0.710			
Bartlett's Test of Sphericity:						
		Approx. chi-square	1301.783			
		df	253			
		Sig.	0.000			
Extraction Method: Principal Component Analysis.						
Rotation Method: Varimax with Kaiser Normalization.						
Rotation converged in 8 iterations.						

Competent client and contractor (4.28) is crucial in coming up with creative ideas to achieve the goals of the government for PPP projects. In a typical PPP project, the special purpose vehicle will outsource the construction, operations, and equipment supply to qualified suppliers to manage its design, construction, operational, and maintenance obligations. The significance of hiring a qualified contractor has also been mentioned by Pinto and Slevin [38], Baker et al. [52], Pinto and Covin [35], Dvir et al. [36], Ghosh et al. [37], Qiao et al. [17], and Jefferies et al. [5].

The fourth crucial factor has a significance of 0.567 and a mean value of 3.73 and is the executive support from public and private sectors. To ensure a successful PPP project, Kerzner [31], Ashley et al. [34], Pinto and Slevin [38], White and Patton [32], Dvir et al. [36], Ghosh et al. [37], and Qiao et al. [17] all emphasized the importance of managing the relationships. The attitude of the actors affects the caliber of the final product. This implies that this issue must also be considered when assessing the project's viability [53].

The fifth crucial factor, regular monitoring and feedback (4.04), has a rather high loading and a significance of 0.518. A monitoring process is necessary to ensure an efficient operation; it includes performance monitoring, determining if the contracted services are provided in accordance with the contracted standards, and analyzing the corrective measures implemented by the PPP provider. The information must be factual, pertinent, and quantitative. Numerous research [35-36, 38, 55] have highlighted the significance of this characteristic.

Factor 3- Operational Factors:

14.972% of all CSF deviations are accounted for by the operational factors. This primary aspect has six components: detailed and clear project identification, dedicated and skilled project team, comprehensive technical feasibility, optimal stakeholder relations and communication, achieving design objectives, proper and systematic project control.

With a significance of 0.783, detailed and clear project identification (4.33) has the highest loading. The project identification step is crucial because it ensures that all involved parties have a shared knowledge of the project's goals. The team becomes committed to and in agreement with the project goals when there are only a few primary goals [79]. As a result, a project's progress may be efficiently tracked. Because the project's objectives are made explicit from the outset, success may ultimately be assessed more precisely [17, 30, 34–35, 38, 43, 55].

If the project's scope is established at the outset, it should remain within those boundaries and avoid growing to encompass more than was originally intended. This element was discussed in earlier studies, and it was believed to be crucial for success in the end result. However, it was discovered in this study that it is extremely important for the Turkish building industry.

The second crucial factor is a dedicated and skilled project team (4.22), which has a high loading and a significance of 0.684. The success of the project depends on understanding the contractor and consultant teams involved in PPP delivery [34, 36, 38, 41]. A team-based

management approach is typically justified by the complexity and size of the majority of PPP projects in order to ensure that all necessary abilities are successfully utilized. The team's experience spans a wide range of areas, including management, previous work on related projects, public relations, leadership skills, and many more.

Comprehensive technical feasibility, the third operational component, has a mean value of 4.26 and a significance level of 0.664. For the private sector to win a PPP contract, comprehensive technical feasibility is necessary [35, 38, 46, 52]. Technical challenges are typically one of the most crucial factors in a project feasibility assessment. This implies that it is crucial to analyze the related technical issues while thinking about PPP procurement choices.

Another important component is optimal stakeholder relations and communication (3.98). When used efficiently, communication can cut down on ineffective work, prevent duplication, and aid in error-free operations. This can aid in managing uncertainty, help identify issues earlier, or spark ideas for better solutions [36–38, 43, 51, 56].

Functional and technical specifications, schedule goals, and budget goals are components of achieving design objectives with a significance of 0.575 (3.96). Both the consultant and the contractor have a responsibility to collaborate amicably in order to accomplish these objectives for a successful project completion. Numerous researchers have highlighted the significance of this component [34, 36, 44–45, 54].

The final operational factor with a loading of 0.524 is proper and systematic project control (4.07). For a project to be delivered successfully, adherence to the initial requirements - including those related to schedule, budget, quality, and environmental concerns - is crucial. Over the years, the construction sector has regularly failed to deliver successful projects on schedule, within budget, and with the required level of quality [80]. All parties are required to follow the timelines, finances, quality, safety, and environmental criteria set forth at the project's inception [32, 34, 52]. To produce a successful

project, all parties must work together in coordination to complete tasks within the allotted time frames [36, 42]. The fact that the results were provided in this manner is not unexpected given that the literature research indicates a moderate loading for this element. In addition, the criticality level for proper and systematic schedule, cost, quality, and budget control has been noted to be near to moderate. It is related to elements like a realistic and logical project manager and an enthusiastic and skilled project crew. Unfortunately, in Türkiye, the planning stage is typically kept very brief, making it impossible to accurately estimate the time and cost of construction. Eventually, the contractors request an extension to finish the projects because, in these conditions, the needed quality cannot be achieved.

Factor 4- Procurement:

11.380% of all CSF deviations are attributable to the procurement component. Three things fall under this category: wide client acceptance, effective procurement process, and successful client consultation.

Wide client acceptance (2.99) indicates that the final project's sale to its intended users has the maximum loading, with a significance of 0.882. Client satisfaction with the goods and services the industry has been delivering in recent years has increased pressure on service providers to increase performance [2]. While the communities' goals are to receive better services or live in a better environment, the private sector's typical goals are profit production and market penetration [53]. Additionally, it has been noted by Pinto and Slevin [38], Pinto and Prescott [55], and Pinto and Covin [35] that client acceptance is one of the essential elements for a project's effective completion.

Effective procurement process (3.63) must be present throughout the whole procurement process. With a significance of 0.714, this sub-factor has a significant loading. A quick and effective procurement procedure is crucial for reducing transaction costs and expediting the negotiation and closing of the purchase. To achieve competitive neutrality, or the objective and uniform treatment of public and private

parties in their rivalry for public works and services, the government must establish the relevant policies or legal procedures [81]. Maintaining the integrity of the procurement process, sustaining competition, fostering technological and financial advances, optimizing resource allocation, boosting productivity, and cutting costs are all significant goals of a competitively neutral procurement process. Most of the time, competitive bidding processes based only on price may not be able to help achieve a strong private consortium and obtain value for the public. When looking for the ideal partner, the government should have a long-term perspective [5, 17, 53, 67, 71]. Despite its relatively high mean value, effective procurement process was ranked 20th by the respondents. A few studies [31, 34] have also shown the importance of this aspect.

Another crucial element is successful client consultation, which has a factor loading of 0.681 and a mean value of 3.39. A construction project needs to comprehend and meet the needs of the clients. Client consultation is the initial phase of a program to execute change, according to Kolb and Frohman [82]. In their investigations, Pinto and Covin [35], Pinto and Slevin [38], and Manley [83] also highlighted the significance of this aspect.

Factor 5- Organizational Factors:

10.589% of the overall variance in CSFs can be attributed to organizational factors. This factor consists of three parts: complete project management methodologies, simple organizational structure, and strong public entity. Complete project management methodologies are related to higher loading (3.73).

According to Schultz and Slevin [84], Jaselskis and Ashley [59], Wong and Maher [33], and Ghosh et al. [37], managerial support for projects, or indeed for any implementation, has long been seen to be extremely important in determining whether they would ultimately succeed or fail. According to Beck [85], project management is ultimately responsible for carrying out executive management's plans or goals for the organization. It is dependent on executive management for authority, direction,

and support. The project manager's confidence in management's support during a crisis as well as the allocation of enough resources (money, people, time, etc.) are both examples of how management may help the project.

One of the organizational variables related to organizational outcomes revealed in this study is the simple structure of the project organization (3.30). It has a favorable relationship with project management success, as determined by cost effectiveness or overall evaluations of project performance. The organizational structure of a project has also been deemed essential for the project's success by Nahapiet and Nahapiet [61], Might and Fisher [30], Kerzner [31], White and Patton [32], Wong and Maher [33], Dvir et al. [36], and Clarke [43].

Finally, for PPP projects to be financially viable and appealing investment prospects for private sector developers, a strong public entity (3.78) is required. The loading for this sub-factor is 0.612. This affirms the institutional framework of a PPP project, which holds that policymakers, government agencies, and its agency are essential for the execution of PPPs [53].

4. Conclusion

This study examines the CSFs of PPP projects in developing nations using the results of a questionnaire survey. In this regard, data from the Turkish construction industry was gathered. The 23 CSFs' underlying factor groupings were discovered by factor analysis, and they are denoted by the following names: project finance, project management, operational factors, procurement, and organizational factors. Based on a one-way ANOVA analysis, the relative significance of the CSFs was assessed. The three elements "favorable legal framework," "detailed and clear project identification," and "detailed cost and benefit analysis" are deemed to be the most important for the Turkish building industry.

According to the analysis' findings, a favorable legal framework is the most important component for the success of PPP projects. Given the complexity of the country's legal system and the lack of a unified PPP law, the scenario is not unexpected in the case of Türkiye.

The government's development plans also refer to the requirement for a supportive legal environment. Detailed and precise project identification is the second most important component of a successful project delivery. Construction time and operating time must be carefully scrutinized, particularly throughout the tendering process.

Due to the national culture and business practices of Türkiye, project specifications frequently change even after the bidding process. In the Turkish construction sector, clients frequently request numerous project adjustments since they don't give themselves enough time to plan. The third most crucial success criterion for PPP projects in the Turkish construction industry is a thorough, acceptable cost-benefit analysis. Both the public and private sectors should thoroughly evaluate the benefits and drawbacks, risks, expenses, and other factors of a PPP project before moving forward.

Cost-benefit analysis is crucial because the majority of PPP projects are intricate and highly regulated. Since Türkiye is a developing nation with an unstable political and economic climate, borrowing rates that directly affect project costs might fluctuate sharply far too frequently. The climate for investing is made unstable by this circumstance, which raises the risk for the investors. Potential PPP project partners prefer to prolong the operation period and take precautions to manage this risk.

Learning from past mistakes and experiences, the Turkish government should support the PPP technique as it will enable the timely and high-quality completion of public projects. The findings of the analysis indicated that the Turkish government should resolve legal matters first in order to draw in investors and the private sector. Second, each partner should devote an appropriate amount of time to preparation in order to correctly identify the project's purpose, objectives, and requirements.

The results of the study reflect the perceptions and experiences of the Turkish construction professionals. Even though they are well-experienced in international arena, this should be considered as a limitation. Based on the unique

circumstances of the nations where PPP projects are done, the results could differ. Türkiye serves as an example of a developing nation. In contrast, in a developed nation with a well-established legal system, the outcomes would be different.

Article Information Form

Funding

The authors have not received any financial support for the research, authorship, or publication of the study.

Authors' Contribution

The authors contributed equally to the study.

The Declaration of Conflict of Interest/ Common Interest

No conflict of interest or common interest has been declared by the authors.

The Declaration of Ethics Committee Approval

This study does not require ethics committee permission or any special permission.

The Declaration of Research and Publication Ethics

The authors of the paper declare that they comply with the scientific, ethical and quotation rules of SAUJS in all processes of the paper and that they do not make any falsification on the data collected. In addition, they declare that Sakarya University Journal of Science and its editorial board have no responsibility for any ethical violations that may be encountered, and that this study has not been evaluated in any academic publication environment other than Sakarya University Journal of Science.

Copyright Statement

Authors own the copyright of their work published in the journal and their work is published under the CC BY-NC 4.0 license.

References

- [1] Ministry of Development. "Advances in PPP in Türkiye and in the World", Republic of Türkiye Ministry of Development Memorandum, Ankara, Türkiye, 2012.
- [2] C. T. Amponsah, "Public-Private Partnerships: Critical Success Factors for Procurements of Capital Projects," Ph.D. dissertation, Capella University, 2010
- [3] B. Li, A. Akintoye, An Overview of Public-Private Partnership. Public-Private Partnerships: Managing Risks and Opportunities, Blackwell Science Ltd, 2003.
- [4] L. Y. Tang, Q. Shen, E. W. L. Cheng, "A review of studies on Public-Private Partnership projects in the construction industry," International Journal of Project Management, vol. 28, pp. 683-694, 2010.
- [5] M. C. Jefferies, R. Gameson, S. Rowlinson, "Critical success factors of the BOOT procurement system reflections from the stadium Australia case study," Engineering Construction and Architectural Management, vol. 9, no 4, pp. 352-361, 2002.
- [6] C. Hardcastle, P. J. Edwards, A. Akintoye, B. Li, "Critical success factors for PPP/PFI projects in the UK construction industry: a factor analysis approach," Construction Management and Economics, vol. 23, no 5, pp. 459-471, 2005.
- [7] Z. Y. Zhao, J. Zuo, G. Zillante, X. W. Wang, "Critical success factors for BOT electric power projects in China: Thermal power versus wind power," Journal of Renewable Energy, vol. 35, pp. 1283-1291, 2010.
- [8] X. Meng, Q. Zhao, Q. Shen, "Critical success factors for transfer-operate-transfer urban water supply projects in China," Journal of Construction Engineering and Management, vol. 27, no 4, pp. 243-251, 2011.
- [9] A. Gupta, M. Gupta, R. Agrawal, "Identification and ranking of critical success factors for BOT projects in India," Management Research Review, vol. 36, no 11, pp. 1040-1060, 2013.

- [10] D. K. H. Chua, Y. C. Kog, P. K. Loh, "Critical success factors for different project objectives," *Journal of Construction Engineering and Management*, vol. 125, no 3, pp. 142-150, 1999.
- [11] R. Morledge, K. Owen, "Critical success factors in PFI projects," in 14th Annual ARCOM Conference, University of Reading, Association of Researchers in Construction Management, 1998, pp. 565-74.
- [12] European PPP Expertise Centre, "Market update - First half of 2013", Luxembourg, 2013.
- [13] A.P. Gurgun, A. Touran, "Public-private partnership experience in the international arena: Case of Türkiye," *Journal of Management in Engineering*, vol. 30, no 6, pp. 04014029, 2014.
- [14] R. Osei-Kyei, A. P. C. Chan, "Review of studies on the critical success factors for public-private partnership (PPP) projects from 1990 to 2013," *International Journal of Project Management*, vol. 33, no 6, pp. 1335-1346, 2015.
- [15] A. M. Algarni, D. Arditi, G. Polat, "Build-operate-transfer in infrastructure projects in the United States," *Journal of Construction Engineering and Management*, vol. 133, no 10, pp. 728-735, 2007.
- [16] D. Jamali, "Success and failure mechanisms of public private partnerships (PPPs) in developing countries: Insights from the Lebanese context," *International Journal of Project Management*, vol. 17, no 5, pp. 414-430, 2004.
- [17] L. Qiao, S. Q. Wang, R. L. K. Tiong, T. S. Chan, "Framework for critical success factors of BOT projects in China," *The Journal of Project Finance*, vol. 7, no 1, pp. 53-61, 2001.
- [18] R. Agrawal, "Successful Delivery of Public-Private Partnerships for Infrastructure Development," Ph.D. dissertation, Jaypee Institute of Information Technology, Noida, India, 2010.
- [19] S. Ismail, "Critical success factors of public private partnership (PPP) implementation in Malaysia," *Asia-Pacific Journal of Business Administration*, vol. 5, no 1, pp. 6-19, 2013.
- [20] H. Alinaitwe, R. Ayesiga, "Success factors for the implementation of public-private partnerships in the construction industry in Uganda," *Journal of Construction in Developing Countries*, vol. 18, no 2, pp. 1-14, 2013.
- [21] B. Acikgoz, "Public-Private partnership—the case of Türkiye," in *Public Financial Management Reforms in Türkiye: Progress and Challenges*, Singapore, 2020, Volume 1, pp. 105-118.
- [22] O. Okudan, C. Budayan, "Determination of the critical success criteria for public-private partnership (PPP) projects in Türkiye," *Politeknik Dergisi*, vol. 24, no 4, pp. 1675-1689, 2020.
- [23] M. Balcilar, G. Uzuner, C. Nwani, F. V. Bekun, "Boosting energy efficiency in Türkiye: The role of public-private partnership investment," *Sustainability*, vol. 15, no 3, pp. 2273, 2023.
- [24] M. Top, C. Sungur, "Opinions and evaluations of stakeholders in the implementation of the public-private partnership (PPP) model in integrated health campuses (city hospitals) in Türkiye," *The International Journal of Health Planning and Management*, vol. 34, no 1, pp. e241-e263, 2019.
- [25] H. Oge, T. Bas, "Public-private partnership healthcare projects in Türkiye," *The Journal of Business Science*, vol. 4, no 2, pp. 105-119, 2016.

- [26] D. Bulbul, "Evaluation of the public private partnership practices in terms of financial transparency in Türkiye," *The Journal of International Scientific Researches*, vol. 2, no 7, pp. 93-108, 2017.
- [27] C. Budayan, O. Okudan, I. Dikmen, "Identification and prioritization of stage-level KPIs for BOT projects—evidence from Türkiye," *International Journal of Managing Projects in Business*, vol. 13, no 6, pp. 1311-1337, 2020.
- [28] C. Budayan, "Evaluation of delay causes for BOT projects based on perceptions of different stakeholders in Türkiye," *Journal of Management in Engineering*, vol. 35, no 1, pp. 04018057, 2019.
- [29] K. Kuru, D. Artan, "A canvas model for risk assessment and performance estimation in public–private partnerships," *International Journal of Construction Management*, vol. 20, no 6, pp. 704-719, 2020.
- [30] R. J. Might, W. A. Fisher, "The role of structural factors in determining project management success," *IEEE Transactions on Engineering Management*, vol. 32, no 2, pp. 71-77, 1985.
- [31] H. Kerzner, "In search of excellence in project management," *Journal of Systems Management*, vol. 38, no 2, pp. 30-39, 1987.
- [32] D. E. White, J. R. Patton, "Metrics and critical success factors for managing organizations by projects," *IEEE Transactions on Engineer Management*, vol. 37, no 4, pp. 252-253, 1990.
- [33] Y. Y. Wong, T. E. Maher, "New key success factors for China's growing market," *Business Horizons*, vol. 30, no 2, pp. 43-52, 1997.
- [34] D. B. Ashley, C. S. Laurie, E. J. Jaselskis, "Determinants of construction project success," *Project Management Journal*, vol. 18, no 2, pp. 69-79, 1987.
- [35] J. K. Pinto, J. G. Covin, "Critical factors in project implementation: A comparison of construction and R&D projects," *Technovation*, vol. 9, pp. 49-62, 1989.
- [36] D. Dvir, S. Lipovetsky, A. Tishler, A. J. Shenhae, "In search of project classification: A non-universal approach to project success factors," *Research Policy*, vol. 27, pp. 915-935, 1998.
- [37] B. C. Ghosh, T. W. Liang, T. T. Meng, B. Chan, "The key success factors, distinction capabilities and strategic thrusts of top SMEs in Singapore," *Journal of Business Research*, vol. 51, pp. 209-221, 2001.
- [38] J. K. Pinto, D. P. Slevin, "Critical factors in successful project implementation," *IEEE Transactions on Engineering Management*, vol. 34, no 1, pp. 22-27, 1987.
- [39] M. K. Parfitt, V. E. Sanvido, "Checklist of critical success factors for building projects," *Journal of Management in Engineering*, vol. 9, no 3, pp. 243-249, 1993.
- [40] P. Galilea, F. Medda, "Does the political and economic context influence the success of a transport project? An analysis of transport public-private partnerships," *Research in Transportation Economics*, vol. 30, pp. 102-109, 2010.
- [41] D. K. H. Chua, Y. C. Kog, P. K. Loh, E. J. Jaselskis, "Neural networks for construction project success," *Expert Systems with Applications*, vol. 13, no 4, pp. 317-328, 1997.
- [42] H. Kerzner, "In Search of Excellence in Project Management: Successful Practices in High Performance Organizations," Van Nostrand Reinhold, New York, USA, 1998.
- [43] A. Clarke, "A practical use of key success factors to improve the effectiveness of project management," *International*

- Journal of Project Management, vol. 17, no 3, pp. 139-145, 1999.
- [44] J. Shenhar, D. Dvir, O. Levy, "Mapping the dimensions of project success," *Project Management Journal*, vol. 28, no 2, pp. 5-13, 1997.
- [45] D. Dvir, T. Raz, A. J. Shenhar, "An empirical analysis of the relationship between project planning and project success," *International Journal of Project Management*, vol. 22, pp. 24-30, 2002.
- [46] R. L. K. Tiong, "CSFs in competitive tendering and negotiation model for BOT projects," *Journal of Construction Engineering and Management*, vol. 122, no 3, pp. 205-211, 1996.
- [47] J. Birnie, "Private finance initiative (PFI) – UK construction industry response," *Journal of Construction Procurement*, vol. 5, no 1, pp. 5-14, 1999.
- [48] M. J. Brodie, "Public/private joint ventures: The government as partner-bane or benefit?" *Real Estate Issues*, vol. 20, no 2, pp. 33-39, 1995.
- [49] S. G. Hambros, *Public-Private Partnerships for Highways: Experience, Structure, Financing, Applicability and Comparative Assessment*, Hambros SG, Canada, 1999.
- [50] G. Zantke, B. Mangels, "Public sector client-private sector project: Transferring the state construction administration into private hand," *Engineering, Construction and Architectural Management*, vol. 6, no 1, pp. 78-87, 1999.
- [51] D. C. Murphy, B. N. Baker, D. Fisher, *Determinants of Project Success*, Boston College School of Management, Boston, 1974.
- [52] N. Baker, D. C. Murphy, D. Fisher, *Factors Affecting Project Success: Project management handbook* (2nd ed.), John Wiley & Sons, New York, USA, 1988.
- [53] Li, A. Akintoye, P. J. Edwards, C. Hardcastle, "Critical success factors for PPP/PFI projects in the UK construction industry," *Construction Management and Economics*, vol. 23, pp. 459-471, 2005.
- [54] S. Lipovetsky, A. Tishler, D. Dvir, A. Shenhar, "The relative importance of defense project success dimensions," *R&D Management*, vol. 27, no 2, pp. 97-106, 1997.
- [55] J. K. Pinto, J. P. Prescott, "Variation in critical success factors over the stages in the project life cycle," *Journal of Management*, vol. 14, no 1, pp. 5-18, 1988.
- [56] T. Kayworth, D. Leidner, "The global virtual manager: A prescription for success," *European Management Journal*, vol. 18, no 2, pp. 183-194, 2000.
- [57] M. A. Tas, E. Cakir, "Green supplier selection using game theory based on fuzzy SWARA," *Sakarya University Journal of Science*, vol. 25, no 4, pp. 885-897, 2021.
- [58] S. C. Turan, M. A. Cengiz, "Determining the factors that influence the effectiveness of the health sector in the OECD countries," *Sakarya University Journal of Science*, vol. 24, no 5, pp. 1094-1104, 2020.
- [59] J. Jaselskis, D. B. Ashley, "Optimal allocation of project management resources for achieving success," *Journal of Construction Engineering and Management*, vol. 117, no 2, pp. 321-340, 1991.
- [60] L. F. Alarcon, D. B. Ashley, "Modeling project performance for decision making," *Journal of Construction Engineering and Management*, vol. 122, no 3, pp. 265-273, 1996.
- [61] J. Nahapiet, H. Nahapiet, "A comparison of contractual arrangements for building projects," *Construction Management and Economics*, vol. 3, no 3, pp. 217-231, 1985.

- [62] O. Gun, P. Y. Kumru, Z. Aladag, "Developing a model for measuring project performance with software life cycle process metrics and calculating project success score," *Sakarya University Journal of Science*, vol. 24, no 3, pp. 536-554, 2020.
- [63] J. C. Nunnally, *Psychometric Theory*. (2nd ed.), McGraw-Hill, New York, 1978.
- [64] Cheung, A. P. C. Chan, S. Kajewski, "Factors contributing to successful public private partnership projects, comparing Hong Kong with Australia and the United Kingdom," *Journal of Facilities Management*, vol. 10, no 1, pp. 45-58, 2012.
- [65] B. G. Hwang, X. Zhao, M. J. S. Gay, "Public private partnership projects in Singapore: Factors, critical risks and preferred risk allocation from the perspective of contractors," *International Journal of Project Management*, vol. 31, no 3, pp. 424-433, 2013.
- [66] U. Emek, "Turkish experience with public private partnerships in infrastructure: Opportunities and challenges," *Utilities Policy*, vol. 37, pp. 120-129, 2015.
- [67] M. C. Jefferies, "Critical success factors of public private sector partnerships: A case study of the Sydney SuperDome," *Engineering, Construction and Architectural Management*, vol. 13, no 5, pp. 451-462, 2006.
- [68] J. Mota, A. C. Moreira, "The importance of non-financial determinants on public-private partnerships in Europe," *International Journal of Project Management*, vol. 33, no 7, pp. 1563-1575, 2015.
- [69] C. M. Tam, W. Y. Li, A. P. C. Chan, "BOT applications in the power industry of South East Asia: A case study in China," in *CIB W92 Procurement Systems Symposium*, University of Hong Kong, 175, Hong Kong, 1994, pp. 315-322.
- [70] A.A. Abdul-Rashid, S. J. K. Puteri, U. A. Ahmed, J. Mastura, "Public Private Partnerships (PPP) in Housing Development: The Experience of IJM Malaysia in Hyderabad, India," in *World Conference on Accelerating Excellence in the Built Environment*, Birmingham, UK, 2006.
- [71] P. Corbett, R. Smith, "An Analysis of the Success of the Private Finance Initiative as the Government's Preferred Procurement Route," *Accelerating Excellence in the Built Environment Conference*, Birmingham, UK, 2006.
- [72] M. J. Norusis, *SPSS for Windows, Professional Statistics, Release 5*, SPSS Inc., Chicago, 1992.
- [73] A.O. Sanni, "Factors determining the success of public private partnership projects in Nigeria," *Construction Economics and Building*, vol. 16, no 2, pp. 42-55, 2016.
- [74] K. Dithebe, C. O. Aigbavboa, W. D. Thwala, A. E. Oke, "Factor analysis of critical success factors for water infrastructure projects delivered under public-private partnerships," *Journal of Financial Management of Property and Construction*, vol. 24, no 3, pp. 338-357, 2019.
- [75] Bennett, *Public Private Co-Operation in the Delivery of Urban Infrastructure Services (water and waste)*, UNDP/Yale Collaborative Program, United Nations Development Program, New York, 1998.
- [76] Payne, "Key legal issues in projects procured under the private finance initiative," *Engineering, Construction and Architectural Management*, vol. 4, no 3, pp. 195-202, 1997.
- [77] J. Rubin, W. E. Seelig, "Experience as a factor in the selection and performance of project managers," *IEEE Transactions on*

Engineering Management, vol. EM-14, no 3, pp. 131-135, 1967.

- [78] A. Mustafa, "Public-private partnership: An alternative institutional model for implementing the private finance initiative in the provision of transport infrastructure," *Journal of Project Finance*, vol. 5, no 2, pp. 64-79, 1999.
- [79] T. Richardson, "Project management pitfalls," *Business Management Review*, vol. 25, no 8, pp. 49-51, 1995.
- [80] P. W. G. Morris, G. H. Hough, *The Anatomy of Major Projects: A study of the Reality of Project Management*, Wiley, Chichester, UK, 1987.
- [81] X. Zhang, S. Chen, "A systematic framework for infrastructure development through public private partnerships," *IATSS Research*, vol. 36, no 2, pp. 88-97, 2013.
- [82] D. A. Kolb, A. L. Frohman, "An organization development approach to consulting," *Sloan Management Review*, vol. 12, no 1, pp. 51-65, 1970.
- [83] T. Manley, "Have you tried project management?" *Public Personnel Management*, vol. 12, pp. 180-188, 1975.
- [84] R. L. Schultz, D. P. Slevin, "Behavioral considerations in the implementation of marketing decision models," in *Spring and Fall AMA Conference*, Wilmington, Delaware, 1972, pp. 494-498.
- [85] D. R. Beck, *Implementing Top Management Plans Through Project Management*, *Project Management Handbook* (eds. D. I. Cleland and W. R. Kings), New York, 1983.