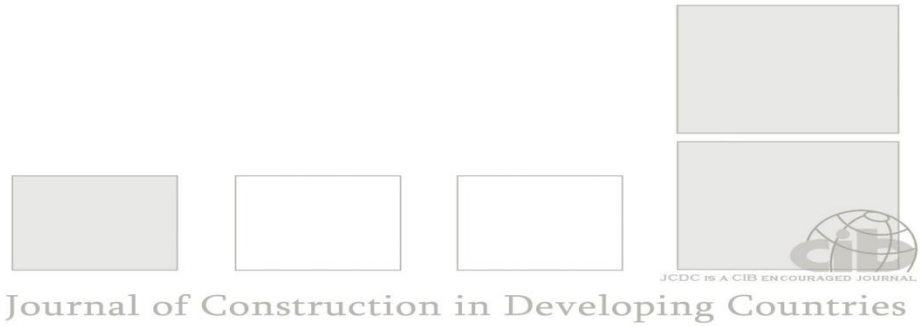

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Perceptions on PPP Transportation Project Success Factors in Developing Countries: An Explanatory Sequential Investigation

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Abstract

Inadequate transportation infrastructure is a significant obstacle to any economy's growth and development potential. A primary challenge to sustainable delivery is finance. Concerns about the efficacy of innovative mechanisms for financing infrastructure investments, primarily through public-private partnerships (PPP) abound in the literature and practice. Few studies focus on the critical success factors (CSFs) for PPP transport projects in emerging markets. This paper aims to identify the taxonomy and manifestations of CSFs associated with executing PPP-based transportation projects in developing countries. The study collected and analysed data using a questionnaire and in-depth interviews using a mixed-methods sequential explanatory investigation among built environment professionals, including general contractors, consultants, and government agencies. Findings indicated that good governance, the project's technical feasibility, the commitment of the public and private partners, appropriate risk allocation and sharing, and experience were the most critical success factors. Multivariate techniques using factor analysis identified four principal components: partnership and procurement, economic and governance technical, and political and social factors. The study contributes to the body of knowledge using mixed methods within an underexplored context, developing countries. The findings could be extended further using more robust statistical techniques. The localisation conditions for the effective delivery of transportation projects should be considered.

Keywords: Construction industry; Critical success factors; Developing countries; Infrastructure, Public-private Partnerships; South Africa

INTRODUCTION

Adequate transportation infrastructure provision is pivotal to achieving Africa's sustainable development and socio-economic growth. It facilitates the movement of goods and services, stimulates economic activities, improves the continent's competitiveness, and provides access to social services (African Development Bank, 2014). The level of transport infrastructure provision in Africa is inadequate in terms of quantity and quality, with variation from one country to another. This has negatively affected the continent's efforts to achieve the desired levels of socio-economic growth, regional integration and social inclusion. Inadequate infrastructure will remain the biggest threat to Africa's long-term growth if considerable attention is not given to sustainable funding sources for such investments.

According to the World Economic Forum (2021), the global infrastructure financing deficit is estimated at $1 trillion annually, which is 1.4% of the gross domestic product. The world will be facing a $15 trillion infrastructure gap between projected investment and the amount needed to provide adequate global infrastructure by 2040 (George *et al.*, 2019). African governments have historically financed a sizeable share of the continent's infrastructure development on the balance sheet, and budgetary restrictions have thus constrained infrastructure rollout. With over half the world's population living in cities, transportation concerns are ever-growing. The rapidly increasing demand and the inefficacy of financing infrastructure investments pose challenges to developing sustainable projects (African Business, 2023). Moreover, efforts to alleviate poverty and continuously incline toward sustainable development are hampered by poor-performing transportation infrastructure (Jiang *et al.*, 2020). Inadequate transport services and physical or financial inaccessibility to transport options are prevailing in African cities and have been used to conceptualise transport poverty (Popoola *et al.*, 2022). Poor transport infrastructure and lack of access to safe and practical transport infrastructure constrain development in many developing countries (Oraegbune & Ugwu, 2020). In this sense, transportation infrastructure provision is linked with Sustainable Development Goals (SDG) 11 (sustainable transport infrastructure) and 10 (reduced inequalities), societal development and international relations (Skorobogatova & Kuzmina-Merlino, 2017). For economies to grow and strive towards realising SDG imperatives, continuous attention on the efficacy of the financial models for transportation infrastructure delivery is pertinent.

Many cities including developing countries have turned to public and private partnerships (PPP) to alleviate the situation for infrastructure development. PPPs have been favoured to support developing and managing the rapidly demanded public infrastructure and leverage both public and private resources (Ahmadabadi & Heravi, 2019; Chan *et al.*, 2023). PPP is a cooperation between public and private actors to develop products and services and share associated risks, costs and resources (Benitez-Avila *et al.*, 2019).

Transportation projects have been successfully delivered through PPP projects in England, Australia, and Asian and African countries (Menzies, 2016; Seeletse, 2016; Ke *et al.*, 2017). Sustainable infrastructure delivery through PPP partly depends on the structure for costs, transparency, risk-sharing, design and implementation. However, private sector involvement does not necessarily alleviate associated difficulties on PPP projects; thus, continually analysing risk factors for such arrangements is vital (Okoro *et al.*, 2017). The sustainability of partnerships in infrastructure service delivery is linked with Sustainable Development Goal 17 with a focus on "multi-stakeholder partnerships as important vehicles for mobilising and sharing knowledge, expertise, technologies and financial resources to support the achievement of the sustainable development goals in all countries, particularly developing countries" (Chan *et al.*, 2023).

Although a plethora of studies exists on PPP transportation projects in developing countries, as was observed from an integrative review of studies using multiple databases, few studies have ranked the risks or critical factors for success in developing countries, a view supported by Chan *et al.* (2023). It is important to rank these factors and explore the context in which they affect the sustainability of PPP arrangements. Further, some studies were based on limited perspectives from single-country participants such as Chan *et al.*'s (2023) quantitative study among 35 experts in Iran; while others have a limited scope, and the focus is different from the current study. For example, Prabhudesai and Sarode (2018) focused on a concessionaire's business success and goals; thus, interest rate, revenue/cash flow, and contracting terms were relevant to the stakeholder concerns. Thus, the private sector views may not apply to the partnership goals and objectives, a view supported by Malek and Bhatt (2022) who compared CSFs for private and public stakeholders. Further, Damoah and Samoah's (2021) study of Intercity STC Coaches in Ghana focused on service delivery, thus, has a limited scope. Likewise, the study by Chan *et al.* (2023) investigated barriers to entry for the private sector and not the success or performance of existing PPP mechanisms/arrangements. Malek and Bhatt (2022) compared CSFs for public and private sector stakeholders in the Indian road sector using SEM. Furthermore, limited studies have employed mixed methods. For example, Osei-Kyei and Chan (2019) examined the causal relationship between CSFs and success criteria for PPP projects with data collected from a questionnaire survey analysed using multiple regression; Prabhudesai and Sarode (2018) examined 26 CSFs using mean scores of 95 concessionaires from a single database, while Malek and Bhatt (2022) used SEM to evaluate 42 CSFs in Indian PPP road projects.

Therefore, it was assumed that the relative importance and taxonomy of factors from the above studies might differ from those captured in the current study, with a broader focus, sample and mixed methods. In addition, some CSFs could vary from country to country, and potential risks can change over time (Bae & Joo, 2016). Further, continuous research on developing countries is critical because according to the United Nations, sustainable transport for

countries in special situations is crucial and this is recognised by the international community (Chan *et al.*, 2023). Therefore, the following research question was posed: *what factors or combination of factors contribute the most to the success of PPP transportation projects and how do these manifest in developing countries?*

To answer the research question, the study adopted a broader approach using mixed methods and a wider sample of experts from different developing countries to identify and rank the CSFs and demonstrate how it manifests in different PPP transportation projects in Africa. A questionnaire and subsequent expert interviews were employed as complementary tools to rank the CSFs identified from previous studies and establish the latent meaning and manifestations of the factors in various African settings and contexts. The definition of project success as delivery within time, budget, quality and scope boundaries, innovation and cooperation as well as stakeholder benefits (private sector's profit and value in use) was adapted (Ahmadabadi & Heravi, 2019). This implies success in the overall project execution, service delivery gains and achievement of the project's objectives.

Therefore, this study aimed to extend the findings from existing studies by examining the CSFs in developing countries' contexts using a sequential explanatory approach. In addition, the limited focus on other forms of transportation is covered in the current study. Therefore, the study's objectives were to:

1) evaluate the importance and taxonomy of the CSFs for PPP transportation infrastructure, and
2) establish meanings and perceptions of the identified CSFs concerning transportation projects delivered through PPPs.

Insights on how the CSFs unfold in the specific context in developing countries were provided through a sequential explanatory research approach and in-depth exposé, which is omitted in most studies. Findings from the study are envisaged to be beneficial in developing structures under which PPP transport projects could flourish in emerging economies. Stakeholders can know which factors are most compelling to give top priority and resources to deliver sustainable transportation projects. The subsequent sections present a literature review on PPP in transportation projects, methods adopted, findings, related discussion, and conclusions from the study.

LITERATURE REVIEW

PPP transportation infrastructure in developing countries

Africa's poor roads and other transportation constraints are significant and endanger connectivity between areas and employment opportunities. The COVID-19 pandemic further highlighted the centrality of Africa's transportation and connectivity needs (United Nations, 2022). The availability and overall condition of transport infrastructure do not deliver services that address the public (Heyns & Luke, 2017). These weaknesses are partly physical, operational,

and institutional (responsibility for the interchanges not falling clearly to one agency/party). Transport poverty manifestations in African cities impact urbanism, spatial transformation, and economic progression (Popoola *et al.*, 2022).

Transportation infrastructure projects are prone to high failure rates due to uncertainties concerning the design and execution (Okoro *et al.*, 2017). The impact of a failed transportation project is enormous in emerging economies, given their limited access to adequate alternative means of mobility. As one of the targeted goals for improving living standards in South Africa, as expressed in the National Development Plan 2030, transportation infrastructure should be a major focus (Habiyaremye *et al.*, 2022). What is needed is a transport regulatory and administrative framework that promotes seamless transportation networks more consciously. Therefore, an adequate financing and project procurement model such as PPP is essential. The PPP arrangement implies private sector participation in planned infrastructure delivery with the expectation of better value for money and application of competencies; as well as new technologies while relying on the regulatory framework and oversight of the public sector to deliver and manage better-performing infrastructure and services (Ke *et al.*, 2017). Besides the level of private sector involvement, contract type, period, stakes (reimbursement), cost/benefit analysis, legal context and environmental impacts are considered (Fouad *et al.*, 2021).

However, the adoption of PPPs has faced some challenges such as limited financial markets, inadequate legal and regulatory frameworks, inefficient administrative procedures, an unfavourable policy framework for risk transfer and dispute resolution, lack of technical skills within government agencies, lack of private sector interest, and political and national risks (MFDP, 2009; Ngoma *et al.*, 2014; Ernst & Young, 2015). Consequently, conflicts with multiple parties, inappropriate tax increases and discontinuation of concessions occur. Other challenges include poor project preparation and concessionaire selection, lack of accountability and transparency, lack of knowledge and expertise, and poor procurement and management processes (Fombad, 2013; Ngullie *et al.*, 2021). Therefore, an understanding of the factors that could ameliorate these challenges is warranted.

Success factors for PPP transportation infrastructure

For a transport project to succeed, applicable CSFs for its development and management must be identified due to individual characteristics and multiplicity of contractual arrangements of the different asset classes (road, rail, bridges, and so forth.) (Hwang *et al.*, 2013). According to Ahmadabadi and Heravi (2019), project success for PPP transport projects goes beyond the traditional metrics of time, quality and cost to include the benefits from the association or cooperation for the stakeholders because of the long-term nature of such projects. Success can also be in terms of expected results, fulfilment of objectives from project planning to operation, and stakeholder satisfaction (Voordijk *et al.*, 2016). It can be related to project management

success and the bankability of completion risk as opined by Liu *et al.* (2015) and Owolabi *et al.* (2020) in their assessment of CSFs in PFI/PPP megaprojects using views from major financier stakeholders including senior lenders, equity financiers, and infrastructure financiers. The evaluation of CSFs offers a route for the successful execution of PPP projects (Ahmadabadi & Heravi, 2019; Osei-Kyei & Chan, 2019; Chileshe *et al.*, 2022). CSFs are important activity areas in which positive results are essential to reach one's goals (Prabhudesai & Sarode, 2018; Ngullie *et al.*, 2021).

Several studies have identified critical factors for successful PPP transportation project delivery in developing countries (Osei-Kyei & Chan, 2015; Okoro *et al.*, 2018; Debela, 2019). Some of the studies focused on roads (Debela, 2019; Matta & Panchal, 2020), and single PPP elements, for instance, governance factors (South *et al.*, 2015; Debela, 2019), traffic demand factors (Nguyen *et al.*, 2018), project sponsors' risk management (Wang, 2015), and factors to attract private investment (Likhitruangsilp *et al.*, 2018). Prabhudesai and Sarode's (2018) study ranked 26 CSFs according to their perceived importance among 95 concessionaires including private firms or a consortium of firms awarded the tender for project implementation in PPP road projects in India. However, the sampled concessionaires were under one client, the national government ministerial body; thus, the findings are not representative or generalisable within the country or indeed other developing nations. Debela (2019) investigated CSFs relevant to PPP implementation in the Ethiopian road sector. Using a representative sample of the public sector, private sector and development partners, descriptive and inferential statistical analysis were applied to responses from 53 respondents. The study revealed that an enabling policy, a well-organised and committed public agency, and a stable political- and social environment are most critical in PPP road transport arrangements. The least ranked were public or community support, technology transfer, and a pro-investment culture. However, the small sample may have influenced these results.

On their part, Ahmadabadi and Heravi (2019) evaluated the relationship between success criteria and CSFs in PPP projects on highway projects in Iran, focusing on different phases of development. CSFs were considered during the procurement phase, while success criteria were assessed during the construction, operation, and final transfer stages. The study utilised PLS-SEM analysed using PLS-SEM and subsequently, a case study of two national projects. The study found that private sector capability has a direct effect on project success during the construction period and government capability is very effective during the project operation stage. The study defined project success beyond time, quality and cost, to include innovation, technology, cooperation and knowledge transfer among stakeholders and benefits to the public or user during the operation stage.

Damoah and Samoah's (2021) study of public transport in Ghana focused on service delivery. While the study identified the benefits of cooperation among partners to deliver long-lasting projects and impacts, the authors

recommended the need for a more detailed and current study with a broader sample across developing countries. In addition, some studies have focused on specific project stages such as pre-construction, feasibility, construction, or implementation (Likhitruangsilp *et al.*, 2018; Matta & Panchal, 2020). Given that transport projects have a long lifecycle, consideration of success beyond the implementation stages is critical.

The study by Malek and Bhatt (2022) compared CSFs for public and private sector stakeholders in the Indian road sector. With a focus on road construction projects, a structural equation modelling of 42 CSFs at different project phases was performed. Two hundred and seventy-five responses from government and private sector organisations were used to evaluate the relationships between six construction phases and CSFs. The survey statements related to the successful completion of each stage and the entire project.

Okoro *et al.* (2022) examined PPP considerations regarding bus rapid transit systems. The study used interviews with experts and BRT users in one province of South Africa. The study found that institutional arrangements, existing characteristics and impact, service reliability and quality, technical analysis of infrastructural integration, demand, environmental performance metrics and life cycle costs are important considerations. While the strengths of PPP arrangements were acknowledged, the study focused on BRTs and project success indicators and incorporated the perception of users.

More recently, Chan *et al.* (2023) employed quantitative techniques to assess and rank barriers to private sector entry into PPP transportation project arrangements; not existing mechanisms. The study used opinions from only 35 respondents including contractors, consultants, and employers in Iran; thus, the findings may not be generalisable or applicable to other developing countries. It is possible to come up with a different structure or taxonomy of factors in other developing countries because cultural differences, settings and governance dynamics are different. PPPs are highly complex and unique policy instruments; thus, may differ due to inherent complex attributes, service quality, culture, governance and economic impact (Liang & Wang, 2019).

Therefore, although the findings are arguably generalisable as developing countries share similar characteristics, it is essential to investigate how these various factors apply in other emerging economies. Therefore, it appears that limited studies have ranked and explained these CSFs using a mixed-method approach, incorporating participants in more developing countries and different transport asset classes (rail, road, and airport). This approach will contribute to filling the gaps and extending the knowledge on PPP transport CSFs in developing countries. Integrating the results from a quantitative and subsequent qualitative approach provides a deeper understanding of the research problem and how it manifests in specific contexts and projects.

RESEARCH METHODS

Research Design

The methodology for the study was determined by the gap in existing studies, and the need to collect specific data from a large population and triangulate from different sources and approaches (Opoku *et al.*, 2016). A pragmatic approach through a sequential explanatory design was adopted to collect statistical and in-depth textual information. The taxonomy of the CSFs was established in the first phase and the latent meaning, interactions, and manifestations of the CSFs in different settings and scenarios were established in the second phase (Santos *et al.*, 2017). Higher priority was given to the quantitative phase as it took longer to obtain responses and more analysis to extract more components. However, this was understandable given that transportation projects are few, and PPP projects are even fewer in South Africa (Bruchez & Steiner, 2014). Therefore, the mixed-method approach combined quantitative and qualitative strands of information to develop nuanced and comprehensive findings (Draucker *et al.*, 2020). The subsequent qualitative phase helped to reflect upon experience and depth, contextualise and enrich the findings, thus increasing the findings' reliability (Bowen *et al.*, 2017). Moreover, mixed methods are often used in Built Environment research (Day & Gunderson, 2018). The mixed methods approach also allowed for the collection of both quantitative and qualitative data on transport PPP projects CSFs; thus, a broader perspective to understanding the phenomenon under study was obtainable. The approach enabled the study to come up with qualitative explanations for the quantitative responses from research participants. Therefore, the mixed methods approach was applied to counter the weaknesses of a single approach to this type of research study, where quantitative opinions need to be backed by explanations.

Sampling and data collection method – Questionnaire survey

The semi-systematic literature review enabled a critique and synthesis of representative literature on PPP CSFs for transportation infrastructure in an integrated way such that new frameworks and perspectives on a topic were generated (Tarraco, 2005). Databases included Scopus, Web of Science and Google Scholar. The search included articles with keywords including public-private partnership, 3P, PPP, PFI, transportation infrastructure, transportation project, and transportation procurement. The CSFs were thus identified from recent studies, for example, Osei-Kyei and Chan (2015; 2019) and Debela (2019). Twenty-six factors were identified and used to develop a closed-ended questionnaire to obtain statistical information to rate the level of importance of the CSFs. Since the factors had been tested and used in similar studies in other developing countries, they were used as a basis, as was done by Debela (2019). The questionnaire was divided into three sections with the first section focusing on demographics and project characteristics in which respondents had been involved. The second part of the questionnaire had Likert-type questions, as was used by Malek and Bhatt (2022). Participants were required to indicate their level of importance of factors contributing to successful PPP project implementation on a scale of 1=Not important to 5=Very important.

The data required for the study was obtainable from a population of Built Environment professionals involved in the transportation sector and easily reachable through a survey (Farrugia *et al.*, 2010). Purposive sampling was used to include Built Environment professionals identified among construction and project management professional bodies in South Africa, who had been involved in PPP transportation projects (Rowley, 2014). These included experts such as contractors, sub-contractors, and consultants as was conducted by Chan *et al.* (2023). Also, the researchers' academic contacts and colleagues' residents and practising in other developing countries, including Zambia, Ghana, Nigeria, and Botswana were included. These five countries were taken to be a representative sample of developing countries. For the quantitative phase, a Google form link was distributed. The online platform ensured that respondents completed the surveys in relatively less time and expense, and the varied and "required" response options were a plus, ensuring an absence of missing values (Nulty, 2008; Ebert *et al.*, 2018). Eighty-seven responses were received through the questionnaire survey and analysed (in a process explained in the next section). The profile of the respondents is presented in Table 1.

Table 1: Demographic characteristics

Characteristics	Frequency	Percent	Valid Percent	Cumulative Percent
Organisation type				
General Contractor	24	27.6	27.6	27.6
Sub-contractor	1	1.1	1.1	28.7
Consultant	30	34.5	34.5	63.2
Government Agency	17	19.5	19.5	82.8
Other	15	17.2	17.2	100.0
Job title				
Project Manager	37	42.5	42.5	42.5
Projects/Field Engineer	8	9.2	9.2	51.7
Finance Manager	1	1.1	1.1	52.9
Construction Manager	9	10.3	10.3	63.2
Director/Manager	20	23.0	23.0	86.2
Other	12	13.8	13.8	100.0
Highest academic qualification				
High School Diploma	2	2.3	2.3	2.3
Technical College/Vocational Certificate	2	2.3	2.3	4.6
National Diploma	13	14.9	14.9	19.5
Bachelor's Degree	30	34.5	34.5	54.0
Master's Degree	30	34.5	34.5	88.5
PhD	10	11.5	11.5	100.0
Years of experience				
Less than 5 years	10	11.5	11.5	11.5

6-10 Years	9	10.3	10.3	21.8
11-15 Years	13	14.9	14.9	36.8
16-20 Years	17	19.5	19.5	56.3
More than 20 Years	38	43.7	43.7	100.0

The respondents were from consultant institutions (34.5%), general contractors (27.6%), government agencies (19.5%) and universities (17.2%). They were project managers (42.5%), directors/managers (23%), academics (13.8%), construction managers (10.3%) and engineers (9.2%). Therefore, the respondents were possibly major decision-makers at their institutions. Regarding academic qualification, 34.5% had Bachelor's and Master's degrees, respectively; 14.9% were National Diploma holders and 11.5% had a doctorate. Further, 43.7% had more than 20 years of experience, 19.5% had 16-20 years, 14.9% had 11-15 years, and only 11.5% had less than five years of experience. Therefore, the respondents had adequate knowledge and experience to provide well-founded and informed data (Babatunde *et al.*, 2010). They also worked on various projects, including rail, highway, bridges and airports. Also, 58.62% had been involved in less than three PPP projects, whilst 12.64% had more PPP experience as they had been involved in more than eight PPP projects. About 10.34% had not been directly involved in any PPP projects but had knowledge and updates about PPP projects in their location. These findings may indicate the rarity of landing PPP projects for many contractors and consultants in developing countries (Babatunde *et al.*, 2014).

Qualitative data collection

In the subsequent qualitative phase, structured interviews were undertaken among hand-picked practitioners based on the authors' knowledge of who had participated in PPP transport projects in some form or role and through snowballing. Snowball sampling entails identifying further participants based on referrals from initial participants, which helps ensure sample diversity (Kirchherr & Charles, 2018). The participants' profile is presented in Table 2. They comprised professionals involved in PPP transactions in the transportation setting. They had 15 to 25 years of experience and were involved in different project types, including roads, rail, bus rapid transit and airports. They were involved at different stages and in various capacities and provided rich insights from their experience in their respective countries. Six professionals were interviewed. An effort was made to include participants involved at different stages of PPP projects – ideation, feasibility and financial close, implementation and operational stages. The interviews were conducted electronically via Microsoft Teams and WhatsApp. The use of the WhatsApp platform allowed participants greater freedom to talk, convenience, the ability to express themselves via text and the possibility of exercising greater control over the interview (Gibson, 2020). The average length of the interviews was 30 minutes.

Table 2: Profile of interview participants

ID	Role in company	Years of experience	Location of participant/ project	PPP project involved	Role on project/ stage involved
1	Government advisor on BRT	25	South Africa	BRT (Johannesburg)	Planning
2	Government advisor on infrastructure	23	Zambia	Road, 25-year concession signed recently	Notification to the public and financial close
3	General contractor, transport and other infrastructure	15	Ghana	Roads	Contractor with the road sector, projects supported by the World Bank and Ministry of Roads and Transport
4	Government advisor on PPP frameworks/policies	20	Zambia	General	Planning, framework development stage
5	Former Group Treasurer/ Corporate Finance Consultant (private)	22	South Africa/India	PPP consortium – Mumbai International airport, India	Represented Airports Company South Africa in financial management – guarantee for any funding to the consortium to the airport, and any guarantee in relation to the operations

Quantitative data analysis

Quantitative data were analysed using the *Statistical Package for the Social Sciences (SPSS)* version 26 software through descriptive, Kendall's coefficient of concordance and multivariate (factor) analyses. These were deemed appropriate to characterise the observations' central value and interrelationships among many factors. The data was preliminarily assessed for skewness and internal consistency reliability (using Cronbach's Alpha). A Cronbach's alpha above 0.8 is considered very good and between 0.6 and 0.7 is acceptable (Nunnally, 1978). A Cronbach alpha value of 0.953 obtained for the CSFs demonstrated very good internal consistency reliability.

Descriptive analysis entailed the relative importance index (RII), mean, mode, interquartile range (IQR) and standard deviation (SD) values. The CSFs were ranked based on the RII to evaluate their importance based on weights attached to Likert-scale responses as was used in Debela (2019). The mode showed the most preferred response, while the IQR and SD showed the spread and consensus of the responses. RII indices range from 0 to 1, with higher values signifying higher importance. Further, the extent of agreement on the rankings of the CSFs was assessed through Kendall's coefficient of concordance (W) at a pre-defined test value of p=0.05, as was used in previous PPP studies (Osei-Kyei & Chan, 2017; Kavishe & Chileshe, 2019).

Furthermore, exploratory factor analysis (EFA) through principal components analysis (PCA) was used to examine the constructs; also revealing the structural validity (Gaskin & Happell, 2013; Knekta *et al.*, 2018). Preliminary assessments for sampling adequacy were undertaken using the Kaiser-Meyer-Olkin (KMO) and Bartlett's Sphericity test. These were needed to check the case-to-variable ratio and thus the factorability of the data. A KMO score of 0.5 and above is acceptable for factor analysis (Ul Hadia *et al.*, 2016). The Barlett's test indicates whether the correlation matrix is significantly different from the identity matrix (i.e., viz a viz the matrix in which all of the diagonal elements are 1 and other elements 0) and whether a significant value is acceptable (Field, 2013). Communalities were also assessed to check item correlations with other items. An item with a communality score below 0.3 indicates a weak correlation and can be deleted (Santos *et al.*, 2019). The variables were thereafter rotated using promax rotation to establish the variance explained by underlying components and thus possible components that can be extracted. Objects with eigenvalues greater than 1.0 are separated into different components. A variance above 60% is acceptable for factor analysis if the factors have eigenvalues above 1 (Hair *et al.*, 2019), and a cut-off point of 0.45 for the factor loadings is acceptable (Hair *et al.*, 2014). However, for robustness, this study used values above 0.5 for further analysis.

Qualitative data analysis

Qualitative data analysis was undertaken using thematic analysis. Themes from the quantitative phase were used to identify relevant codes. Therefore, integration occurred at the study design stage through the sequential design adopted (Othman *et al.*, 2020). Further integration of data from both phases was done during the interpretation and reporting phase, with the findings discussed theme-by-theme while triangulating with existing literature (Othman *et al.*, 2020).

The participants' responses to the singular question asked for the qualitative phase, "What are the meanings and perceptions on the emerged components, as represented in the projects they were involved in?" were analysed using thematic analysis. A deductive approach to thematic analysis, using coding reliability, was adopted to analyse the qualitative data, as described in Braun and Clarke (2020). It followed a structured approach to coding centred around a coding frame, and pre-existing analytic work and involved early theme development and identifying evidence for themes (Braun & Clarke, 2020).

RESULTS

Overall Ranking of the CSFs (level of importance)

The descriptive analysis results of the PPP CSFs are depicted in Table 3. The relative importance index (RII), mean, mode, standard deviation (SD) and interquartile range (IR) of the variables as assessed were presented.

Table 3: Descriptive summary of the PPP critical success factors.

Critical Success Factor	N	RII	Mean	Mode	IR	SD
Good Governance	87	0.880	4.402	5	1	0.799
Technical Feasibility of Project	87	0.874	4.367	5	1	0.864
Commitment of Public/Private Sector	87	0.871	4.356	5	1	0.914
Appropriate Risk Allocation and Risk Sharing	87	0.864	4.321	5	1	0.842
Experience	87	0.859	4.299	5	1	0.929
Performance Specification/Payment Mechanism	87	0.855	4.275	5	1	0.871
Transparency of Procurement Process	87	0.844	4.218	5	1	1.027
Capable Public and Private Partners	87	0.841	4.206	5	1	1.013
Transportation Infrastructure Needed	87	0.834	4.172	5	1	0.954
Efficient Procurement Process	87	0.834	4.172	5	1	1.002
Well Organised Public Agency	87	0.828	4.137	5	1	0.966
Favourable Legal Framework	87	0.828	4.137	4	1	0.929
Thorough and Realistic Cost Benefit	87	0.827	4.138	5	1	1.101
Dedicated Unit of Oversight & Approval of PPP Process	87	0.825	4.126	5	1	1.043
Availability of Suitable Financial Market	87	0.814	4.069	4	1	0.937
Shared Authority Between Public & Private Partners	87	0.811	4.057	5	2	1.004
Revenue Forecasts	87	0.811	4.057	4	1	0.919
Favourable Investment Climate	87	0.802	4.011	4	1	0.982
Political Support and Stability	87	0.800	4.000	5	2	1.275
Community Engagement Programme	87	0.795	3.977	4	2	0.988
Stable Macro-economic Environment	87	0.791	3.954	4	1	0.975
Sound Economic Policy	87	0.789	3.942	5	2	1.004
Social Support	87	0.782	3.908	5	2	1.030
Competitive Procurement	87	0.775	3.873	5	2	1.139

Implementation of Innovative Solutions	87	0.768	3.839	4	2	1.055
Government Provides a Guarantee	87	0.763	3.816	4	2	1.094
	W		Chi-Square		Asympto Sig	
Kendall's coefficient of concordance (W)	0.056		121.559		0.000	

Notes: RII = Relative importance index; IR= Interquartile range; SD = Standard deviation

Further, the ranking was undertaken based on the RII. The data showed that good governance was ranked the most important CSF with an RII of 0.88 and a mean of 4.402. A mode of 5 revealed that most respondents identified this factor as very important in PPP transport infrastructure projects for developing countries. Based on the SD of 0.799 and IR of 1, there was uniformity in responses on this factor.

Technical feasibility was ranked second (RII=0.874, Mean=4.367), and commitment of the public and private sectors closely followed (RII=0.871, Mean=4.356). They were both deemed very important with a modal value of 5. The findings further uncovered the importance of appropriate risk allocation and sharing in PPP transport infrastructure projects, ranking fourth (RII=0.864, Mean= 4.321), and experience ranked fifth (RII=0.859, respectively mean=4.299). The SD values of 0.842 and 0.929, respectively, and IR of 1 showed that respondents agreed that these were important CSFs.

The least-ranked factors had RII lower than 0.80 and mean values lower than 4. The need for government to provide a guarantee (RII=0.763; Mean=3.816) ranked the lowest, followed by implementing innovative technologies or solutions (RII=0.768, Mean=3.839). In the majority of the least-ranked CSFs, the SD was greater than 1, and the IR was 2, signifying the spread and divergence in the respondents' opinions.

Further, an assessment of the extent of agreement on the rankings was done through Kendall's coefficient of concordance (*W*). The Kendall W was 0.056 indicating there was no concordance among respondents in terms of ranking the success factors. Therefore, there was a general lack of agreement on the assigned rankings for the identified CSFs.

Factor Analysis Results (taxonomy of factors)

Preliminary assessments of sampling adequacy showed a KMO score of 0.880 indicating that factor analysis was possible with the selected sample. The Bartlett's Test of Sphericity had a significant *p*-value of 0.000 suggesting that the variables were correlated enough for factor analysis (Field, 2013). All 26 items had commonalities above 0.3, meaning that they fit well with the others, and none was eliminated.

Factors were thereafter retained during rotation based on the cut-off point of 0.45 for the factor loadings and an eigenvalue of 1. Eigenvalues above 1 were

also supported in the scree plot. An examination of the total variance output showed that five components had eigenvalues above 1. However, no factor loaded on the fifth. At least three measured variables are needed for the statistical identification of a factor (Watkins, 2018). The analysis was then rerun with a pre-determined number of four components as illustrated in Table 4.

Table 4: Total variance explained for CSFs for PPP implementation on transportation infrastructure projects

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings
	Total	% of Variance	Cumulative %	Total
1	12.248	47.106	47.106	9.773
2	1.878	7.222	54.327	8.906
3	1.458	5.609	59.937	7.530
4	1.195	4.597	64.534	4.904

Notes: Extraction Method: Principal Component Analysis

An examination of Table 4 shows that the total variance explained by the four components was 64.53%. According to Hair *et al.* (2019), a variance above 60% is acceptable if the factors have Eigenvalues above 1. The four components accounted for 47.11%, 7.22%, 5.61% and 4.60%, respectively, and they were all retained.

Table 5 shows the factor loadings for the four components. The contribution of each item to each component is reflected through the factor loadings. For robustness, only factor loadings of 0.50 and above were considered in this study. The rotation converged in 25 iterations. The four rotated components were classified and named according to the dominant themes in each component. The emerging components were named "partnership and procurement", "economic and governance", "technical", and "political and social" factors.

Table 5: Promax rotation matrix and principal factor extraction of CSFs for infrastructure projects

Critical success factors (CSFs)	Component			
	1	2	3	4
Factor 1: Partnership and procurement				
CSF9 = Capable public and private partners	.872			
CSF8 = Shared authority between public & private partners	.712			
CSF6 = Experience	.692			
CSF7 = Commitment of public/private sector	.675			

CSF12 = Competitive procurement	.660			
CSF14 = Well-organised public agency	.636			
CSF16 = Efficient procurement process	.516			
Factor 2: Economic and governance				
CSF11 = Stable macro-economic environment		.838		
CSF21 = Implementation of innovative technologies/solutions		.782		
CSF19 = Good governance		.774		
CSF10 = Favorable investment climate		.699		
CSF20 = Availability of suitable financial market		.754		
CSF22 = Government provides a guarantee		.559		
CSF15 = Sound economic policy		.522		
Factor 3: Technical				
CSF17 = Appropriate risk allocation and risk sharing			.830	
CSF5 = Technical feasibility of a project			.723	
CSF18 = Favorable legal framework			.595	
CSF3 = Transport infrastructure needed			.594	
Factor 4: Political and social				
CSF4 = Political party and stability				.671
CSF2 = Social support				.640
CSF1 = Thorough and realistic cost-benefit				.604

The unifactorial test with the internal consistency, KMO index and variance explained by the four principal components showed acceptable values (Table 6): KMO values were all above 0.5 and Cronbach's alpha values above 0.7 (partnership and procurement = 0.899; economic and governance = 0.871; technical = 0.835 and political and social = 0.713).

Table 6: Unifactorial test with the internal consistency and KMO index of principal factors

Factor	Factor interpretation	Cronbach alpha (reliability)	KMO (unifactorial)	Variance explained (unifactorial)
1	Partnership and procurement	0.899	0.864	47.106
2	Economic and governance	0.871	0.848	7.222
3	Technical	0.835	0.805	5.609
4	Political and social	0.713	0.673	4.597

The four components were thereafter used for further investigation using in-depth interviews to elicit comprehensive data and meanings from personal accounts and experiences. The naming of the themes is discussed with

literature evidence while integrating the findings from the interviews, as was done by Othman *et al.* (2020). Participants' statements were identified with codes using the letter "P" and the corresponding number in the order the interviews were conducted.

DISCUSSION AND INTEGRATION OF QUANTITATIVE AND QUALITATIVE FINDINGS

Importance of the CSFs

The descriptive analysis indicated that "good governance", "technical feasibility", "commitment of the public and private partners", and "appropriate risk allocation" were the top-ranked factors. The qualitative findings support the criticality of these factors, as participants stated:

> *"On the Mumbai airport PPP (India), the shareholders each had a representative on the board to represent their own interests. All parties ensured that the controlling shareholders do not do everything in relation to budget, declaring dividends and remunerations of top executives, et cetera. Similarly, no segregation of duties, Chairman and CEO being different … Risks were also represented by the shareholding percentage, but also in terms of the technical skills brought on board so one will then get remunerated when you share the risk. For example, the airports company had to operate the airport and therefore provided the operating guarantee to ensure that all goes smoothly, but the concession in terms of the three parties reimbursed the company because it was understood that the guarantee sets for all parties, although is taken by one party"* (P5).

The governance issue was further supported by Interviewee P4 who stated: *"Good government must retain some of the risks, those that they are able to manage. For example, political will, political stability, government needs to take that role to ensure that the environment is politically stable to give confidence to the private sector. Some risks are best managed by the private sector, which is probably the design, construction and operation"*.

Interviewee P2 further lends support and noted: *"On the Chingola-Solwezi PPP road project (in Zambia), the concessionaire was asked to refurbish the road and consider refunding the portion that the government had done the residual value, and then the concession would develop the remaining section and add to the stretch maybe one or two more tolling gates to recoup the financing"*.

In addition, the technical feasibility of the project was considered crucial. According to the interviewees, *"In developing countries, there are certain technical gaps in terms of design, construction and operation from technical aspects"* (P4); *"You need to know the terrain where you are working, get acquainted with what is on the ground, constraints of the site, availability of labour, type of equipment to bring in, what materials they have that you might not need to import to the site, to minimise the problems and consider alternatives"* (P3). Therefore, these potential technical risks must be considered in the risk-sharing discourse between parties in a PPP arrangement.

Further, technological risks were found to be note-worthy in innovative transportation solutions and may require specialised procurement and contractual arrangements (González-Medrano & Martín, 2021). Likewise, traffic revenue risks due to the unpredictability of traffic flow in developing countries were highlighted as a concern in the qualitative arm of the study:

> *"Passenger traffic was a big factor in relation to why the partnership and why the airport when the concession became available. India had more potential than anywhere else given the large population"* (P5); *"the systems* [BRT] *are not getting the passenger volumes that they thought they would be getting on the route; the more people pay, the less subsidies you would need"* (P1); *"the traffic volumes* [on a Zambian project] *are not sufficient to raise funds so they have to come up with plans on recouping the financing that had gone into the construction. However, there were various ways of recouping the funds, like in our case, every road that we selected ends at the border post and then we have a border facility which includes a trade facility at the border from where most of the recouping of the funds will be taken because you are going to cover trade and the trucks and vehicles that are transiting"* (P2).

Extant studies also emphasise the criticality of traffic revenue for the sustainability of PPP transportation projects especially toll roads, which have to be borne by the parties in one way or another, as specified in contractual agreements (Babatunde & Perera, 2017; Okoro, 2019; Matta & Panchal, 2020; Damoah *et al.*, 2022).

Appropriate risk allocation and sharing among partners and the technical feasibility and viability of the project were deemed important in a UAE study (Al-Saadi & Abdou, 2016). Governance also ranked highly (second) among public CSFs evaluated by Li *et al.* (2005). On the other hand, "government provides a guarantee", "competitive procurement", "social support" and "sound economic policy" were identified as the least CSFs in the descriptive analysis. These factors were also found to be among the least important by Li *et al.* (2005) but had a significant influence on the value of money as demonstrated by Almarri (2017). Notwithstanding, these factors were highlighted as critical by the experts interviewed. For government guarantee, in the case of the Mumbai airport, *"the consortium itself did not require a government guarantee. The Indian Government required operational guarantee from the concession and each party that was involved to make sure that they will deliver"* (P5).

Competitive procurement ranked first among public sector CSFs and 16th (out of 18) evaluated for the private sector by Li *et al.* (2005). This indicated that the private sector may not be concerned about competitive bidding as much as the public sector would, and this opinion was reflected in the current study with most of the questionnaire survey respondents being from private consulting and contracting organisations. The higher ranking of the "Partnership and procurement" component from the factor analysis also indicated the importance of procurement dynamics. According to one of the interviewees,

procurement is critical in terms of transparency to encourage private sector participation. The following statement exemplified this, "*… where there is no transparency in the procurement, you will have low volumes of transport sector based projects, and remember they have to rely on toll fees, and collections and so if the procurement is not transparent, it means that private partners cannot trust the process of running those PPP projects*" (P4).

Taxonomy of the PPP Critical Success Factors

The factor analysis's main outcome and intended contribution is the proposed taxonomy comprising CSFs for PPP implementation in transportation infrastructure projects in emerging economies. According to Tarraco (2005), taxonomies can be used to classify previous research, lay the foundation for theorising, and promote common understanding or conceptual alignment about factors (Pieroni *et al.*, 2019). As discussed in this section, the qualitative phase offered means to interpret the emerged taxonomy (four-factor solution) from the factor analysis.

Component 1 - Partnership and procurement factors

Component 1 explaining 47.106% of the variance was called "partnership and procurement". It comprised relational elements between public and private partners and ease of procurement. This component comprised the following seven items "capable public and private partners", "shared authority between public and private partners", "experience", "commitment of public/private sector", "competitive procurement", "well-organised public agency" and "efficient procurement process" with factor loadings of 0.872, 0.712, 0.692, 0.675, 0.660, 0.636 and 0.516 respectively. The grouping is in line with Li *et al.*'s (2005) findings. "Shared authority between public and private partners", "well-organised public agency" (to negotiate on behalf of the public body and promote the project), and "competitive procurement process" were grouped as effective procurement factors.

One of the participants revealed that shared authority was concerning responsibilities and representation in the partnership. In addition, "*the experience of different parties in bringing together the team was crucial about who goes there, who was already running airports in South Africa, and how to do the similar*" (P5). On the contrary, another believed that "*experience does not count much. What counts more is the financial capacity to provide those facilities*" (P2).

Regarding the parties' commitment, because transportation projects are long-term in nature, it behoves the parties to commit for the long haul. The returns are also not immediate and should be considered: "*Without commitment, there is no way you pull through, especially at the beginning, where a consortium does not make much money. So we had to take a long-term view; everyone had to be committed to that long-term deep integration procurement process, most definitely, within the policies of the consortium*" (P5).

Partnership and procurement factors are essential to make the PPP successful while aligning with utilising the PPP arrangement (Sanni, 2016). However, this grouping was slightly different in Sanni's study, in which partnership elements were named leadership factors. The study also differentiated the factors relevant to the public and private sector partners, thus a different outcome from the present study. Nonetheless, the CSFs under this grouping are all related to ensuring a stable and effective procurement process and competitive bidding also help select the right partner with a long-term view in mind (Mohammed & Alshaoush, 2018). In the UAE and UK context, Almarri and Boussabaine (2017) identified that the chance for the successful delivery of a PPP project depends significantly on the bid winner, who is ultimately responsible for delivering the best value for money for the project. In Vietnam, Likhitruangsilp *et al.* (2018) support the findings that lack of transparency in bidding, the unfair process of selection in the private sector, and conflicting or imperfect contracts with shared authority and transparency deter private investment in transportation infrastructure. Therefore, an "efficient procurement system" and a "competitive environment" are CSFs (Zhang & Chen, 2013). The right concession and procurement arrangement design form the basis on which other project stages are implemented in addition to planning and allocating risks for enhanced efficiency (Zhang and Chen, 2013). Manu *et al.* (2021) recommended developing the procurement capacity of public agencies to improve efficiency.

Further, financial regulations in a well-organised public agency maintain a competitive environment in terms of a concessionaire's monopolistic rights and ensure continuous efficiency and project success. The lack of competition and the non-adequacy of the transparency and probity processes may adversely affect the efficiency of the tendering phase and lead to project failure (Simon *et al.*, 2020). Essentially, there must be good direction within the partnership, efficient procurement and smooth implementation of the PPP with the objectives of the public and private partners.

Related to the above is the PPP legislation, which is supposed to take care of both public and private sector requirements, but favours the public sector in some developing countries, for instance, "*in Zambia, one of the weakest points in terms of PPP procurement is that the law is very biased towards protecting the public sector, leaving out the private sector not taken care of and this eroded the confidence in the partnership and procurement of transport sector related projects*" (P4).

Component 2 - Economic and governance factors

Component 2 was called economic and governance factors. This component comprised the following seven items "stable macro-economic environment", "implementation of innovative technologies/solutions", "good governance", "availability of suitable financial market", "favourable investment climate", "government provides a guarantee" and "sound economic policy" with factor loadings of 0.838, 0.782, 0.774, 0.754, 0.699, 0.559 and 0.522 respectively.

The descriptive analysis discussed in the previous section discussed the importance of good governance and a sound economic environment. According to participants, PPP transportation project delivery will be successful if these elements are present. In addition to the representation of interests, the investment climate or economic environment has to be favourable for the partnership: "*India has a large population …* [On the Mumbai airport project] *that was a big factor concerning why the partnership. You also need a financial market that is sound and operational. Luckily, we had South African banks operating in India, which made things easier*" (P5).

The investment climate also incorporates institutional arrangements that do not favour private sector involvement and this was identified as a major underlying cause of the lack of sustained transportation infrastructure. Two participants attested to this:

> "*Institutions in developing countries have been quite weak in terms of governance of these projects, and it has affected the growth of PPP projects in the transportation sector. And then the infrastructure deficits in the transportation sector are very huge. And yet, there are so many resources in the private sector, but because of governance issues, the levels of trust are quite low … We need to see good governance in terms of how the government executes and handles these particular projects and beyond by instilling or giving confidence to the private sector; that government is going to stick and honour the concessions to be signed, and meet its obligations as stated in the concession agreements*" (P4).

> "*In Ghana, we have a unitary system, where it is a centralised government that controls everything. We take all our powers and directions from the central government and that is where the difficulty is because the individual has more power than the institution. Therefore, if there is a blueprint, where institutions will be given the power and the mandates, despite whoever comes to power, whatever contract that has been executed or needs to be carried on, that caveat should be given, that no matter what, there should be continuity with such projects*" (P3).

Therefore, solutions such as flexible contracts and government guarantees were suggested to cushion the effect of institutional weakness and change in governments in developing. The long-term commitment needed for partnerships in transportation projects necessitates the development of policies to pre-empt problems that might occur in the long run. In the Nigerian context, Babatunde and Perera (2017) identified government involvement by providing guarantees and project economic viability as necessary in their case study of PPP transport projects. In the Shanghai YD 2nd Tunnel project, the local authority provided six major guarantees for the concessionaire and in the UK, tax holidays and bond guarantees is given for many years (Li *et al.*, 2005).

The dominant influence of good governance and economic factors in terms of developing PPP is therefore recognised. If a favourable and stable economic and governing environment is available, the partnership's

objectives could be achieved (Sanni, 2016). A stable macro-economic environment, where the market exhibits reasonable certainty and market risk is correspondingly low, reduces the risks for private investors. Therefore, governments could set appropriate fiscal and monetary policies and work with lending institutions, such as banks, to provide favourable market rates and access to loans by practitioners. Economic and governance factors give direction to the development of the economy and provide an environment conducive to implementing PPP projects. The government can help create and maintain the environment through sound economic policy, which affects the credibility of a price regimen and trust in the convertibility of the currency, to attract and retain private sector investment (Li *et al.*, 2005). Further, governments can develop strategies to overcome difficulties with managing the associated oversight obligations by implementing innovative solutions and technologies, which will contribute to achieving good governance and the success of the PPP project (Wibowo & Alfen, 2015; Wang *et al.*, 2020).

Component 3 – Technical factors

Technical success factors for PPP transportation projects made up the third component, comprising "appropriate risk allocation and risk sharing", "technical feasibility of the project", "favourable legal framework" and "transportation infrastructure needed" with factor loadings of 0.830, 0.723, 0.595, 0.594, respectively. These factors demonstrate the project's rationality and implementation ability, as demonstrated in the UK study by Li *et al.* (2005). The authors acknowledged that technical issues are among the most critical considerations in a PPP project, and favourable legal framework, project technical feasibility, appropriate risk allocation and sharing were termed "project implement ability factors". These variables were also considered necessary by participants in the qualitative strand. Technical issues are related to the partners' capacity, role and risk-sharing within the law and infrastructure needs. These views were exemplified in the following statements:

> *"Many developing countries, Zambia inclusive, do not have that required capacity in terms of technical know-how to undertake large infrastructure projects in the PPP based … there is capacity, but to handle infrastructure in the transport sector, there are definitely gaps in design and construction. To avoid challenges, there would be a need to look at the local requirements to ensure that the technical input and the technical capacity meet local requirements*" (P4).

Another participant emphasised the need for transportation projects to be provided in line with the demand or need for the project by the "would-be users":

> *"People at the end of the day should benefit from the project and people would want to make good use of it. For example, when you are constructing a route there have been instances where they have constructed a flyover like a walk pedestrian flyover, where is a pedestrian crossing the highways, you have a walkway where you can easily walk*

through, and usually, there has been problems with how to ply this flyover. Most of the flyovers are far away from people's residential area ... and so you should know where to position certain things so that at the end of the day, you will not be found wanting for projects not being used." (P3).

"The airport itself was growing at that time already, but there was a lot of people using road and rail transport and with the economic growth and development happening, people were going into middle class, and we were seeing the potential of those people starting to use air travel. Therefore, there was a need for that and we were trying to accommodate for that demand by providing capacity while ahead" (P5).

These comments may be related to locational characteristics, the spatial distribution of economic activity, and inequalities concerning travelling experiences, which influence travellers' use of a particular mode of transport (Okoro *et al.*, 2019; Yang *et al.*, 2020). Low demand for transport services affects the revenue accruable to transportation projects. Similarly, the revenue to a transportation investment can be influenced by the legal framework, another influential technical factor submitted by one of the participants:

"In terms of the legal framework, Acts and statutes allow you to recover revenue because you need to understand as you do the financial model whether the legal framework will allow you to recover your costs, declare dividends and pay them to a foreign entity like ourselves or go through tax loss. So we also looked at that in terms of when you do cash injection of equity, and when you then declare dividends, are the tax laws punitive so that what you get might be very much lower than what you anticipated." (P5).

The above views are consonant with extant literature. In the Portuguese context, the technical rationality of a highway project using PPP depended on the need for the project, favourable quality options, costs and benefits, and the legal framework given diverse and sometimes conflicting interests from public and private partners (Firmino, 2018). The term "technical factors" was also supported by Sanni (2016), which emphasised the importance of appropriate risk allocation and sharing at the initiation stage of the project and allocating to the best party capable of managing the risk and guided within a legal framework favourable to all parties involved. Further, the government's demonstrable commitment to the PPP model through consistent and transparent legislative and institutional frameworks can lower the risk of adverse changes that can reduce investor confidence and deter participation (EY, 2015).

Component 4 - Political and social factors

The "political and social" construct had "political support and stability", "social support", and "realistic cost-benefit" as the key success factors with factor loadings 0.671, 0.640 and 0.604, respectively. The qualitative arm of the study complements these findings, propounding that when there is political and public support for a PPP transportation project, which essentially depends on

the revenue from usage, the chance of success is higher. These views were exemplified thus:

> *"There is an issue with the World Bank project* [in Ghana] *where people are used to construct their rural roads. And first you need to talk to them so that they will be involved in it, and when you are constructing the project, then they are also part of it; they also take charge in terms of maintenance, and then you look at the longevity of that project… The people are the end-users of this facility. So, that is where they need to be engaged from the project's inception"… these people in the grassroots also have their own political wings and ideas and you need to bring them on board and get consensus with the political parties"* (P3).

> *"Government must demonstrate political will, even when there is a change of government. The government the concessions should still be respected and honoured by the new governments that are coming in"* (P4).

On the airport PPP project, *"given that we were a foreign company into another country, we needed the political support from that country to be able to operate successfully. And the fact there they were part of the BRICS relationship, already they were Presidential levels, and the identified economic benefits for both countries"* (P5).

However, this taxonomy was not congruent with the findings from the study by Li *et al.* (2005), in which social support failed to load on any component. This is probably because results may differ in developed countries' contexts. In the UK context, the authors deemed that political support may be more relevant to projects undertaken in developing countries. Nonetheless, the importance of social factors was emphasised in a Chinese study, which expressed that a PPP transportation project may be vulnerable from a social perspective because they involve human rights, labour, or environmental sustainability and can spawn public protest and social unrest (Yuan *et al.*, 2018). Likewise, commitments from the public sector, including members of the public could affect the development of the projects (Fombad, 2013). This view was also supported in Matsiliza (2016) in the case of the e-toll road project in Gauteng, South Africa, which experienced public opposition.

The importance of political leaders and the support of members of the public was also emphasised in Sanni (2016). For a PPP agreement to be properly implemented, managed, enforced, monitored, and reported on, mechanisms must be put in place to communicate with all the stakeholders, including the users of the intended infrastructure and/or service. Public opinion and support are key in implementing PPPs to ensure accountability (Fombad, 2013). Therefore, although the participation of the private sector in different forms is desirable to make resources readily available and encourage the delivery of higher quality and citizen-friendly services, attention to the project's social risks and the political championship is critical (Pârvu & Voicu-Olteanu, 2009).

CONCLUSION

The study set out to establish a taxonomy of CSFs for PPP transportation infrastructure projects by seeking the perceptions amongst South African construction and project management professionals within the built environment sector. The results from the descriptive (*ranking analysis*) and multivariate analysis (i.e., *factor analysis*) identified the topmost seven critical success factors in the order of the mean responses as follows: 1) Good governance; 2) Technical feasibility of the project; 3) Commitment of public/private sector; 4) Appropriate risk allocation and risk sharing; 5) Experience; 6) Performance specification/payment mechanism; 7) Transparency of procurement process and 8) Capable public and private partners. The result of the factor analysis was able to identify the four most important components: Partnership and procurement, economic and governance, and technical, political and social factors. These CSFs will help direct project teams' efforts to identify essential areas and leverage relevant resources to deliver projects according to intended objectives.

Conceptual and Empirical Contributions

The study's theoretical contribution is three-fold. The first stems from an explanatory sequential mixed-methods design where qualitative results from the second phase were used to explain the nuances behind the quantitative findings. The study's significant contribution is threefold: First, the study identified an ordered grouped set of CSFs and their contribution to successful PPP transportation infrastructure project delivery. Insights on how the CSFs unfold in a specific context in the selected developing countries were also revealed in the rich in-depth description, which is omitted in most studies.

Second, the study brings an emerging economy perspective that augments the developed country-dominated literature on PPP transportation CSFs. Aspects of organisational and historical contexts of PPP transportation project implementation were captured from the sampled developing countries. Therefore, the study extends knowledge on the desirable CSFs for transportation infrastructure projects in developing countries. Furthermore, as observed by Voordijk (2012), identification of the South African-related CSFs for PPP infrastructure projects provides an opportunity for reducing the western systems (i.e., CSFs for PPPs) and life world (South African specific). Further, studies have shown variations in implementing PPP between developing and developed counties (Cherkos & Jha, 2022). Therefore, investigating South African-specific CSF for PPP is important.

Third, the contribution is conceptual in nature and drawing from Schryen *et al.* (2015), literature reviews play an important role in the development of knowledge and offer a broad spectrum of potential contributions. Therefore, one of the principal contributions of this study is the synthesis of the 26 critical factors identified from the semi-systematic literature review into the taxonomy of four components. This classification or taxonomy provides deeper insight into the CSFs for PPP transport projects in emerging markets. Further, as acknowledged by Brown and Dant (2008), adding new knowledge through

the filling in of knowledge gaps constitutes a significant contribution to knowledge. Second, the principal contribution of this study is that it sheds light on the understanding of the insight into the CSFs for PPP transportation projects in emerging markets, which is a previously unexplored context.

Managerial and Practical Implications

The following managerial and theoretical implications that can be used by the stakeholders, practitioners, and governments in understanding the CSFs to the implementation of the infrastructure projects in developing countries and formulating policy are suggested: The managerial implication that emerged from this study is that these CSFs are perceived as partnership and procurement; economic and governance, technical; political and social factors. The identification and evaluation of the key CSFs would be used to advocate for both formal and informal capacity-building interventions and programs to provide adequate skills and knowledge in the management of procurement processes, technical skills in the allocation of risk allocation and risk sharing, and formulation of governance structures (amongst others). Most critically, infrastructure projects operate in varying and occasionally, volatile, and uncertain environments, and are prone to a range of risks (Chileshe & Kavishe, 2021).

The role of governments in facilitating PPPs and attracting the private sector is well acknowledged in the literature. However, as reported by Chileshe and Kavishe (2022), some developing countries have weak legal and regulatory frameworks for their contracts such as PPPs in infrastructure projects. Therefore, the findings reinforce the need for governments to revisit their policies around 'transparency in the procurement process' and having robust regulatory and legal frameworks. Governments in developing countries could as well leverage the identified CSFs barriers to develop plans and best practices aimed at improving the delivery of PPP transportation infrastructure projects.

Pertaining to practitioners, stakeholders, and policymakers, the findings can be used as a road map to successfully implement PPP transportation infrastructure projects in developing countries. The higher ranking of the factor of 'partnership and procurement' signals the need for practitioners and stakeholders to strengthen their capacity building in those areas and engage in regular discourse on ensuring the successful development and implementation of flexible and favourable contracts. Stakeholders can know which factors are most compelling to give top priority and resources to deliver sustainable transportation projects. Practitioners could use the findings to generate mechanisms and guidelines to improve PPP implementation's partnership and procurement aspects.

From the theoretical implications' perspective, as observed by Dale *et al.* (2019), to link the outcomes of science (knowledge) with policy and practice, some two-way interactions are required. Therefore, this could be achieved by developing some management frameworks which could be informed by the extracted four components of the CSFs as a taxonomy. Such frameworks could

be used as a roadmap for managing PPP transport projects in developing countries. The study has uncovered factors unique to developing countries that are critical in ensuring the success of PPP transport infrastructure projects. In addition to using these CSFs as a roadmap for the implementation of PPP projects, these factors should be incorporated into transport infrastructure policy development. Well-laid-out policies go a long way in enhancing confidence and attracting private sector investment in PPP projects, and as opined by Nguyen *et al.* (2020), recognising the CSFs is indispensable to ensure the success of PPP infrastructure project implementation.

Limitations and Suggestions for Future Studies

Whilst this study makes significant contributions in shedding light on our understanding of the CSFs needed for the successful implementation of PPP on transportation infrastructure projects in emerging markets, a few limitations and assumptions are acknowledged. First, the study assumes that for the implementation of PPP on transportation infrastructure projects in emerging markets to be successful, a taxonomy of CSFs should be established. Future studies could be longitudinal and assess the impact of the CSFs on case study projects monitored and reported over their life cycle. Second, the factor analysis was limited to considering the strength of association among the CSFs. Furthermore, this study is based on the perception of stakeholders including the private sector and government agencies in a PPP arrangement. The perception of the members of the public could be incorporated into future studies as PPP stakeholders.

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