

# Analysis of critical success factors for public-private partnerships in infrastructure development in South Africa

M. MASEKO  
*University of the Witwatersrand*

This project investigates critical success factors in public-private partnership (PPP) projects for infrastructure development in South Africa. PPPs provide governments across the globe with opportunities to develop public infrastructure through collaboration with private sector partners. The advantage for the public sector partners is that they are able to access resources they do not have in-house. PPPs also provide governments with opportunities to share risks with private partners. To ensure that PPPs are implemented successfully, an environment that is attractive should be created. The South African PPP environment is lagging behind those in the developed economies, although it is developing at a faster rate, and this is demonstrated by the results from this research in comparison to previous investigations.

The first projects using PPP approach were over 12 years ago, and were subject to a number of research studies such as Fourie (2008), Hlala (1999), and Ahwireng-Obeng and Mokgohlwa (2002). Critical success factors (CSFs) were investigated in these studies, and those factors were also tested in the current research to demonstrate how the environment has changed in South Africa. This research was therefore an exercise to test critical success factors applicable in both developed and developing economies for the South African environment.

The sample was therefore South African based, targeting individuals who had experience in PPP projects, both as participants and who work in sectors that have a strategic interest in PPP infrastructure projects. These sectors include energy, transportation, mining, and financial services. A survey questionnaire was distributed with sections that included demographic profiles of respondents, 20 critical success factors to be ranked on the level of importance and the last section requested respondents to respond to three open questions.

Three critical success factors were found to rank significantly higher than the mean, in terms of their importance: (1) project technical and financial feasibility, (2) strong contract management control to ensure contract compliance, and (3) a strong and experienced private consortium with technical strengths. These factors highlight a shift from the findings of earlier studies, in which external factors such as macro-economic factors or political stability were more important. The other key finding came through the open questions, where the respondents unanimously shared a view that PPPs are central to the future of infrastructure development in South Africa as they allow the government to overcome challenges such as skills shortage and budgetary constraints by using private sector resources.

The three factors clearly demonstrate that the South African environment shares similar challenges with those in developed economies. It is therefore a challenge for primary stakeholders in both the public sector and private sector to align their objectives and ensure that a feasibility analysis is conducted before committing to a PPP project, put a management system in place for the full project life cycle, and pay attention to screening processes when forming a consortium. These steps will ensure that the private sector has resources; both financial and technical skills to deliver the projects; and that the public sector sets clear objectives and is able to hold the private sector accountable, and prevent unforeseen escalating capital and operational costs.

## Introduction

The progress of South Africa as a thriving democracy continues to carry hopes and aspirations for many of its citizens, yet there still are questions raised about its economic and social trajectory. The country is currently facing some of its toughest challenges since the dawn of democracy in 1994. Its people continue to enjoy the benefit of freedoms through entrenched human rights protected by

the Constitution and the Bill of Rights. South Africa has regular elections and free media in a constitutional democracy. Despite these successes, uncertainty still remains on the horizon.

Ageing infrastructure is a major impediment to economic development. The infrastructure is incapable of sustaining economic growth, which has averaged 3% for the past 20 years. The country's infrastructure is further strained by

social development, which has seen a significant increase in the percentage of the population having access to electricity, water, and an enhanced quality of life.

According to the October 2011 census, 84.7% of South African households use electricity for lighting (up from 70.2% in 2001), 73.9% use electricity for cooking (up from 52.2%), and 58.8% use electricity for heating (up from 49.9%). There has also been a significant improvement in access to piped (tap) water in South Africa, with the number of households with no access dropping to 8.8% in 2011 from 15.6% in 2001.

Development of infrastructure has, however, lagged behind these economic and social developments, and this has created a massive backlog in the form of power generation, roads, and water reservoirs.

The development of infrastructure across the world remains the backbone of economic development. Public infrastructure is vital for economic development across a range of sectors, including power, transportation, water supply, telecommunications, oil, gas, mining, schools, hospitals, and military training facilities (Zhang 2005; Pillai 2008) impacting directly on the country's economic growth.

Infrastructural development is primarily the responsibility of governments, and when it is executed efficiently contributes to economic and social development.

Governments across the globe are, however, increasingly faced with constraints in delivering on their infrastructure development mandate and responsibility. These constraints are experienced by both developed and developing countries –in China (Jing-Feng *et al.*, 2010), India (Pillai, 2008; Gupta and Biswas, 2010), and the USA (Pagdadis *et al.*, 2008).

Gupta and Biswas (2010) classified the constraints faced by governments as financial, technical, and human resources. These constraints hamper the governments' ability to efficiently deliver services to their communities.

Financial constraints are boosted by escalating costs of construction, which may lead to uncontrollable budget deficits. Technical and human resource constraints lead to government having to face challenges of overcoming inefficiencies due to bureaucracy, corruption, sometimes outdated technology, and a shortage of skilled personnel (Miao *et al.*, 2003).

Governments across the world have turned to public-private partnerships (PPPs) as a means of delivery on infrastructure.

A PPP is a partnership that requires the involvement of both the private and the public sector. PPPs are seen as an alternative solution for efficient delivery of social infrastructure that is critical to economic development and sustainability in both the developing and developed worlds (Gupta and Biswas 2010; Siemiatycki 2010). PPPs are a solution to overcome financial, technical and human resources deficit by allowing governments to draw from private sector organisations for infrastructure needs for their societies (Banerjee, Oetzel *et al.* 2006).

PPPs are instruments whereby public sector risks and rewards in the delivery of a public service can be shared with the private sector (Bing *et al.*, 2005). However, they are not merely vehicles for relieving governments of their responsibilities; they are rather solutions that help governments to efficiently deliver (Zhang, 2005; Gupta and Biswas 2010) while retaining the ultimate accountability for the efficiency and cost of the public services. Governments therefore need to develop capabilities internally to be able

to assess and manage the role, strengths, and weaknesses in a prospective project (Forrer *et al.*, 2010). A government remains a partner or regulator in a PPP project for the entire project life-cycle, to ensure that public resources are used to the benefit of its citizens (Jamali, 2004), and that the project delivered at the end of the concession is in good condition for government to continue with the service. PPPs therefore require appropriate allocation and management of risks from both parties to avoid depletion and wastage of resources (Zhang, 2005). In South Africa, as in many developing economies, there has been a lack of resources and expertise in the initial period of PPPs. However, as the partnerships have matured, the processes have developed experience and expertise.

PPPs therefore present unique opportunities for social development. Among many benefits is the opportunity to build human capacity through skills transfer by strategic placement, in the hope that the government is able to build these skills while at the same time building and maintaining assets that require specialized skills and a budget that it does not have capacity for. In this way, the government leverages on the private sector's expertise and funding, and creates business opportunities for private sector companies, especially during economic downturns. This relationship therefore enhances social and economic progress, stability, and benefits society at large (Gupta and Biswas 2010).

Zhang (2005), however, cautions that the PPP approach presents alternative solutions with no guarantees of efficiency, and its success or failure is driven by methods of implementation and a complex combination of underlying factors. Those underlying factors are related to the environment, the participants, and the nature of the project.

### PPP challenges

When the government enters into a PPP arrangement, it is vital that benefit analyses are carried out, such as return on investment (RoI), access to funding, feasibility of the project, and access to private sector resources such as human expertise and technology, since they form the basis of need for governments (Forrer *et al.*, 2010). Failure to complete proper planning will lead to governments committing to projects with no prospects of success, and may lead to project delays due to lack of funding and resources. A government is a public entity and should act responsibly by planning properly before committing to projects, as society holds only government accountable (even in a PPP arrangement) so far as project and service delivery is concerned.

The implementations of PPPs have given rise to a number of challenges, with many expectations that are not met. Challenges are due to a combination of factors that need to be considered and managed during the project life cycle, and are compounded by the inclusion of multiple participants in addition to the inherent challenges in projects (Zhang 2005; Jing-Feng *et al.*, 2010). Some of the project factors listed by the authors pertain to cost, quality, schedule, management ability, and slow progress in the implementation of PPPs. Poor management of these factors leads to cost overruns, poor quality of products, and late delivery. Some of these factors lead to unforeseen increases in capital and operating cost or higher than expected service delivery and maintenance costs (Bender and Gibson 2010; Jing-Feng *et al.*, 2010).

PPPs have also come under criticism from civil society organizations, public interest groups, the media, and other stakeholders, due to the lack of trust in the role of the

private sector in public service provision (Gupta and Biswas 2010), especially among trade unions. In South Africa, a number of PPP projects resulted in increased tariffs, such as in the Dolphin Coast water supply project, where the tariff increase in some communities was 119% (Farlam 2005). Concerns raised by critics include tariff increases, layoffs, high procurement costs that deter small players, and faulty, rushed, non-competitive, and non-transparent application of PPP principles.

Countries are therefore often not clear about their expectation and objectives from a PPP initiative. In China, the private sector faced stronger challenges in the development and successful implementation of PPPs in the metropolitan transportation systems (MTS). This was due to reliance on the objectives set by the public sector, which tended to be inflated by social pressures and the need to justify investment of public funds (Jing-Feng *et al.*, 2010).

Moreover, both public and private sector organizations tend to lack public trust in most countries. This creates a challenge for multi-sector delivery of public services, hence the need for a balanced approach to PPPs, in order to meet public demands such as cost-effectiveness, risk sharing, innovation, reliability, timeliness, stakeholder participation, transparency, and security (Zhang 2005). In public management, accountability is a critical factor (Forrer *et al.*, 2010), hence expectation and targets should be realistic from conception to completion. Inflated expectations create pressures that can be unbearable for the PPP initiative.

The complex range of issues arising when public infrastructure is delivered through partnerships between the public and private sectors varies over the lifespan of the partnership (Siemiatycki 2010). It is therefore vital for implementation plans to be extended to the whole life of PPP projects (Jing-Feng *et al.*, 2009). Vital management controls also need to be in place for the lifespan of the PPP project, such as strong contract management control that ensures contract compliance (Bender and Gibson 2010). A common problem with projects in South Africa is that this function tends to diminish as the concession continues, due either to negligence or shortage of skills.

### Infrastructure and mining activities

South Africa's historical reliance on mining activities, has significantly diminished as the economy has become more diversified. Despite this increased diversification, mining still plays a vital role, in the country's employment provision both directly and indirectly, and in attracting foreign direct investment.

AngloGold sums up this contribution in the article Facts about Mining. The South African Treasury planned to spend about R845 billion on capital projects over the three-year period from 2012 to 2014. Eskom was due to spend R296 billion in this period, mostly on new power stations and improving the network and distribution infrastructure. Transnet was expected to spend R101 billion in the MTEF period.

These investments focus on the freight rail network, supports large capacity upgrades on the iron ore and coal export lines, acquiring modern rolling stock, and refurbishing existing infrastructure. The increased capacity would boost general freight and mining exports.

Critically, Transnet Rail Freight and Eskom infrastructure upgrades would be funded for by user charge fees paid by the mining companies during the 10 to 20 year period. Ultimately, all the capital and operating costs would have to be recovered from users. Given that mining accounts for

50% of Transnet Rail Freight's business over half the expected capital cost would be recouped from the mining sector. Similarly, with mining and smelting accounting for close to 40% of Eskom's business, the same cost recovery mechanism would play out in the electricity sector. This means that mining companies would in all likelihood pay about R50 billion of the Transnet Rail Freight's capital costs and R100 billion of Eskom's costs.

Mining in South Africa is concentrated in remote towns and is responsible for bringing development to those areas. This has a direct impact on the demographics of these areas, leading to increased population and increased strain on existing infrastructure.

Mining industry remains a key contributor to economic activities. However, the role of mining as a development agent for the wellbeing of society remains a vastly contested subject across the world.

The influx of migrant labour to regional centres inevitably increases traffic on roads, and places pressure on local infrastructure and utilities (Cheshire *et al.* 2014). Cross country trucking of mining resources often damages road infrastructure for heavy loads. Demand for housing and accommodation, education and health services is also increased in ways that local economies cannot sustain. Research conducted elsewhere (Australia) also indicates a higher incidence of social problems, such as relationship breakdowns, drug abuse and poor mental health in these centres as well as the additional demands that even transient workers place on a range of local infrastructure and services such as temporary accommodation, recreational facilities, health and allied services. Most mining companies do not consider some of these ills their responsibility (Cheshire *et al.* 2014).

In Australia, concerns are growing about the social impacts of mining expansion as they relate to housing and service provision; the capacity of local infrastructure to withstand increased demands; and heightened conflict over land use and resource allocation (Cheshire *et al.*, 2014).

In South Africa similar conditions are developing according to Ololade and Annegarn (2013). The population growth in mining towns is due to the influx of migrant workers coming in to the regions to avail themselves of the employment opportunities. Most of the shacks in these informal settlements lack basic services such as water and sanitation, and their residents are vulnerable to crime and disease. Most of the residents in the Rustenburg area, for example, make use of conventional pit latrines that are not connected to a waterborne sewerage system. There is no proper waste management programme in the area, and old borrow pits, with little or no proper management, are often used as domestic dumping sites. The state of the sanitation facilities reflects the general standard of infrastructure in the area and the extent of development.

A 2010 study showed that people from the Marikana area in Rustenburg were 'dissatisfied not just with mines but they also had no faith in the local municipality'. They perceive that the local government officials were 'not being effective in delivering essential public services and that most of the administration of the local government was conducted by migrant workers who were not acquainted with the needs and cultural values of the indigenes.

The need for collaboration of all stakeholders is critical for a lasting solution. PPPs present such opportunities for the mining industry to collaborate with government, communities, and local authorities in order to make a meaningful contribution to the areas they operate in. Such



contributions will ensure that mining lead to a sustainable economic environment that will continue to function even after mining activities have ceased.

### **Implementation of PPPs**

Implementation of PPPs for infrastructure development in developed and developing countries has yielded mixed outcomes. Successful implementation of PPPs has improved delivery of infrastructure and services, while poor implementation has led to project delays and cost overruns (Zhang 2005). For the successful implementation of a project, a positive government role is critical. The role of government in PPP implementation is to maintain a favourable environment for macro-economic stability, as financiers pay attention to macro-economic indicators. Furthermore, legal independence and predictability are important to provide guarantees for property rights. There is also need to ensure that procurement practices are transparent and competitive (Ahwireng-Obeng and Mokgohlwa 2002). The government should however be careful that its involvement is not perceived as interference.

To create a controlled environment, The South African government introduced the Municipal System Act (2000), which provided guidance for a municipality's involvement in a PPP. Although it gave municipalities the freedom to pursue PPP projects, it introduced a capping of tariffs in municipal services. This was viewed as government interference and therefore could have a negative impact on revenue generation from long-term concessions, and as a result financiers stayed away from the PPP projects while demanding the rectification of the law (Leigland 2003).

Many governments worldwide have played active roles in establishing and supporting PPP initiatives. In the UK PPPs were first introduced in 1992 by the Conservative Party government, first as a Private Finance Initiative (PFI) and later under a PPP policy (Bing *et al.*, 2005). This model was generally hailed for its success, and in many quarters it is the model adopted for the PPP initiative. Its driving factors have been investigated by many researchers and cost savings from projects carried through this method have been widely recognized (Bing *et al.*, 2004; Zhang, 2005). Projects carried out under this approach involved mainly large private sector players, and adequate resources and funding. A different situation is generally found in the developing economies.

In China, the state plays a significant role laying economic plans, and PPPs have for many years contributed to national and local infrastructure development by providing investments, advanced technology, and management skills (Jing-Feng, Skibniewski *et al.* 2010). The Chinese metropolitan areas have implemented PPP projects to close the gap in capital and lack of efficiency in project delivery (Yuan *et al.* 2010). Sewage treatment plants in the Long Tian and ShaTian townships of Shenzhen City are such examples.

PPPs in infrastructure development are increasingly becoming popular in African countries as well, with South Africa being the leader on the continent. In South Africa, the Nelspruit water and sanitation concession, the N4 toll road and Dolphin Coast water supply projects were the first long term concession projects (Kotze *et al.* 1999). Gautrain, the fast rail network linking two metros of Johannesburg and Pretoria, the Humansdorp District Hospital Project, as well as two privately-run prisons in Bloemfontein and Louis Trichardt are among the few examples of PPP projects undertaken in the country. In the Democratic

Republic of Congo the introduction of a water project in urban Brazzaville was hailed a success, with the biggest turnaround being water connections, the response time between lodging a request and installation of a water connection having improved to 48 hours, compared with 6 months to two years prior to the PPP initiative (Tati 2005).

India has also been active with over over 300 PPP projects 20 states, in sectors such as transport, power, ports, urban infrastructure, tourism and railways having been implemented. Government policy has created an environment, that led to a flow of private sector funding (Gupta and Biswas, 2010). Like South Africa, where the government established a PPP unit, the government of India has developed a scheme of support through the Ministry of Finance with a clear objective of driving costs down and efficiency up (Pillai 2008).

### **Critical success factors in PPPs**

PPP infrastructure projects are characterized by a combination of factors, such as the PPP experience and expertise of role players in terms of contract negotiations, company formation, and management. In addition, a broad range of uncertainties describes the environment around their application, particularly if the legal framework is not stable (Zhang, 2005). Three objectives are often recognized as critical; namely cost, time, and quality. However, there is also a host of other factors that contribute, and the combinations thereof have significant impact on the efficient allocation of limited resources of time, manpower, and finance (Chua and Kog, 1999; Zhang, 2005). These factors are measurable and form the basis for this research.

Even though PPP experiences are project- and country-specific, the public sector in all cases has the ultimate responsibility for the type of services or projects to pursue, and ultimately determines the time, quality, and cost requirements (Zhang, 2005; Xueqing, 2006). It is therefore vital that the public sector identifies the driving factors of PPPs that can be used as focal pointers for planning and implementation of PPP projects (Jing-Feng *et al.*, 2010). One of these is selecting the right private sector partner; 'the private-sector partner must have the necessary skills, experience, and resources to manage these risks and provide quality and cost effective facilities and services' (Xueqing, 2005).

### **Identification of critical success factors**

There are various methods through which critical success factors (CSFs) have been identified worldwide. These methods include interviews with experts in the field and studies of the literature on the subject. In this research study, literature has been used to identify 20 CSFs in Figure 1 to be analysed for the South African environment. These factors were tested against the perception of South African PPP practitioners and managers with strategic positioning to PPP.

### **Research methodology/paradigm infrastructure**

This section discusses the research methodology used to gather information and data for analysis. The methodology chosen was quantitative, using a questionnaire as a tool to gather data. In quantitative research, the researcher typically employs statistics to analyse the distribution of variables, and then draws explanations, patterns, and conclusions, using distributions to a certain degree of

Strong and experienced private consortium with technical strength (Bing <i>et al</i> 2004; Xueqing 2005);
Black economic empowerment requirement on consortium (Bender and Gibson 2010);
Involvement of Trade Unions (Tuman 2007; Bender and Gibson 2010);
Strong contract management control that ensures contract compliance (Bender and Gibson 2010);
Transparent and competitive procurement practices (Bing <i>et al</i> 2004);
Appropriate risk allocation through concessionaire contract (Grant 1996; Xueqing 2005);
Project technical and financial feasibility (Bing <i>et al</i> 2004);
Socio-political environment (Ahwireng-Obeng and Mokgohlwa 2002; Xueqing 2005);
Predictable independent regulatory and legal environment, (Ahwireng-Obeng and Mokgohlwa 2002);
On-time or early project completion (Jing-Feng <i>et al</i> 2009);
Transfer of risk from public to private sector (Xueqing 2006);
Project design and construction execution (Xueqing 2005);
Project revenue generation (Bender and Gibson 2010);
Concession Period (Xueqing 2005);
Benefits to local economy and strong public awareness (Xueqing 2006);
Ability of each participant in the consortium to raise funding (Hlala 1999);
Good quality personnel and stable management of consortium (Bender and Gibson 2010);
Unforeseen increase in capital and operating cost or higher than expected service delivery and maintenance costs (Bender and Gibson 2010; Jing-Feng <i>et al</i> 2010);
Stable macro-economic environment (Zhang 2005), and
Training and skills transfer (Jing-Feng <i>et al</i> 2009).

**Figure 1. 20 critical success factors**

probability (Smeyers, 2008). Data is generally numerical and is analysed through statistical methods to arrive at certain outcomes that can be interpreted to infer conclusions. Quantitative methodology tends to be based on predictive and randomized controls to ultimately arrive at certain conclusion (Koro-Ljungberg and Douglas, 2008).

The aim of this research was to determine the critical success factors in infrastructure development in South Africa, based on the cumulative knowledge and judgments of experts in the industry (Chua and Kog, 1999). A research approach was chosen with the aim of addressing the problem.

### Research design

A survey questionnaire was developed for this research that included open ended questions to draw more insight from the participants. The questionnaire was developed to quantify attitudinal constructs using a numerical scale of equal intervals (Stacey 2005). The questionnaire consisted of three sections, with section 1 enquiring about the demographics of the participants. Section 2 presented the main survey questions which included 20 questions that participants were required to rate each on a numerical scale. Section 3 included pre-determined questions for the participants to answer.

One disadvantage of the questionnaire method includes that biased interpretations often surface, where numerical scale allows two people with different inclinations to choose the same number regardless. The researcher has also already restricted the participants to a certain choice, thus partially influencing the outcome of the research, and the findings are then rather generalized in nature (Tucker *et al.*, 1995; Marecek *et al.*, 1997). Further disadvantages are that this method mainly presents a snapshot of what participants think, and the question structure channels the responses and therefore limits opinions. It is for this reason that Marecek *et al.* (1997) suggest that researchers should have the moral standard, authority, and responsibility, regardless of the method used to present data without prejudice, and avoid selective presentation, taking into consideration that they are essentially presenting the interests and perceptions

of the participants, who have inspired their research in the first place.

The advantage of this method is that it provides an environment for naturally occurring phenomena to be understood (Tucker *et al.*, 1995). It is easy to administer, with more controlled variables, and allows for holistic analysis using a statistical approach.

### Population and sample

#### Population

The population for this research was drawn from participants in various PPP projects in South Africa. They either are or have been involved in various public and private sector organizations responsible for the development of infrastructure in South Africa, or alternatively they have experiential knowledge in PPP. They have been employed by or consulted for private companies or the public sector in PPP projects at national or provincial levels. Other participants were public sector representatives in governmental departments and PPP units based at the South African National Treasury. Some research participants were drawn from project financing institutions. Furthermore, academics involved in PPP research were approached but no response was received from any. Lastly, it is important to note that individuals with high involvement, expertise and experience, in these various organizations were targeted for the research study.

#### Sample and sampling method

A statistical sample is a subset of the larger population, selected for study and should be representative, meaning similar to the larger population (Wolverton 2009). The sample for this research was purposefully small and reasonable flexibility was allowed as the research progressed to ensure maximum interaction and to also allow for maximum input from participants with managerial experience and with strategic roles in the PPP environment (Tuckett 2004; Zawawi 2007; Koro-Ljungberg and Douglas 2008; Padgett 2009). A sample was initially planned for specialized groups in the field, but it was broadened to cover multiple disciplines and was still considered reasonable and acceptable as reflecting expertise and experience of the population. The level of PPP implementation in South Africa is approximately 10 years.

The research sample intended to focus on experts and practitioners in PPP implementation, but this was broadened to include those whose fields do have some

Sector	No. of Participants
Law	1
Power	1
Municipalities	2
Procurement	4
Risk management	1
Financial systems	2
Project management	5
Economist	1
General management	1
Marketing	1
Project finance	2

interaction with PPP environment. PPP practitioners with maximum exposure to PPP project implementation were also targeted for this research. Arrangements were made telephonically and by email, with personal visits to potential participants in some cases to ensure maximum interaction and ensure that the best information was sourced. Table I shows the profile of the sample.

### The research instrument

To ensure that the participants were carefully limited in what they could do or say, structured questionnaires were used to provide only a few predetermined options for selection. However, to ensure that additional information was uncovered and the experience level of the participants was not suppressed, predetermined questions were added, and flexibility was allowed for other questions to emerge (Marecek *et al.*, 1997; Whiting 2008).

### Procedure for data collection

Potential participants were established through referrals and were profiled. They were then approached by means of a telephone call to request an appointment and introduce them to the research subject and to explain what would be requested of them. The questionnaires were sent through by email. Most of the participants preferred to send the questionnaires back without participating in an interview.

### Data analysis and interpretation

Data gathered through questionnaires was analysed using a data research approach called the normal distribution fitting algorithm. This approach, which was developed by Stacey (2005), was chosen because of the nature of the research. The research design was fundamentally based on attitudinal constructs from the sample, interpreting attitudes and perceptions. The responses therefore are inclined to be ordinal as opposed to interval-level data. In line with Stacey (2005). Following a view among researchers that response categories may be equally spaced, in order for the data to be quantified a continuous numerical scale was defined, associating numerical values to the ordinal responses: 'Strongly agree'=5, 'Agree'=4, 'Neutral'=3, 'Disagree'=2, 'Strongly disagree'=1.

The distribution-fitting approach used is an algorithm approach rather than an arithmetic approach and was found by Stacey (2005) to have superior accuracy and validity to other comparable approaches. The distribution-fitting approach 'estimates the values of the parameters (typically means and standard deviations) of distributions of underlying attitudes (for example normal or log-normal distributions) together with the attitudinal thresholds that would result in the best fit with the observed categorical response frequencies'.

$$f(x) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$$

(Stacey 2005).

The first step of the approach according to Stacey (2005) is to assign numerical values to ordinal data for numerical simplicity. Parameters of the distributions of responses are the mean ( $\mu$ ), standard deviation ( $\sigma$ ) and the threshold values (t-values). The statistical analysis begins with estimates of the means, standard deviations and the threshold values. The expected response frequencies for

each ordinal responses of the proposition were calculated. Then  $\chi^2$  value maybe calculated, and the algorithm approach determines the means, the standard deviations and the threshold values that minimize the value of  $\chi^2$ .

## Presentation of results

### Introduction

This chapter consolidates all the results obtained from the questionnaires that were received. In total 21 responses were received out the 47 questionnaires sent. This was a response rate of 45%. The response rate was high enough for the responses to be accepted as data for statistical analyses.

The questionnaire was structured into three three sections, with a total of 26 questions. The selections of questions over the various sections were spread out as follows:

- Section 1: Background Information – 3 questions
- Section 2: Critical Success Factors – 20 questions
- Section 3: Opinions – 3 questions

The first section gathered information pertaining to the demographic profile of the participants. The second section required participants to choose the best answer, based on given ordinal responses, by rating each question on the level of importance, of each critical success factor (CSF) on on a scale of 1 ('Strongly disagree') to 5 (Strongly agree). The last section required worded responses to three questions. The responses were the opinions of the participants on the subjects.

### Demographic profile of participants

The demographics of the sample are detailed below, by experience, sector, and province, working experience and field specialisation.

### PPP experience

The research sample differed from the initial profile that targeted experts with many years of experience in PPP projects, but it was broadened to include participants from across the industry, with a reasonable rated level of PPP experience. Section one of the questionnaire required the participants to rate their level of PPP experience, on a scale of one to five, with one being no experience, and five being highly experienced, and three being average. The sample experience profile is presented below. Of the participants represented; 38% were highly experienced, giving a combined experience level of participants in the survey of 62%. The plan was to have 100% of that experience.

The results of the survey are presented on Table II.

### Sector

In total 10 sectors were represented by the sample, representing a broadened range as opposed to specialised projects envisaged. The biggest representation in the sample came from finance, which was divided into two sectors, namely private sector finance and developmental finance. They collectively represented 34% of the sample composition. The rest of the sectors such as construction, consulting, energy and services had representation of between 10% and 15% of the sample. Mining, telecommunications, legal and defence sectors were the least represented with 5% each.



**Table II**  
**Results of Survey**

	Strongly disagree	Disagree	Neutralr	Agree	Strongly agree
Project technical and financial feasibility	0	1	0	11	9
Strong contract management control that ensures contract compliance	0	6	7	4	4
Strong and experienced private consortium with technical strength	2	6	4	8	1
Potential project revenue generation	0	2	1	7	11
Appropriate risk allocation through concessionaire contract	0	5	2	5	9
Transparent and competitive procurement practices	0	1	5	7	8
Unforeseen increase in capital and operating cost or higher than expected service delivery and maintenance	0	0	1	7	13
Project design and construction execution	0	5	7	5	4
Benefits to local economy and strong public awareness	0	1	10	4	6
Transfer of risk from public to private sector	4	1	4	7	5
Concession period or length of arrangement	1	4	2	7	7
Good quality personnel and stable management of consortium	0	1	5	10	5
Predictable independent regulatory and legal environment	0	3	1	8	9
Socio-political environment	0	2	7	6	6
Ability of each participant in the consortium to raise funding	0	3	3	9	6
On-time or early project completion	2	2	7	6	4
Black Economic Empowerment requirement on consortium	0	0	9	6	6
Training and skills transfer	0	1	7	6	7
Stable macro-economic environment	0	5	9	6	1
Involvement and cooperation with trade unions	2	2	9	5	3

### **Province**

Most participants came from Gauteng, which represented 86% of the total sample. KwaZulu-Natal, Mpumalanga, and Eastern Cape each had one representation, equivalent to 5% each. No questionnaires were returned from any of the other provinces.

### **Working experience**

Participants with between 10 and 15 years' working experience represented 57% of the sample. Generally, the bulk of the participants (81%) had at least 10 years' working experience, with the most experienced participant having 33 years of working experience. The average working experience of the sample was 13 years.

### **Field of specialisation**

The objective of the research was to seek to cover roles that are generally active in PPP set-up and implementation. The highest represented specialization was project management, representing 24% of the sample, followed by procurement at 19%. Project finance represented 10% of the sample, together with municipalities and financial systems. The least represented specialization fields were marketing, general management, power, and law.

### **Results discussion pertaining to propositions**

The data gathered through the questionnaires was ordinal level data. Stacey's (2005) distribution fitting approach that was used for analysis allows the ordinal values to be computationally rescaled to interval level data before

applying statistical analysis for normalization of the data.

Table III presents the results from the analysis showing the rescaled mean, standard deviation, threshold values and probabilities ( $\alpha = 0.05$ ), with the six survey items that are significantly more important than the mean and ranked highest highlighte.

### **Project technical and financial feasibility**

Technical and financial feasibility of a PPP project obtained the highest rank from the analysis, with 62% of the participants responded with the 'strongly agree' response to its importance level. In total, 95% of the participants were convinced that this was an important CSF.

### **Strong contract management control that ensures contract compliance**

The second highest ranking CSF had to do with strong contract management that ensured compliance from both the public and private partners. Fifty-two per cent of the participants 'strongly agreed' that this was an important CSF, contributing to a total of 85% that believed it important. 10% disagreed, with 5% opting for a neutral position.

### **Strong and experienced private consortium with technical strength**

The technical and financial feasibility of a PPP project was ranked highest, with the highest mean of 0.7343 and lowest p-value of 0. It is clear that in South Africa control of technical and financial risks is considered critical for

**Table III**  
**Normal DFA Results**

	$\mu$	$\sigma$	t-value	p-value	Rank order
Project technical and financial feasibility	0.7343	0.5647	5.9585	0.0000	1
Strong contract management control that ensures contract compliance	0.5774	1.0427	2.5375	0.0201	2
Strong and experienced private consortium with technical strength	0.4044	0.6867	2.6989	0.0142	3
Potential project revenue generation	0.3209	1.0238	1.4363	0.1672	4
Appropriate risk allocation through concessionaire contract	0.2963	0.8057	1.6853	0.1083	5
Transparent and competitive procurement practices	0.1648	1.3526	0.5582	0.5832	6
Unforeseen increase in capital and operating cost or higher than expected service delivery and maintenance costs	0.1451	0.7952	0.8362	0.4134	7
Project design and construction execution	0.1245	0.6287	0.9071	0.3757	8
Benefits to local economy and strong public awareness	0.0894	0.8591	0.4770	0.6388	9
Transfer of risk from public to private sector	0.0498	1.1848	0.1927	0.8492	10
Concession period or length of arrangement	0.0344	0.8272	0.1907	0.8508	11
Good quality personnel and stable management of consortium	0.0333	0.7096	0.2151	0.8320	12
Predictable independent regulatory and legal environment	-0.0368	0.7592	-0.2224	0.8264	13
Socio-political environment	-0.3097	0.8962	-1.5834	0.1298	14
Ability of each participant in the consortium to raise funding	-0.3342	1.0649	-1.4381	0.1667	15
On-time or early project completion	-0.3515	1.4375	-1.1207	0.2764	16
Black Economic Empowerment requirement on consortium	-0.3961	0.9410	-1.9290	0.0688	17
Training and skills transfer	-0.4769	0.9549	-2.2889	0.0337	18
Stable macro-economic environment	-0.4941	0.6284	-3.6032	0.0019	19
Involvement and cooperation with trade unions	-0.5752	0.9333	-2.8240	0.0108	20

success of a PPP project. A reason for this is the current challenges facing South Africa, skills shortages being one of them. Project management and technical skills are also currently scarce resources.

#### ***Strong contract management control***

The second highest ranking CSF was strong contract management that ensures compliance from both the public and private partners. South African PPP projects are inclined to be characterized by variations of scope as the project progresses, both justified and unjustified. Justifiable variations are driven by a lack of clear scoping at the beginning of the project, while unjustifiable variations are mainly a result of poor control measures in place during implementation, which leads to the contractor adding to the original scope. Both have a tendency to overrun budgets and time.

In a case study for the South African National Treasury PPP Unit, Bedener and Gibson (2010) reviewed a 30-year concession that has already been operating for 10 years. The contract management in the Mbombela (Nelspruit) Water and Sanitation Concession was in place at the beginning of the project, but it faded away with time. At the time that the case study was compiled, 10 years later when the municipality of Mbombela wanted to restore the functions of contract management, the challenge was skills shortage. It is clear from the Mbombela Concession that contract management is a critical success factor for the PPP participant to fulfil their side of the contract for the full length of a project.

#### ***Strong and experienced private consortium with technical strength***

Bing *et al* (2004), investigated CSFs for PPP/PFI projects in the UK construction industry, and found that a strong, experienced private consortium is among the three most important factors in the UK PPP/PFI environment. This CSF received a high ranking in this specific research study as well; being ranked relatively highest.

In South Africa, BEE legislation encourages companies wishing to participate in PPPs to include companies with BEE credentials to boost the empowerment ratings of the consortium. This often results in a company with little or no technical experience in the service required included in the consortium. Responses for this CSF suggest that companies need to select partners with a view to strengthening the consortium rather than weakening in by complying with the requirements of South African BEE legislation.

#### ***Training and skills transfer***

The CSF that emphasized transfer of skills was ranked 18th, with 14% of the respondents strongly agreeing that it was important. This is interesting, as training and skills transfer are high on the South African Government's agenda, when it motivates the importance of PPP initiatives. The international studies did not rate this factor higher either; instead they reflected PPP private sector skill as leverage that governments uses to become efficient.



### ***Stable macro-economic environment***

The ranking of macro-economic environment at 19th was also a surprise, mainly because foreign investors tend to worry about the stability of the macro-economic environment in African countries. From the South African perspective, this is a positive feature and a sign of a maturing economy. That the macro-economic environment is not considered an important critical success factor illustrates that participants are least concerned about stability.

### ***Involvement and cooperation with trade unions***

The lowest ranked CSF was participation or cooperation with trade unions within the PPP approach. This was not surprising, as the sample profile represents people placed higher up in the management hierarchy, who often find trade unions to be an irritation rather than an added value. The concern, though, is that even though the findings are in line with international studies, South Africa has a strong trade union movement with close ties to the government, and projects are often delayed as a result of strikes and poor employee relations. The research findings suggest that little attention is paid to ensuring that trade unions are involved to create cooperation, especially in PPP projects.

### **Results from open questions**

Three open questions were posed to the participant in order for the researcher to gain more insight from their experience.

The first question was whether there were any other CSFs that participants would have added to the list of 20 compiled factors. The second requested the participant to suggest any major problems, shortcomings or low points in South African PPPs, and to state whether they attribute these shortcomings to public or private organizations. The final question solicited the participants' view of the future of PPPs in South African infrastructure development.

### ***Other CSFs***

Participants suggested a total of 13 factors they considered critical, which are as follows:

- Risk transfer can be mitigated rather than transferred
- Opinion on the legitimacy and honesty of PPPs, especially with regard to corruption, should be measured
- A measure of PPP governance should be addressed
- PPP tends to receive much more high profile (political and community) support and in most cases the BEE element is satisfied by politically aligned partners
- Counter-trade agreements on projects beyond a certain financial threshold especially for those that cross borders
- Stakeholder management and strategy
- Intellectual Property management strategy, including skills and technology transfer
- Utility quantification strategy or business case
- Conducive environment, based on acceptable best practices, for PPP in both private and public sectors to thrive
- PPP alignment with government policies
- Political Leadership that ensures willingness and readiness to drive projects to completion
- Critical stakeholder management system to identify and manage issues and concerns that may impact the project

- Job creation must be one of the key drivers for PPP
- Adequate skills on the public side are essential
- Differences in incentives between the private and the public sector members in a consortium
- Reduced autonomy for the technical specialists
- Difference between political allegiance and commitment to technical competency, given that the public sector struggles to attract the right kind of skills.

### ***Major challenges in the South African PPP environment***

Addressing the question of shortcomings in the South African PPP environment, participants had a number of opinions based on their experience:

- Capacity and understanding of the process is still a major problem that faces South African PPP projects
- PPPs in South Africa are underutilized as a vehicle for infrastructural development. PPPs have been badly publicized and have created suspicion across broader society. Even though the primary objective is shared between both the public and private entities, synergies are polarized with regard to other objectives, such as skills and social responsibilities
- There are still problems in the process of concluding the legal transaction, and finalizing the government's stake is inclined to take too long
- Local government and provincial government lack the capacity to identify potential PPPs or to create PPPs even on pure public service responsibilities
- Poor negotiations, driven by fraud and corruption; lack of strategy and vision; poor or nonexistent intellectual property management strategy and lack of skills and technology transfer; lack of quality or skilled personnel, an uncondusive environment; lack of decisive transformation; and too much biased political influence are still prevalent problems
- Clarity on the part of government in terms of principles governing PPPs is still lacking. Objectives and expectations are not clearly set out at the conception of a project. Apart from PPPs in road infrastructure development, there is a question of the availability of capacity within the country to run successful PPPs
- Inefficient state-owned enterprises that have a monopoly on particular services are a stumbling block. Eskom is the classic example. The law must be changed to ensure more PPPs are prioritized to provide security of electricity supply for South Africa
- The three challenges mentioned earlier are salary disparities between the public and private sectors, reduced autonomy for the technical specialists in the public sector, and negative political interference. Lack of transformation in the private sector as well as unwillingness to transfer skills also have a negative impact.

### ***The future of PPPs in South Africa***

Participants were requested to share their view on the future of PPPs in South African infrastructure development. They responded as follows:

- Both the public and the private sector have accumulated considerable experience, and with the government seeking more involvement in various sectors of the economy, PPPs will continue to be a huge imperative for the broader economic development in South Africa
- There are emerging trends of non-political locally

based PPP participation. This would lead to increased stability in the external project environment

- The simple answer is that PPPs will have an important, perhaps critical, role to play in the infrastructure development in South Africa. One just has to note the success of World Cup infrastructure development, the Gautrain, and many other examples to accept that when the public and private sector work together to deliver on projects execution, gains and delivery are much easier. Also, PPPs somehow unite the nation
- PPPs have a place in South Africa and if government is to deliver on the much-needed infrastructure, there needs to be a great deal more effort put into ensuring that the country establishes working PPP models and this has created suspicion across broader society
- PPPs are here to stay, given the huge capital funding requirements for many infrastructure development projects. Government alone is not able to deliver, as it has many competing needs and limited resources. On the other hand, for business to thrive it needs good infrastructure, such as telecommunications, transportation, water and sanitation, and energy infrastructure. It is therefore imperative for both government and business to work together in infrastructure development as they both are the beneficiaries of good infrastructural environment.
- With current projections and the need for accelerated growth, PPPs will become the future of delivering services in South Africa. The reputational risk, though, is if PPPs are seen by the public or trade unions as a means of privatizing public services or enriching the private sector, who cannot risk their investment without a government cushion and guarantees of shared risk
- The future of PPPs looks poor at this stage. If adequate controls, mechanisms and governance are put in place, the future of PPPs can be turned around.

### Summary of the results

The results represent the outcome of a survey conducted over a period of six months among experts, practitioners, and strategic stakeholders in PPP projects in South Africa. The results from the survey provided data for demographic profiling of the participants and for ranking the importance of critical success factors that were drawn from the literature.

Participants also had the opportunity to express their opinions on the subject.

The research results have drawn attention to the maturity level of the PPP environment in South Africa. They have brought to light some of the factors in the PPP environment through ranking of critical success factors and suggestions from participants. PPP stakeholders are able to use the information developed to pursue PPPs with a broader perspective. Firstly, it has been clearly suggested that PPPs should be consolidated into future policy, but measures are needed to sell PPPs to the public as economically viable, and as alternatives to solve the infrastructure backlog in South Africa.

The government has an opportunity to ensure a stable environment, with competitive and transparent procurement processes. This will go a long way towards ensuring success for PPPs in South Africa and creating an attractive environment for both local and foreign investors. The crucial factors that came out in South African PPP environment are human resources and funding. Skills are

scarce in the current cycle of development, and creating professionally managed projects will ensure that skills can be attracted to the PPP space.

### Conclusions

The chapter draws conclusions from the research work and results, and is followed by recommendations for the various stakeholders. The research study is finally concluded with suggestions for future research.

A Ahwireng-Obeng and Mokgohlwa (2002) suggested that South African PPPs differed from global PPPs in a number of ways, due mainly to the wide experience gap. However, they suggested that in the future this could be different as most of the issues in their findings were transitional. In their findings, market, socio-political, regulatory, legal, financial and development factors were high on the agenda of most people.

With the exception of finance, the factors above were ranked relatively lower on the list as opposed to capability factors, these being those that reflect the ability of the consortium to deliver the project successfully. The study by Ahwireng-Obeng and Mokgohlwa predicts correctly that the PPP environment will mature in the future. The fact the socio-political factors are ranked lower than others is evidence of the changing dynamics in the South African environment.

The experience gap seems to have shrunk, with the South African PPP environment having become more active and sophisticated. Challenges in PPP projects tend to be internal, such as those affected by project type, the composition and capabilities of the consortium, as well as management controls. These challenges are of a global nature, hence the assessment of the PPP environment in South Africa shows that it has matured. Neither the comments from the participants nor the responses to the questionnaire placed higher emphasis on factors such as political or macro-economic stability, alluding to a view that the South African environment is competitive and conducive to PPP projects implementation.

### Recommendations

The study has sought to provide guidance to stakeholders interested in pursuing PPP infrastructure projects in South Africa. The primary stakeholders are the government or public sector representatives, and the following recommendation are put forward:

- Adequate feasibility analysis including technical capability and availability of funds should be conducted before any PPP projects are approved for implementation
- Negotiating and contract management skills should be sought by the public sector to ensure that contracts benefit the public sector and provide protection against abuses that can be perpetrated by participants in PPP projects
- The criteria for selecting a private partner should prioritise experience, and capability to deliver projects on time, within budget, with the required quality controls
- Procurement and sourcing of private partners should be transparent and competitive to ensure that the costs of developing infrastructure are competitive
- Objectives need to be clear in order for variations to the initial scope to be avoided. The public sector organization should ensure that it has the technical

resources to conduct a feasibility analysis, to draw up a detailed scope, and that all legal requirements have been fulfilled before the project goes into implementation

- Projects that are carried out with a PPP approach should be viable for revenue generation without excessive tariffs being applied during operation, therefore causing a public outcry which sends a negative sentiment to foreign investors as was the case with the Johannesburg and Pretoria toll fees in 2011. Recommendations for private sectors organizations that desire to participate in PPPs for infrastructure development in South Africa are as follows:
- The private partner should ensure that they have adequate human and financial resources, and that they understand the public sector requirement in order to prevent unforeseen increases in capital and operating costs while the project is underway, as this creates a negative image for PPPs
- Stable management is important for private sector partners in a PPP project, to provide predictability and stability.
- The BEE component is a strategic factor for the government goal of diversifying the economy and empowering certain sections of society, therefore private partners should put an effort in screening for the right BEE partner who has both the financial and the human resource capacity, to ensure that their choice adds value.

Recommendations to foreign organizations that desire to participate in PPPs for infrastructure development in South Africa are as follows:

- The South African PPP environment is growing and maturing. The macro-economic climate and political stability are no longer priorities, but skills, management control, and project type are very important factors. Recommendations to academics and students who want to participate in PPPs for infrastructure development in South Africa are as follows:
- Factors such as BEE, job creation, and trade unions which are important to the public sector are not necessarily as important to the private sector. This creates a misalignment for primary partners in PPPs, and research is recommended to find methods that will align these stakeholders.

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