INFRASTRUCTURE DEVELOPMENT WITHIN A REGULATED ENVIRONMENT: CONCERNS FOR REGULATORS

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Abstract

Poor delivery of infrastructure leads to inefficient pricing of these assets, which is passed through to consumers. Inefficient pricing is caused by a poor selection of a funding and financing method as well as project overruns. This article used a case-study approach to investigate if South African (SA) infrastructure projects were executed efficiently. It was found that the procurement method was not a reason for inefficient infrastructure delivery. Further, SA projects overran significantly by between 5 and 58%. The case of Transnet's pipeline project was highlighted. Two case studies (Gautrain and e-tolls) are presented to highlight issues around funding. It was found that the user-pays mechanism of funding is efficient only if there is complete transparency and communication between the user of the infrastructure and other stakeholders. Given the findings, this paper ends with policy recommendations for regulators of utilities that will ensure that consumers are protected.

Keywords:

Allowable revenue, Regulated Asset Base, Weighted Average Cost of Capital, project overruns, financing, funding

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1. INTRODUCTION

"Infrastructure refers to all basic inputs into and requirements for the proper functioning of the economy" (Mutheiwana, 2014:1). Examples of infrastructure include telecommunication, bridges, schools, roads, transport, ports, electricity, piped water supply and sanitation. According to Mutheiwana (2014) infrastructure development and management are crucial for efficient development within a society, and are the cornerstone of socio-economic development. For this reason, a country needs to invest in infrastructure.

Developing economies such as South Africa's typically suffer from an under-investment in infrastructure. The infrastructure deficit in South Africa is currently estimated at R1.5 trillion (Paton, 2013). South Africa's critical infrastructure needs are in part the outcome of two decades of underinvestment (National Treasury Budget Review, 2012:92). Public infrastructure spending tailed off from the early 1980s. However, from the mid-1990s, government began to increase capital spending, with a sharp rise after 2003 as the South African government's fiscus allowed it to do so (DBSA, 2012).

South Africa's infrastructure spend has been increasing since the 2003/04 Medium Term Strategic Framework. Furthermore, investment in infrastructure is also done through the fiscal power of the government as demonstrated through the New Growth Path (Department of Economic Development, 2010). It accounted for just less than 8% of GDP in the 2012/13 fiscal year (Department of Economic Development, 2010).

FIGURE 1 provides a breakdown of South Africa's public infrastructure spending. Expenditure mostly emanates from non-financial public enterprises such as state-owned enterprises (SOEs) (with Eskom and Transnet accounting for the largest proportion), followed by provincial and local government. SOEs in South Africa provide crucial services to citizens. For example, Eskom provides electricity to its users. Therefore, infrastructure spending is vital to ensure that the demand for electricity is met.

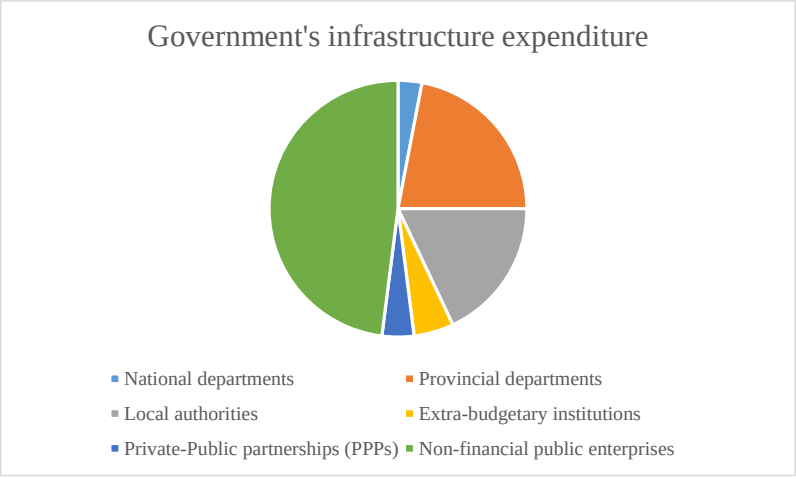

FIGURE 1: Government's infrastructure spending (2011/12 fiscal year)

Source: *National Treasury (2012)*

There are two crucial components to achieving successful infrastructure implementation. The first is attracting investment in infrastructure, which South Africa has done through the New Growth Path and the Medium Term Strategic Framework. The other crucial element is good governance. Kenny (2007) argues that "Governance is central to development outcomes in infrastructure." Hence the capacity to plan and execute infrastructure projects looms large as a determinant of their successful implementation.

Successful implementation of infrastructure rests on the state's ability to (Kenny, 2007):

- Collect tax and user charge revenue: This determines the resources available for infrastructure investment;
- Achieve allocative efficiency, which in turn depends on the state's capacity for integrated planning across different infrastructure sectors;
- Achieve efficacy in the way that programmes are implemented and delivered to the targeted beneficiaries (including the management of public finance, procurement, processes, contract management and effective monitoring of state-owned enterprises (SOEs)); and
- Ensure effective oversight and regulation of public and private entities that provide infrastructure, and associated services.

Notably, each outcome relies on the strength of the public institutions tasked with implementing them. If any of the four capacities are inadequate, infrastructure delivery will be compromised (Kenny, 2007).

From a theoretical perspective, inefficient infrastructure delivery, particularly from SOEs, leads to inefficient prices of the asset in question. Crucial to the pricing of these infrastructure assets is the Allowable Revenue (AR) model, which allows capital expenditures (CAPEX) for infrastructure to reflect in the SOE's asset base (AER, 2011). The institution is then able to recover its CAPEX outlay by being allowed a higher revenue, through charging higher prices. The asset base of the institution will be inflated the higher the CAPEX allowed. If the CAPEX is inflated due to imprudent costs, consumers suffer due to higher prices (AER, 2011). Two reasons for imprudent costs by an infrastructure implementing institution are:

- An inability to select a financing (procurement) and funding method which minimises costs; and
- Project overruns associated with large infrastructure projects which require additional CAPEX.

Here financing refers to the way in which money is raised to pay for the construction and/or maintenance of an asset (Deloitte, 2012) and funding refers to the way in which the asset will be paid for once it has been procured (Deloitte, 2012).

A thorough investigation is therefore needed to determine whether infrastructure projects are being efficiently implemented. This is needed to ensure that South Africa is succeeding in closing the infrastructure gap and that users of the infrastructure are paying efficient prices. This investigation will be done by means of case studies of South African infrastructure projects by looking at the efficiency of infrastructure investment on two levels:

- Through the financing (procurement) and funding methods used for infrastructure projects; and
- Project overruns associated with the infrastructure projects.

The paper is therefore organised as follows: section 2 provides a literature review. This section will discuss the importance of infrastructure in an economy. It provides the competing financing and funding models that could be used by institutions when implementing infrastructure projects. The section will end with a discussion on project overruns, which negatively affect successful infrastructure implementation. Section 3 explains how infrastructure costs are recovered by explaining the pricing of these assets. The allowable revenue is discussed in detail and will highlight the importance of optimally choosing a financing and funding model as well as avoiding project overruns so as to ensure efficient pricing. Section 4 presents case studies of infrastructure projects in South Africa to investigate whether the projects were successfully and efficiently implemented. Section 5 presents concludes with recommendations to policymakers based on the findings in section 4.

2. LITERATURE REVIEW

2.1 Importance of infrastructure within an economy

In an attempt to highlight the relationship between state investment in infrastructure and economic growth, Kessides (1993) provides empirical evidence from across the world on the requirements for effective state investment and delivery of infrastructure. He draws the following conclusions:

TABLE 1: Benefits of infrastructure

Outcome	*Reason*
Infrastructure contributes to economic growth	Diversifies the economy Provides access to modern technology
Infrastructure raises the quality of life	By creating amenities for citizens
Infrastructure develops economic potential	Where other inputs (labour and capital) in the production process become more productive
Infrastructure improves the macroeconomic climate	Due to efficient resource allocation
Infrastructure facilitates economic demand considerations such as service prices and demand elasticity	Reliability of services for users Quality of services for users
Efficient infrastructure ensures user charges that reflect supply and demand conditions and non-market externalities as far as possible	To ensure infrastructure will be more economically efficient and favourable to the environment.

Source: *Kessides (1993)*

Each of the benefits in TABLE 1 are realised only when the state has the capacity to deliver and effectively maintain infrastructure.

The next section will provide financing and funding options available to institutions investing in infrastructure. Due to the complex nature of infrastructure projects, model selection must be done with caution and must meet the requirements of the project at hand.

2.2 Financing options available when investing in infrastructure

2.2.1 Public finance

Public financing of a project refers to the financing of a project from the government's budget. Governments could raise finance for public infrastructure projects in several ways, namely (National Treasury, 2001):

- Government could issue debt (borrow), but may also contribute its own equity;
- A sovereign guarantee is given by governments to lenders to repay all funds borrowed. The problem with this is that it reflects as a liability in the government's balance sheet and that may increase government's borrowing costs in future, and
- Governments could raise funds through taxation.

However, many governments have realised that this approach is no longer sustainable as it creates highly leveraged government balance sheets given the ever-increasing needs for new and better infrastructure (National Treasury, 2001).

2.2.2 Public-private partnerships

The relationship that is formed between the public and the private sectors when procuring an infrastructure asset is called a public-private partnership (PPP) (Grimsey & Lewis, 2005). PPPs can vary significantly in terms and structure. TABLE 2 below gives a summary of the different PPP models employed around the world.

This form of financing is now common in many countries both in the developing and the developed world. It is seen as a superior alternative to other financing methods, as both governments and the private sector share the risks involved (Calitz & Fourie, 2007). The advantages and disadvantages of PPPs are listed in TABLE 3 below:

TABLE 2: Public-private partnership models

Contract type	*Specifications*
Service contracts	The private sector procures, operates and maintains an asset. The public sector bears financial and management risks.
Operation and management contract	The private sector operates and manages a publicly owned asset. The public sector bears the financial and investment risks.
Leasing-type contracts • Buy-build-operate (BBO) • Lease-develop-operate (LDO) • Wrap-around addition (WAA)	The private sector buys or leases an existing asset from the government, renovates, modernises, and/or expands it, and then operates the asset.
Build-Operate-Transfer (BOT) • Build-own-operate-transfer (BOOT)	The private sector designs and builds an asset, operates it and then transfers it to the government when the operating contract ends. The private

Contract type	*Specifications*
• Build-rent-own-transfer(BROT) • Build-lease-operate-transfer(BLOT) • Build-operate-transfer (BOT)	partner subsequently rents or leases the asset to the government.
Design-Build-Finance-Operate (DBFO) • Build-own-operate (BOO) • Build-develop-operate (BDO) • Design-construct-manage-finance (DCMF)	The private sector designs, builds, owns, develops, operates, and manages an asset with no obligation to transfer ownership to the government.

Source: *Compiled by authors from different sources*

TABLE 3: Advantages and disadvantages of PPPs

Advantages	*Disadvantages*
Ease the strain on government's balance sheet.	Transaction costs associated with PPP contracts are normally high and this discourages many small potential service providers from participating in the bidding process.
Introduce competition when bidding for infrastructure projects takes place.	Lack of a well-developed capital market can limit the development of a viable PPP market.
Restructure the public sector service by embracing private sector capital and practices.	Inappropriate risk transfer raising the perceived risk to investors, and resulting in a high cost of capital.
Achieve greater efficiency than traditional methods of providing public services.	PPPs hinder accountability, as PPP costs to the government are not reflected on the government balance sheet.

Source: *Compiled by authors from different sources*

2.2.3 Corporate finance

Under this financing method, project sponsors will generally use their own credit to raise funds. This approach works better if the project is small in size, shorter and less capital-intensive. The company pays for the construction of the project from its own balance sheet. However, as with public financing above, private companies avoid this option, as it results in strained balance-sheet capacity, and limits their liquidity should they decide to participate in potential future projects (National Treasury, 2001). The observation in South Africa is that many SOEs make use of this type of finance and as a result have strained balance sheets. They then rely heavily on the government for additional finance, and recover higher costs through higher prices.

The repayment of the debt used to finance the asset has to be made within a short time period, while the asset will continue to provide the service for a longer period, thus putting unnecessary pressure on consumers. Subsequently, the utility is forced to ask for a higher tariff, as the

repayment of the asset is spread over a shorter time period than the asset's lifespan. This problem is also encountered in PPP projects (National Treasury, 2001).

2.2.4 Competitive bidding

The basic idea of competitive bidding starts with some pre-qualification of bidders based on financial and technical criteria that reduce the number of bidders, but at the same time lower the risk of non-compliance by potential bidders (Mundhe, 2008). This form of procurement is associated with competition among suppliers. After specifying important parameters (technical and non-technical), the shortlisted bidders are asked to bid on various factors depending on the nature of the project (Mundhe, 2008). The supplier who meets crucial criteria (for example: lowest amount) wins the bid. The most obvious feature of this model is competition for the market, which drives down prices.

The competitive bidding approach is usually associated with engineering, procurement and construction (EPC) contracts. In an EPC contract, contractors are obliged to turn over a full facility to developers – i.e. the completion of the facility is guaranteed at a fixed price and date. This implies that contractors absorb all the risks, and that failure to meet any contractual obligations results in monetary liabilities incurred by the contractor (Cliffe Dekker Hofmeyer, 2012).

As attractive as this may seem, infrastructure projects are too large a risk for contractors to undertake. Therefore they are associated with simple project structures. For instance, these contracts are applied to projects which are easy to design, with little uncertainty about what needs to be produced, and are accompanied by high levels of design completeness (Bajari & Tadelis, 2006). In contrast, complex projects, which leave scope for project incompleteness, ought to be procured using cost-plus contracts (at the original cost plus any extra expenses incurred should there be any unforeseen expenses not included in the contract), and should be awarded through negotiation with a reputable and qualified supplier (Bajari & Tadelis, 2006). The reason for using competitive bidding is that the procurer can avoid the costly and wasteful renegotiation that follows requests for changes in the project. Thus, while competitive bidding does have the advantage of unbiased awarding of projects, it fails to respond optimally to factors not included in the contract, which have the potential to escalate costs (Bajari & Tadelis, 2006).

Each of these procurement methods must recover the cost of financing. Generally this is recovered from an end user through funding. If these costs are not recovered, this contributes towards a financing failure of the infrastructure project. Therefore a note on funding is provided.

2.3 Funding options available when in infrastructure

Once the infrastructure project is commissioned, funding comes either from the consumer, through the user-pays principle, or from the tax base (Deloitte, 2012). The term 'user pays' refers to charging customers a price that reflect the costs of providing the goods or services. It ensures efficient markets by linking producers and consumers (Fine & Chalmers, 2000). This means that both the producer and the consumer are responsible for ensuring efficient markets. Producers must charge prices which reflect appropriate costs, and consumers will benefit from the good/service provided at fair and efficient prices (Fine & Chalmers, 2000). The user-pays

principle also ensures fairness, as only users who use the infrastructure pay for it. This means that individuals who cannot afford it are excluded (Fine & Chalmers, 2000).

Funding from governments comes from paying off the asset from the fiscus. In most cases this places strain on governments' balance sheets (Deloitte, 2012). There are also competing development goals which governments should consider for the economy and money from the fiscus is allocated to more urgent objectives. This type of funding also becomes problematic when financing is done through PPPs, as private investors require higher rates of return, which the fiscus cannot support. Therefore the user-pays principle is deemed the most efficient (Deloitte, 2012). However, clear communication must be made to users of infrastructure assets and there must be willingness to pay for use of the asset. It becomes problematic for regulators, private investors and governments if the user refuses to pay for the infrastructure.

Infrastructure projects are large in nature and therefore have a long timeframe. There is a high probability that these projects incur both time and cost overruns. The next section discusses project overruns in detail.

2.4 Project overruns

Logically, any delay in implementation in itself will cause cost overruns for a project. There are two main types of costs that economists speak of: variable costs and fixed costs. Infrastructure projects will incur both. With regard to the former, since infrastructure costs are estimated for the planned duration of the project, should there be any time delays, there will be inflationary consequences and, accordingly, construction costs will increase (Singh, 2009). With regard to the latter, certain overhead and input costs have to be met as long as the project remains incomplete; such costs include salaries and wages related to extended time of construction (Singh, 2009). Project overruns are associated with both cost underestimation and time delays. They are common in most projects, irrespective of the means of procurement. A study conducted by Allen (2001) in the United Kingdom revealed that project cost overruns are experienced in both publicly and PPP-procured projects. He compared six projects, three procured through the traditional procurement method and the other three procured through PPPs. The traditionally procured projects overran by between 31 and 214%, while the PPP-procured projects overrun by between 60 and 600%. This is an indication that the financing method used for a project is not the only factor that influences a project's success. For this reason cost overruns must be analysed and understood when infrastructure is being financed. Allen (2001) found that when an infrastructure project is procured through public finance, cost projections tend to underestimate the project risks, and, as a result, budgets for major projects have sometimes been prone to optimism bias. With regard to PPP-procured projects, the cost overruns were mainly due to inflation increases and public sector procurers changing the project scope (Allen, 2001).

There are a number of reasons for project overruns. The following section discusses these reasons in detail.

2.4.1 Reasons for project overruns (time and cost)

Project overruns are caused by many factors, some of which include changes in project scope, changes in the economic environment, political factors and poorly written contracts, among other things (Singh, 2009). International evidence indicates that cost overruns occur in approximately 73% of infrastructure projects (Dahdal, 2010). Most of the cost overruns are a

result of poorly written contracts, especially in PPP projects. However, even if the PPP contract is well written, governments can still initiate changes in the project scope (Allen, 2001). Given the private sector's bargaining power, it will lobby for increased costs. Subsequently, governments have to allow this, because changing the contractor is more costly once the project has started (Hart 2003). Other reasons for project overruns include (Singh, 2009):

- Technical reasons:
  i. Excusable delays (due to force majeure), such as contractual issues. These include planning and design deficiencies such as incorrect estimates of work quantities.
  ii. Non-excusable delays (contractual issues), due to unforeseen circumstances. These include site conditions (which differ from the contract document), materials, equipment, and labour-related delays, which are the major cause of contractors' performance delays.
- Political reasons: When project planners misrepresent timescales as well as cost/benefit projections in order to win political favour for the project and get it started. The principal-agent problem explains that this arises because funders of infrastructure projects (users/taxpayers) have limited information about the project because they are separated by a chain of intermediaries, including contractors, consultants, local government departments and national bodies.
- Optimism Bias: Is the tendency to be overly optimistic about cost estimates, completion times and risks. If this occurs, the contractor eventually fails to achieve the perceived benefits. To correct for optimism bias one needs to understand the technical and political reasons for project overruns and perhaps adopt more accurate forecasting (Kahneman, 1979, 2003; Kahneman & Lovallo, 1993).

3. INFRASTRUCTURE PRICING: ALLOWABLE REVENUE MODEL

Allowable revenue (AR) is an important factor for regulated entities, such as SOEs, as it hugely influences the amount of revenue that a regulated entity is to receive as determined by a regulator (AER, 2011). A tariff decision of regulators is normally based on the amount of revenue that would reasonably be required to recover a set of costs included in the regulated asset base (RAB), among others (AER, 2011).

$$Allowable\ Reveue\ (AR) = (RAB\ X\ WACC) + D + E + C + F \quad \textbf{(1)}$$

$$Tariff = {}^{Allowable\ Revenue}/_{Quantity\ of\ output\ sold\ by\ the\ Regulated\ entity} \quad \textbf{(2)}$$

where the RAB is the cumulative historical investment made by the utility. The weighted average cost of capital (WACC) reflects the opportunity cost of the investments made by the investor. D = depreciation of the RAB over time. E = operational expenses incurred by companies. C = claw back and F= F-Factor, which is additional revenue to meet debt obligations that may be granted by a Regulator. If the allowable revenue excluding the F-factor does not enable the applicant's regulated activity to operate with a debt service cover ratio acceptable to its financiers, then additional revenue may be allowed.

The RAB is typically the largest component of AR and it will grow by the amount of the net capital expenditure outlays (for infrastructure) made by the company (Meaney & Hope, 2012). One reason why companies increase capital outlays is to expand infrastructure capacity as the demand for services increase (AER, 2011). Therefore if capital expenditure increases, RAB increases; so does the AR and subsequently the tariff. Regulators must ensure that capital outlays allowed into the RAB must be prudently acquired. If they are not acquired prudently, it will unnecessarily inflate the RAB. Therefore potential flaws in the following will inflate the RAB and cause inefficient prices:

i. Inefficient selection of financing (procurement), which leads to additional capital expenditure.

ii. Project overruns (time and cost): All additional costs increase the capital expenditure needed for infrastructure which is allowed into the utility's RAB and will inflate AR. Moreover, a long delay may cause depreciation of the asset, necessitating expenses on repairs or replacement. In the regulatory environment this may significantly increase tariffs and the eventual price the consumer will face.

iii. Incorrect choice of a contract or contracting approach. This may result in firms paying higher capital outlays to contractors.

As discussed above, inefficient pricing casts doubt on an institution in achieving efficacy. Also as mentioned earlier, the efficacy with which the programmes are implemented and delivered to the targeted beneficiaries is crucial for project success (including the management of public finance, procurement, processes, contract management and effective monitoring of state-owned enterprises) (Kenny, 2007).

The WACC is also affected by the rate of return on debt (K_d) and the rate of return on equity (K_e) for investors. In fact, there are two ways in which investors' returns may increase (AER, 2011):

i. If there is higher capital expenditure, investors will get a higher return; and

ii. If K_d and K_e increase, investors will naturally receive a higher return.

Therefore returns on infrastructure are also directly linked to the K_e and $K_d$components of the WACC. The WACC component of the AR formula is affected mainly by the amount of capital expenditure made by investors. AR must therefore incorporate efficient returns for investors. Inefficiencies may result in higher K_d and K_e, thus increasing the value of the AR for utilities and therefore prices consumers face (AER, 2011). There are two main efficiencies worth highlighting here:

i. Inefficient funding: if a government fails to efficiently collect tax and user charge revenue, this would lead to failure of the project (Kenny, 2007). For example, if funding on a project is delayed because users refuse to pay, this causes a delay in both the cost of finance and the interest on that cost. The total finance owed on the project will be higher as investors must receive the real value (including inflation) of the money they have invested. This will feed into a utility's AR through the WACC component and further increase prices for consumers.

ii. Project overruns: The rate of return that the financers of the project expect from their investment will be higher if a project overruns because the project requires additional capital outlays and becomes riskier; the higher the rate of return, the higher the value of the

asset. This then affects the WACC component of Allowable Revenue, which will eventually affect the prices consumers face.

Therefore infrastructure investment is worthy of investigation: if it is inefficient, the asset will be priced inefficiently and this gets passed through to consumers. This article now looks at case studies of infrastructure projects in South Africa to investigate whether the following inefficiencies are observed:

- Inefficient and/or inappropriate financing (procurement)/funding models adopted by the different infrastructure implementing utilities for infrastructure projects.
- Extensive cost and time overruns associated with these infrastructure expansion projects.

4. SOUTH AFRICAN INFRASTRUCTURE PROJECTS

This section will look at the recent infrastructure projects undertaken/being undertaken in the South African context and investigate the financing, funding and project overruns associated with these projects.

TABLE 4: South African infrastructure projects and the financing method

Project	*Finance/Procurement method*
Gautrain	PPP
Kusile	Corporate finance with government guarantees
Medupi	Corporate finance with government guarantees
Gauteng toll roads	Corporate finance with government guarantees
New multi-product pipeline	Corporate and public finance
OR Tambo international airport	Public finance
De Hoop dam	Public finance
Soccer world-cup stadia	Public finance
N4 toll roads	PPP
Standard Bank building (Rosebank)	Private sector finance and Corporate finance

Source: *Compiled by authors from different sources*

One can clearly see from TABLE 4 that in the financing of infrastructure projects no financing technique is superior to any other. It is only when these projects are commissioned that one can analyse the factors that contributed to the success or failures of these projects. A retrospective analysis might provide a clearer insight into what precautions one should take when financing infrastructure.

In the case of South Africa, no empirical studies have been done to test the success or failure of infrastructure projects. However, Baloyi and Bekker (2011) conducted surveys for the financing of the 2010 World Cup stadia in South Africa. Ten stadia were either upgraded or newly constructed for the event. The World Cup stadia were built using a public finance approach.

However, the problems discussed in section 2.2 with regard to public finance were not the prevalent problems highlighted by the results of the surveys. A close analysis of the surveys revealed the following results: nearly all projects experienced time and cost overruns, ranging from 5 to 48% (see TABLE 5).

TABLE 5: Budget vs. indicated final costs of world-cup 2010 stadia

Stadium	*Initial budget*	*Final cost*	*Cost overrun*
Soccer City: Johannesburg	R2.2 billion	R3.7 billion	41%
Ellis Park: Johannesburg	R240 million	R253 million	5%
Moses Mabida: Durban	R1.6 billion	R3.1 billion	48%
Mbombela: Nelspruit	R600 million	R1 billion	40%
Green point: Cape Town	R2.9 billion	R4 billion	28%
Nelson Mandela Bay: Port Elizabeth	R2.1 billion	Not known	-
Royal Bafokeng: Rustenburg	R1.3 billion	Not known	-
Peter Mokaba: Polokwane	R360 million	R483 million	25%
Mangaung: Bloemfontein	R245 million	R359 million	32%
Loftus Versfeld: Pretoria	R122 million	R131 million	7%

Source: *Baloyi and Bekker (2011)*

Furthermore, a total of 18 factors which contributed to cost overruns were analysed, with the top 10 factors contributing more than 85% of the cost overruns identified. Most of the factors stated were either external or contractual. TABLE 6 below gives the ranking of the factors which caused cost overruns on the 2010 FIFA World Cup stadia.

In terms of time overruns, a total of 34 factors were analysed, with the top 10 factors contributing more than 80% of the causes for delay. Most of the problems stated were client- and contract-related. The top five factors were: incomplete drawings, design changes, clients' slow decision-making, late issuing of instructions, and shortage of skilled labour (Baloyi & Bekker, 2011). Surprisingly, labour disputes ranked seventh; one would expect labour to be the top-ranking factor given the number of labour strikes that took place during the construction period of these stadiums.

Project overruns were experienced in every project listed in TABLE 7, which highlights the inefficiencies discussed in previous sections. The next section provides an example of a project which incurred project overruns and as a direct result prices were inflated.

TABLE 6: Factors reported to have caused cost overruns of world-cup 2010 stadia

Cost overrun factors	*Rank*
Increase in material costs (inflation)	1
Inaccurate material estimates	2
Shortage of skilled labour	3
Clients awarded contract late	4
Project complexity	5
Increase in labour cost	6
Inaccurate quantity take-off	7
Difference between selected bid and consultants' estimate	8
Change orders by client during construction	9
Shortage of manpower	9

Source: *Baloyi and Bekker (2011)*

Note: 1 = most important; 9 = least important.

Given the findings from the World Cup stadia study by Baloyi and Bekker (2011), the authors of this article have compiled a list of completed infrastructure projects in South Africa and looked at whether any project overruns occurred. TABLE 7 below reveals the shocking results of this list. Projects in South Africa overran between 21 and 1 329%.

TABLE 7: Project overruns in South Africa

Project	*Initial budget (R bil)*	*Final cost (R bil)*	*Cost overrun (%)*
Gautrain	25.1	30.5	21
Kusile	90	121	34
Medupi	33.6	105	213
Gauteng toll roads	6.3	90	1329
New multi-product pipeline	11.1	23.4	111
OR Tambo international airport	5.2	8.5	64
De Hoop dam	7.9	20	153
Soccer world-cup stadia	8.1	18.4	126
N4 toll roads	2	3	50
Standard Bank building (Rosebank)	1.1	2	82

Source: *Compiled by authors from different sources*

4.1 Transnet's New Multi-Product Pipeline

Transnet decided to construct a New Multi-Product Pipeline (NMPP) to address fuel shortages in South Africa and the inland security of supply of petroleum products (Department of public enterprises (DPE), 2012). The latter was because the Durban-Johannesburg pipeline (DJP) was old and lacked the capacity for the increase in fuel storage (DPE, 2012). A typical Corporate Finance structure was used as a procurement method (DPE, 2012). The NMPP project is not fully complete, but part of it was commissioned to transport diesel (DPE, 2012).

The project completion date was moved from year 2010 to 2013 and the estimated total cost escalated from R11.1bn in year 2008 to R23.4bn in year 2010 (DPE, 2012). Variation in costs were explained by incorrect forecasts of contract costs, incorrect choice of procurement and a mismanagement of shareholder expectations (DPE, 2012). The escalating construction costs fed into the RAB, and subsequently Transnet applied for an increase in its AR and thus the tariff. Naturally the higher tariff was passed through to consumers. Currently, there is a prudency study being conducted by the national energy regulator of South Africa (NERSA) to address the unhappiness of all parties involved.

Lastly, two examples of South African projects that illustrate a failure and success of the user-pays principle as a funding mechanism are provided below.

4.2 User-pays failure: The Gauteng Toll Roads

An improvement of Gauteng's road infrastructure was undertaken by the South African National Roads Agency (SANRAL). This was financed by SANRAL by means of corporate financing and government guarantees (SANRAL, 2012). It was decided that the funding would come from tolling rather than the tax base (SANRAL, 2012). Pienaar (2011) suggests that through tolling one gets funding quicker than by relying on taxes, which could take several years. The highways themselves cost about R18 billion to upgrade. Due to cost overruns and the installation of gantries for tolling expenses, the total construction costs increased to R23 billion. There was no referendum conducted to see if users agreed with this means of funding (The Star, 2012). This caused public resistance towards the project, as Gauteng residents are forced to use the roads without reliable/available alternatives. Communication is vital before infrastructure financing occurs. This allows users to factor future costs into their budgets. If this is not done, users will refuse to pay and the funding will be delayed. This becomes problematic, as delayed funding increases the interest repayments on the project and requires a higher pay-back. This will feed into a utility's AR through the WACC component and lead to further increase prices for consumers.

Public resistance to paying the tolls has negatively impacted the balance sheet of SANRAL, as the revenue expected from the operation of the project has not been not collected pending legal challenges between the state and the public (The Star, 2012). Toll fees remained uncollected for a long time while the public was challenging the government in the court of law about the impacts the tolling would have on the wider economy. The court eventually decided in favour of the government (SANRAL, 2012). The objections experienced in the country have affected investor confidence and as a result SANRAL's global and national ratings were downgraded in February 2012 (SANRAL, 2012).

4.3 User-pays success: Gautrain rapid rail link project

According to the Gautrain Annual Report (2013), the project started in 1998 and was completed in 2012. The project was financed through the PPP model with Mbombela being the Special-Purpose Vehicle (SPV) for the project (Gautrain Annual Report, 2013). The railway line is 80km with 10 stations, and there is a possibility that it will be extended in the future (Gautrain Annual Report, 2013). Serrao and Van Schie (2011) reported that the amount of R30.5bn which was spent during the construction phase was divided into R27.3 billion, which consists of government's contribution, and the balance from private companies.

User charges were only to cover operational and maintenance costs (Gautrain Annual Report, 2013). In this case, users are not obliged to use the Gautrain as a mode of transport and therefore this funding method was a success.

5. CONCLUSIONS AND POLICY RECOMMENDATIONS

There are two fundamental components to implementing infrastructure: attracting investors to invest, and good governance (Kenny, 2007). This enables the state to do the following (Kenny, 2007): 1) Achieve efficacy with which the programmes are implemented and delivered to the targeted beneficiaries; 2) Collect tax and user charge revenue: this determines the resources available for infrastructure investment; and 3) ensure an effective oversight and regulation of infrastructure providers. If any of the capacities are inadequate, infrastructure delivery will be compromised.

From a theoretical perspective inefficient infrastructure delivery, particularly from SOEs, leads to inefficient prices of the asset in question. The AR model is used to price infrastructure. CAPEX for infrastructure is reflected in an institution's asset base. The institution is then able to recover its CAPEX by being allowed a higher revenue through charging higher prices. The asset base of the institution will be inflated the higher the CAPEX allowed. If the CAPEX is inflated due to imprudent costs, consumers suffer due to higher prices. The AR also requires a healthy rate of return for investors, through the weighted average cost of capital (WACC). Inefficiencies in pricing arise from:

i. Inefficient selection of financing (procurement) and incorrect choice of a contract or contracting approach. This may result in firms paying higher capital outlays to contractors.

ii. Project overruns (time and cost): All additional costs increase the capital expenditure, inflating the RAB unnecessarily. Delays in implementation in themselves will cause cost overruns. A long delay may cause depreciation of the asset, necessitating expenses on repairs or replacement. Lastly, it will also increase the return required by investors, as the project is deemed riskier.

iii. Inefficient funding: if a government fails to collect tax and user charge revenue efficiently this can lead to the failure of the project.

This paper presented an investigation of each of the three factors that cause inefficient pricing as well as failures that arise from infrastructure investment. The findings for each are presented accordingly:

i. Public-private partnerships as a means of procuring an asset seem to be trending in many countries. This financing method used cannot be ignored, because it is through this method

that incentives are created to encourage proper project management. A list of projects in South Africa showed that there is no superior financing technique. However, there is empirical evidence on the Word Cup stadia projects which show that incorrect choice of a contract or contracting approach significantly determines the success of infrastructure projects.

ii. A closer look at South African infrastructure projects revealed that almost all projects overran significantly by between 5 and 58%. Furthermore, the reasons for overruns were attributed mainly to contractual issues. A case study of the Transnet NMPP revealed that the project overran both in terms of cost and time. Transnet recovered costs by applying for tariff increases with NERSA. As a result of the failure to accurately predict cost and time forecasts, consumers had to absorb the higher prices.

iii. Two South African case studies were presented: in one the user-pays principle was a success and in the other a failure. In the case of Gauteng E-tolls, users refused to pay for the infrastructure, as it was not initially communicated. In the case of the Gautrain project, the system of user-fees has been successfully implemented.

Lastly, the following recommendations are provided:

i. Irrespective of which financing method an institution implements for infrastructure, strong precautions must be taken before the selection of a contractor for these projects. Contractors must present clear cost and time forecasts based on thorough research. Where project structures are small, it is suggested that EPC contracts be used as a way of managing project cost overruns and other risks associated with project construction. Under EPC contracts, contractors absorb all the risks, and failure to meet any contractual obligations results in monetary liabilities incurred by the contractor. However, where projects are complex, a cost-plus structure must be used within reason.

ii. In many cases, project overruns are reported as unexpected. This is only evaluated after project completion, as was the case of the NMPP project by Transnet. This additional capital expenditure feeds into a utility's RAB and gets passed through to consumers. A recommendation is made to regulators to first conduct prudency tests of cost and time delays and verify if the overruns are justified before the consumer is faced with increased costs. If it is done after the fact, consumers might not be protected. Regulators should also look to capping overruns at a certain percentage in order to discourage projects from overrunning. This will then create an incentive for both contractors and regulated utilities to hit targets. If a project overruns beyond the project cap, it must be followed by a prudency test before the additional expenses feed into the AR of the utility in question.

    Partnerships between law bodies and regulators are crucial. If a regulator finds that costs were not prudently incurred by the utility in question for an infrastructure project, it is suggested that the regulator take the contractor/utility to task. If the escalated costs are proven to be because of a cartel formation, the buyer can use the justice system to seek damages. This will ensure consumer protection and create disincentives for contractors and utilities to unnecessarily inflate costs.

iii. Crucial to the success of the user-pays principle is that funding methods are made transparent to all parties involved. This will avoid unnecessarily long pay-back periods, which inflate the cost of the project further. This is vital for projects which are pure public goods. The example of Gauteng roads in South Africa should be a lesson for all stakeholders involved. Efficiency and transparency are both crucial in managing the financing and

funding processes. Furthermore, research at the inception phase must be done, such that affordability not only on the financing front but also on the funding front is addressed. Lastly, clear channels of communication must also exist between all stakeholders, and affordability should be taken into account.

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