Feasibility Study Considerations for Transport Infrastructure Performance: A Desk Study

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Abstract
Transport infrastructure projects are complex, stochastic and fraught with uncertainties, which if not accurately predicted, can lead to inadequate assessment and management of risksand over time, poor performance in terms of costs, and associated expected benefits from implementation. The objective of this paper is to identify critical factors which should ideally be included in feasibility studies for adequate prediction of performance of road projects while in operation. A thorough in-depth desk study was conducted using extant literature (from conference proceedings and journals) and reports on feasibility and performance of transport infrastructure projects in Africa and world over. Findings revealed that effectiveness of procurement and financing strategies was the most considered factor during feasibility studies, among the sampled studies; followed by public participation, role of national government and traffic demand factors. Other factors included project environment, planning for operations and effectiveness of plans. These findings will be beneficial to investors who need assurance of the worthwhile performance of transport projects in which they intend to invest in. The study will inform selection of worthwhile projects among alternative and competing options which need to be implemented with limited resources.

Keywords
Forecasting, infrastructure, performance, transport

Background

Transport infrastructureincluding roads, railways, ports and bridges, play important roles in the development of cities, connection of a nation's businesses, improvement in the quality of life of citizens and driving economic growth and overall socio-economic development (Okoro *et al.*, 2016). Road transport infrastructure, in particular, facilitates mobility of people and specialized products and services which are essential for development and growth and enhances the value of land within the locality in which they are provided (Brown-Luthango, 2011). Employment opportunities are created for unskilled workers during construction and taxi ferrying of passengers to neighbouring areas (Renner and Gardner, 2010; Bon, 2015;

Robins, 2015Suffice to say, road transport infrastructure contributes to economic growth and social welfare (Doll et al, 2009).

However, despite its importance, transport infrastructure projects are rife with poor performance in terms of cost overruns, shortfalls in expected benefits and lack of acceptability (opposition) by the public or end-users, which are partly attributed to corruption and financial misdeeds in government, non-involvement of the public in planning decisions, contractual disputes and inadequacy of funds (Beckers *et al.*, 2013; Carter, 2015; Rwelamila, 2016; Prager, 2016). Failure of transport infrastructure has also been attributed to poor or inadequate forecasting where wrong and misleading predictions are put forward to support feasibility of proposed projects, and thus leading to cost overruns, demand shortfalls, less than expected revenues and associated benefits from investments (Nicolaisen and Driscoll, 2014). Transport infrastructure projects in particular, are complex, stochastic and fraught with uncertainties, and if not accurately predicted, can lead to inadequate assessment and management of risksand over time, the costs incurred in remedying the consequences of inaccuracy in forecasts as well as associated travel demand and social benefits are affected. This suggests that the quality of forecasts, partly influenced by the model specifications or the factors included in the feasibility studies at the time of decision to build, is relatable to the performance of the projects while in operation (Rudžianskaitė-Kvaraciejienė *et al.*, 2015). Specification of the model to include a wide variety of project-influencing factors is essential since clarity and detail will be evident and thus inaccuracy of forecasts will be reduced to the barest minimum (Rudžianskaitė-Kvaraciejienė *et al.*, 2015). Research on factors which could potentially influence the outcome (success or failure) of road projects in their operational stage is necessary in order to more adequately predict uncertainties that affect their future performance and to make reliable and informed decisions regarding investments among different alternatives. This is especially important because of the high costs of infrastructure projects, limited availability of resources, irreversibility of decisions and associated inefficiencies. The success of infrastructure projects is important to investors or sponsors, who need to decide on whether to proceed with investing in a proposed development or choose alternative projects, based on projections of costs and benefits potentially accruing to a proposed project (Hyari and Kandil, 2009; Nicolaisen and Driscoll, 2014). These projections ultimately reflect the success or failure of a given project, and the entities intending to invest could collapse if the projects fail (Alasad *et al.*, 2012; Mišic and Radujković, 2015).Inaccuracy in feasibility studies can distort performance measures quite drastically which in turn can lead to a different prioritization of investments than if the information had been available to investors prior to investments (Nicolaisen *et al.*, 2012). Therefore, research on the quality of feasibility studies warrants attention in order to allow for more reliable decision-making regarding performance of projects in operation.

Research has been conducted on factors which should be included in feasibility studies to assure performance of transport infrastructure projects. For instance, Alasad *et al.* (2012) who dwelt on traffic demand factors; Rudžianskaitė-Kvaraciejienė *et al.* (2015) who focused on road projects delivered through public private partnerships (PPP); and more recently, Okoro *et al.* (2016) who reviewed factors influencing forecasting estimates and performance of transport projects in terms of traffic/service demand. However, the factors which holistically influence the performance of projects in terms of costs, acceptability and sustainability of the projects have not been dwelt on extensively. Therefore the objective of the current paper is to identify critical factors that should be considered in transport infrastructure forecasting in order to assure future desirable performance. The current paper reviews, identifies and incorporates all potential factors which should ideally be considered in forecasting transport infrastructure in order to assure performance in the long run. Findings of the study will inform investors about the latent success

(future performance) of their proposed projects and enable them to select and prioritise more potentially viable transport projects. The succeeding sections present further background into the

relationship between the quality of feasibility studies and transport infrastructure performance. The next (section three) briefly describes the methodology used in the investigation and the following section (section four) presents the findings from the desk study. Section five concludes the present paper.

Relationship between road performance and feasibility studies

Forecasts of a given project are estimates that are available to decision-makers and investor at the time of decision to build the project (Flyvberg, 2005). Research indicates that infrastructure projects could fail due to poor feasibility studies as a result of inadequate inclusion of uncertainties in model forecast. Non-inclusion of all potential success-influencing factors influences the accuracy of forecasts and subsequently, the outcome of projects in terms of cost, demand shortfalls and associated benefits from transport infrastructure development (Ofori, 2013; Parthasarathi and Levinson, 2009; Glaister *et al.*, 2010; Alasad *et al.*, 2012; Mišic and Radujković, 2015). Factors which influence project success emanate from uncertainties regarding the differences between the forecasted and actual costs and benefits (revenue and satisfaction to the stakeholders) (Parthasarathi and Levinson, 2010; Glaister *et al.*, 2010; Salling and Leleur, 2012). This is because costs are incurred in remedying the consequences of inaccuracy in forecasts with regard to the expected costs, benefits and demand. Furthermore, revenue loss from unexpected revenue shortfalls makes it impossible for investors to recoup their capital investments. Inaccurate forecasts lead to unrealized revenues and unacceptability by the users. A concessionaire, in a case where private investment is used for instance, requires assurance of cash flow with an acceptable and affordable tariff while at the same time striving to finance its obligations and still maintain a profitable rate of return.

In similar studies, Parthasarathi and Levinson (2010), Liyanage and Villalba-Romero (2015) revealed that traffic demand factors omitted in forecasts could result in underestimated costs and overestimated benefits which in turn are detrimental to transport projects while in operation. Lower than predicted revenues, from less than expected passenger traffic, frequently place project viability at risk and redefine projects that were initially promoted as effective vehicles to economic growth as possible obstacles to such growth (Flyvberg *et al.*, 2003). If proper risk analyses are not conducted, this results in substantially underestimated costs and risks which are detrimental to the economic and social viability of the projects in terms of return on investments (expected revenue) and expected benefits accruing from the project, which in turn determine the level of acceptability of the project (Van der Westhuizen, 2007). Therefore, high estimation errors lead to either inefficient high level of congestion (especially in the case of road projects) or politically untenable levels of under-utilisation, which then require contract renegotiations and flexibility of concession period for cost recovery to restore financial equilibrium. Traffic levels, especially in the case of toll roads (whereby the repayment of loans relies on precise traffic estimates), if not accurately estimated, could result in severe financial default since toll roads are often financed through loans that are secured against future toll revenue only and with no other collateral, as opined by Welde and Odeck (2011) in their Norwegian study.

Furthermore, lower than expected revenues portend failure of a project especially in cases where private investors are solicited to fund proposed infrastructure developments and recoup their investment in a specified period of time. In such projects, specific contract terms are stated. An example of such contracts is a build-operate-transfer (BOT) contract whereby a private investor builds and operates a project within a specified period and transfers the ownership at no cost to the government at the end of the contract (Feng *et al.*, 2015). The private investor recoups investment mainly through toll revenue from traffic demand during the operation stage. This suggests that considerations of financing structures in feasibility studies also influence the outcome of projects.

In Canterelli *et al.* (2010) it was revealed that misleading and inadequate forecasting are partly the culprits

in the failure of large-scale infrastructure projects. The authors further indicated that a change in social opinion and intervention by interest groups or stakeholders of proposed projects influenced the outcome of projects in terms of cost, suggesting that if costs are deliberately underestimated during forecasts due to the interest of specific groups (stakeholders), this influences the difference between the actual costs and forecasted costs. However, this study focused on cost overruns as a success indicator on large infrastructure projects.

Rudžianskaitė-Kvaraciejienė *et al.* (2015) advocated the use of their model in early feasibility studies to determine the benefits and negative impacts of a proposed project which will reflect future acceptability and demand by the citizenry. However, the study included road infrastructure projects developed through PPPs only and therefore might not be generalisable to other types of projects, a view expressed in Flyvberg *et al.* (2006) and Jeerangsuwan *et al.* (2014), which concurred that projects develop and perform differently. Concession rates and forecasting methodologies differ with project type, which may alter the traffic forecasted. For instance, variations in inaccuracy in rail projects occur due to trip distribution, deliberately slanted forecasts, forecasting model/methodology and trip generation, whereas, trip generation, land use development, trip distribution and forecasting models used, mostly cause inaccuracies with regard to prediction in road project performance (Flyvbjerg *et al.*, 2006). The traditional cost-benefits analysis of transport projects, such as used in Norway for road projects, relies heavily on the accuracy of the estimates being used (Welde and Odeck, 2011). If traffic levels turn out be significantly lower than the estimated, the total benefits derived from time savings, reduced accidents or lower-vehicle operating costs can be affected. On the other hand, the capacity relief on the congested links could turn out to be lower than planned, which may distort the viability of the project.

In his study which assessed the strategies, actors and risks of Chinese infrastructure investment in Latin America, Gransow (2015) expressed that feasibility studies should include assessment of associated social and environmental risks. In the author's view, infrastructure expansion strategies should assess and promote associated social benefits such as poverty reduction. However, poverty reduction was unfortunately not high on the agenda of Japanese assistance to China in the infrastructure expansion strategies in 2008 and this resulted in large-scale consequences including displacements and environmental damage (air and water pollution).

Other studies contended that inclusion of factors which chiefly motivate the demand for a particular transport service is vital (Parthasarathi and Levinson, 2010; Alasad et al., 2012; Matsiliza, 2016). Factors such as car ownership, quality of life, cultural habits, societal norms, vehicle operating costs, level of economic activity, policies and legislation (tax/toll fares), alternative land uses, competing transport modes (in terms of park-and-ride possibilities, length of trips and frequency of rides), security, extent of pollution, walking distance from station, travel time, income, employment, number in household, age, and so on, influence the outcome of transport projects.

The above discussion suggests that there is a link between the quality of feasibility studies and the success (performance) of road projects viewed in terms of the objectives for which they were implemented. The succeeding section summaries the factors which should ideally be included in feasibility studies in order to achieve improved quality and thus ensure project success of roads while in operation.

Research methodology

In order to achieve the stated objective, which is to identify critical factors that should be considered in transport infrastructure forecasting to assure future desirable performance, a thorough in-depth desk study was conducted using extant literature (from conference proceedings and journals) and reports on

feasibility and performance of transport infrastructure projects in Africa and world over. Literature spanning a 14-year period, from 2003 to 2016 was included in the study. Materials used for the study were sought from electronic databases and search engines including Google, Academic Search Complete, Emerald and Ebscohost. The following key words and phrases were used in the searches: infrastructure, performance, transport, and feasibility. Various sources including conference proceedings and journals were consulted. The criterion for selection of review articles was that the work possessed the stated keywords and were related to the transport infrastructure sector. A total of fifteen studies were used to summarise feasibility study factors identified from the literature synthesis or desk study and subsequent thematic analysis was conducted to establish emerging common themes/patterns (Alhojailan, 2012). These were thereafter ranked based on their frequency of occurrence among the selected studies, in order to establish the most frequently occurring performance-influencing factors which should be included feasibility studies. The results are presented hereunder.

Feasibility study factors influencing road infrastructure performance

Carter (2015) reported on the success factors for Senegal's Dakar-Diamniadio toll road, the first road PPP project developed in Sub-Saharan Africa. The article revealed that political commitment, consensus building and stakeholder engagement, concessionaire's experience and commitment, clear and visible benefits (time-saving benefits, safety, quality of rides and economic development sprouting around the development), and involvement of development institutions in financing arrangements (both public and private) contributed to the road's success. The author emphasized the importance of outreach to various stakeholder groups in the planning stage of the development in ensuring that projects are accepted by the population, a view supported in Canterelli *et al.* (2010) and Matsiliza (2016), but which has been explored to a minute extent in literature and in practice.

In the study by Glaister *et al.* (2010), procurement and financing arrangements were found to be the most influential factors on project's operational success. Other factors included project environment, degree of turbulence, political control and sponsorship, effectiveness of planning, role of national government and organizing for operations (including for safety and quality management). This study applied multiple regression analysis on data collected through interviews and archives on 19 transport projects (including mostly rail, a bus transit and a road tunnel) across 9 countries, and assessed the extent to which the identified factors were favoured in each project, while considering the political context in all cases.

In related studies, Rebeiz (2012), Gupta *et al.* (2013) and Bivens (2014) concurred that the procurement and financing structures defined at the initial stages of a project influence its outcome and continued viability in terms of financial returns and economic productivity. These studies were too narrowly

focused. While Rebeiz (2012) focused on build-own-operate-transfer (BOOT) arrangements, Bivens (2014) explored the short- and long-term impacts of infrastructure funding through public financing (including and involving public debt, increased or progressive revenues or user fees, private borrowing, regressive transfer cuts, retained earnings, and regulatory mandates) on economic productivity (measured by employment to population ratio and actual to potential GDP ratio) and contribution to overall gross Domestic Product (GDP) of an economy. Gupta *et al.* (2013) employed focus group discussions and questionnaires to identify procurement and financing strategies which make for successful partnership and eventual success. Gupta *et al.*'s study identified that concession agreement, selection procedure of concessionaire, sufficient net cash flow, appropriate risk allocation, reliable concessionaire with strong technical strength, and so on, influence project success. However, it included other forms of infrastructure including airports, energy, tourism, urban development, etc.

In the study by Mišic and Radujković (2015), it was indicated that establishing state-owned, special purpose company to construct, manage and operate transport projects, disentangling projects from individual political agenda in order to implement techno-rationalist decisions, especially at operational level, and less fragmented urban transport governance influences project success. However, although the authors acknowledged that human factors such as acceptability by the users could reflect project success, they tended to focus this aspect on project delivery at construction stage.

Other studies revealed that traffic demand factors omitted in forecasts could result in underestimated costs and overestimated benefits which in turn are detrimental to transport projects while in operation (Parthasarathi and Levinson, 2010; Liyanage and Villalba-Romero, 2015). Lower than predicted revenues, from less than expected passenger traffic, frequently place project viability at risk and redefine projects that were initially promoted as effective vehicles to economic growth as possible obstacles to such growth (Flyvberg *et al.*, 2003).

From the synthesized literature discussed above and summarized in table 1, seven groups of factors were identified. These include:

4 *Effectiveness of procurement and financing arrangements* including appropriate financing model, sufficient net cash inflow, open competitive financial bidding (where private investors are involved), clearly defined responsibilities and control, involving private sector in contract structuring, selection of experienced and committed concessionaire, performance contract that incentivizes good operations, establishing state-owned, special purpose company to construct, manage and operate, strong involvement of development institutions, and appropriate risk allocation;

5 *Project environment and turbulence* including stability of government and providing windows of opportunity for decisive action;

6 *Effectiveness of planning* including explicit plans providing justification, especially for difficult choices, clear and visible benefits, strategies founded on realism of what is possible;

7 *Role of government* including strong support, strategic, appropriate and predictable guidance, strong control and sponsorship, commitment, , clear objectives and leadership during operation, uncompromised authority, reasonable transparency (even with low level of authority), ability to command the powers to deliver the project, less fragmented transport governance;

8 *Planning or organising for operations regarding quality and safety management* including clear focus on ultimate operation (tying implementation to operations), involving private sector in operations/reality checking of outcomes, organizing for technical expertise for operations, innovative approaches to overcome traffic congestions, availability of funding for reliable service delivery,

installation of security cameras, provision of a 24-hour help line, provision of security patrol on toll booths/intervals, responding promptly to safety and security incidents;

7. *Public participation* comprising sharing system-related information with the public, consultation regarding fees and increments, involving locally-based project companies/contractors, involving the public in planning for discounted user charges, getting the local community to understand why the project is being done;

8. *Traffic demand factors* including competing alternative modes of transport, new developments, land use changes, socio-economic factors, level of economic activity, highway capacity improvement.

From table 1, it can be seen that, from the fifteen studies sampled, *effectiveness of procurement and financing arrangements* ranked first among the identified factors, with a percentage occurrence of 47%. This implies that most of the selected studies view procurement and financing as paramount considerations that should be considered during feasibility studies in order to ensure that the project remains successful and performs as expected in the long run. However, it is notable that some of these studies dwelt singularly

on financing and procurement and did not incorporate other factors, for example, Rebeiz (2012), Gupta et al. (2013) and Bivens (2014). P*ublic participation* and *role of government* and *traffic demand factors* ranked second with a respective percentage occurrence of 33%. *Project environment and turbulence* ranked third (percentage occurrence of 27%); while *planning for operations (safety and quality management)* as well as *effectiveness of plans (during feasibility studies)* ranked last, with a percentage frequency of 20%, respectively. This suggests that they are the least considered elements (during feasibility studies) of transport performance. The finding that planning for operations, especially for safety and security while the project is in operation was the least considered factor is inconsistent with the views from the recent study by Osei-Kyei and Chan (2016) in which it was viewed that planning and organizing for management of safety is as important as the planning for implementation since the users of the provided infrastructure need to feel safe and measures need to be put in place to ensure that the masses are protected Such measures include provision of 24-hour help line, security cameras, patrol staff and so forth. These measures will in turn result in increased and sustained service demand which translates to revenue and expected cash flow from the project.

5. Conclusion

The study set out to establish the factors which should ideally be considered in transport infrastructure project forecasting in order to ensure desirable performance in the long run. The objective of the current study was met. Effectiveness of procurement and financing arrangements was found to be the most considered factors among the sampled studies, followed by public participation, role of national government and traffic demand factors. Planning for operations and effectiveness of plans emerged as the least considered factors among the selected studies. These findings underpin the importance of proper financing decisions to be made with the intention of availing funds for the project development and beyond. Transport project investors and planners therefore need to make critical decisions regarding procurement and financing arrangements, with other considerations including involvement of the public (users) coupled with the commitment, support and guidance of the government in which a particular project is being implemented, in order to ensure that project run smoothly as desired in terms of financial returns, acceptability by the public and sustainability of the project. The next stage/phase of the study will focus on investigating the influence of inclusion of the identified factors (in feasibility studies) on transport project performance in reality.

Table 1: Feasibility study factors influencing transport performance

Factor	Literature source															Freq.	% freq	Rank
	Flyvberg *et al.* (2003)	Devkar *et al.* (2009)	Glaister *et al.* (2010)	Parthasarathi & Levinson (2010)	Alasad et al. (2012)	Rebeiz (2012)	Gupta *et al.* (2013)	Bivens (2014)	Chang & Tovar (2014)	Zuofa & Ochieng (2014)	Carter (2015)	Liyanage & Villalba-Romero (2015)	Mišic & Radujković (2015)	Osei-Kyei & Chan (2016)	Matsiliza (2016)			
Effectiveness of procurement and financing arrangements	√		√			√	√	√			√		√			7	47	1
Public participation		√	√								√		√	√		5	33	2
Role of national government		√	√								√		√	√		5	33	2
Traffic demand factors	√			√	√							√			√	5	33	2
Project environment and turbulence			√							√			√	√		4	27	3
Planning/organising for operations (quality and safety)			√						√					√		3	20	4
Effectiveness of planning			√								√			√		3	20	4

6. References

Alasad, R., Motawa, I. and Ogunlana, S. (2012). A system dynamics-based method for demand forecasting in infrastructure projects- A case of PPP projects. In Smith S. S. (ed.). Proceedings fo the 28th Annual ARCOM conference, 3-5 September, 2012. Edinburgh, United Kingdom. Pp. 327-336.

Alhojailan, M. I. (2012). Thematic Analysis: A critical review of its process and evaluation. *WEI International European Academic Conference Proceedings*.October 14-17, Zagreb, Croatia.

Beckers, F., Chiara, N., Flesch, A., Maly, J., Silva, E. and Stegemann, U. (2013). A risk management approach to a successful infrastructure project: Initiation, financing and execution. McKinsey and Company, 1-18.

Bivens (2014). The short and long term impact of infrastructure investments on employment and economic activity in the US economy. EPI

Bivens, J. (2014). The short and long term impact of infrastructure investments on employment and economic activity in the US economy. EPI July 1.

Bon, B. (2015). A new megaproject model and a new funding model: Travelling concepts and local adaptations around the Delhi metro. *Habitat International*, 45:223-230.

Brown-Luthango, M. (2011). Capturing land value increment to finance infrastructure investment: Possibilities for South Africa. *Urban Forum*, 22:37-52.

Canterrelli, C. C., Flyvberg, B., Molin, E. J. e. and van Wee, B. (2010). Cost overruns in large scaletransport infrastructure projects. Explanations and their theroretical embededness. European Journal of Transport and Infrastructure Research, 10(1):5-18.

Carter, L. (2015). Five secrets of success of Sub-Saharan Africa's first road PPP. World Bank.

Devkar, G. A., Mahalingam, A. and Kalidindi, S. N. (2009). Analysing the institutional framework for urban PPP in Indian States. Construction Research Congress, 5-7 April, Seattle, Washington.

Doll, C., Durango-Cohen, P. L. and Ueda, T. (2009). Transportation infrastructure planning, management and finance. *Journal of Infrastructure Systems*, 15(4):261-262.

Feng, Z, Zhang, S. and Gao, Y. (2015). Modeling the impact of government guarantees on toll charge, road quality and capacity for BOT road projects. Transportation Research Part A. 78: 54-67.

Flyvberg, B, Bruzelius, N. and Rothengatter, W. (2003). Mega projects and risks: An anatomy of ambition. Cambridge University Press.

Flyvberg, B. (2005). Measuring inaccuracy in travel demand forecasting: Methodological considerations regarding ramp up and sampling. Transportation Research Part A, 39: 522-530.

Flyvberg, B., Holm, M. K. S. (2006). Inaccuracy in traffic forecasts. *Transport Reviews*, 26(1):1-24.

Glaister, S., Allport, R., Brown, R. and Travers, T. (2010). Success and failure in urban transport infrastructure projects. KPMG.

Gransow, B. (2015). Chinese infrastructure investment in Latin America: An assessment of strategies, actors and risks. *Journal of Chinese Political Science*, 20:267-287.

Gupta, A., Gupta, M. C. and Agrawal, R. (2012). Identification and ranking of critical success factors for BOT projects in India. Management Research Review, 36(11): 1040-1060.

Hyari, K. and Kandil, A. (2009). Validity of feasibility studies for infrastructure construction projects. Jordan Journal of Civil Engineering, 3(1): 66-77.

Jeerangsuwan, T., Said, H., Kandil, A. and Ukkusuri, S. (2014). Financial evaluation for toll road projects considering traffic volume and serviceability interactions. *Journal of Infrastructure Systems*, 20(3):1-9.

Liyanage, C. and Villalba-Romero, F. (2015). Measuring succeed of PPP transport projects: A cross case analysis of toll roads. Transport Reviews, 35(2): 140-161.

Matilidza, N. S. (2016). Critical factors in respect of managing the e-toll road project in Gauteng, South Africa. African Journal of Hospitality, Tourism and Leisure, 5(1): 1-10.

Mišic, S. and Radujković, M. (2015). Critical drivers of megaproject success and failure. Procedia Engineering, 122:71-80

Nicolaisen, M. S. and Driscoll, P. A. (2014). Ex-post evaluations of demand forecast accuracy: A literature review. Transport Reviews, 34(4):540-557.

Nicolaisen, M. S., Ambrasaite, I. and Salling, K. M. (2012). Forecasts: Uncertain, inaccurate and biased? Procs of the Annual Transport Conference. 9 – 12 July, Aalborg University, Denmark.

Okoro, C. S., Musonda, I. and Agumba, J. (2016) Proceedings of the 3rd International Conference on Infrastructure Development and Investment Strategies for Africa, 31 August – 2 September, Livingstone, Zambia.

Osei–Kyei, R. and Chan, A. P. C. (2016). Developing Transport Infrastructure in Sub-Saharan Africa through Public–Private Partnerships: Policy Practice and Implications. Transport Reviews, pp. 170-186.

Parthasarathi and Levinson (2009). Post construction evaluation of forecast accuracy. Department of transport. United States of America: Minnesota.

Parthasarathi, P. and Levinson, D. M. (2010). Post construction evaluation of forecast accuracy. Transport Policy, pp. 1-16. doi:10.1016/j.tranpol.2010.04.010.

Prager, U. (2016. Why private investment works and government investment doesn't. Available from www.youtube. Assessed 7 June.

Rebeiz, K. S. (2012). Public private partnership risk factors in emerging countries: BOOT illustrative case study. Journal of Management in engineering, 28(4): 421-428.

Renner, M. and Gardner, G. (2010). Global competitiveness in the rail and transit industry. World Watch Institute.

Robins, G. (2015). The Dube Trade Port-King Shaka international airport mega-project: Exploring impacts in the context of multi-scalar governance processes.

Rudžianskaitė-Kvaraciejienė, R., Apanavičiene, R. and Gelžinis, A. (2015). Monitoring the effectiveness of PPP road infrastructure projects by applying random forests. *Journal of Civil Engineering and Management*, 21(3):290-299.

Rwelamila, P. D. (2016). Infrastructure development through PPP: Wrestling with twin challenges in emerging economies – from rhetoric to reality. Presentation at the CIDB post graduate conference, 3-6 February, Cape Town, South Africa.

Salling, K. M. and Leleur, S. (2012). Modeling of transport project uncertainties: Feasdibility risk assessment and scenario analysis. EJTIR, 12(1): 21-38.

Van der Westhuizen, J. (2007). Glitz, glamour and the Gautrain: Megaprojects as political symbols. *Politikon*, 34(3):333-351.

Welde, M. and Odeck, J. (2011). Do planners get it right? The accuracy of travel demand forecasting in Norway EJTIR 11(1): 80- 95.

Zuofa, T. and Ocheng, E. G. (2014). Project failure: the way forward. International Journal of Business and Management, 9(11): 59-71.