

EFFECT OF PERFORMANCE BASED CONTRACTING ON PERFORMANCE OF ROAD AGENCIES IN KENYA

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Abstract: *The study sought to determine the effect of performance based contracting on the performance of road agencies in Kenya. Typically, road agencies (RA) are entrusted with the responsibility of managing road assets but a large portion of the road network in Kenya are either in poor or failed condition which calls for the need to put pressure on the road agencies to improve their efficiency in the management of roads. To meet the growing demand for improved conditions of road assets, road agencies have been making deliberate effort to gradually move away from employing traditional engineering approach in favor of a contracting model where payments to the contractor are linked to achieving or exceeding performance goals stated in the contract; also known as performance based contracting (PBC). The study was guided by goal setting theory and it adopted a correlation survey design with a study population of 120 employees selected purposively from the four road agencies in Kenya and who were directly involved in project implementation. The results showed that $R^2 = 0.832$ meaning that performance based contracting (PBC) elements altogether explained 83.2% of road agency performance in Kenya and that PBC is a positive and significant predictor of road agency performance. The study recommends the interrogation of the implementation of PBC in other sectors to realise improved outcomes*

Keywords: Performance Based Contracting, Performance Goals, Road Agency, Road Assets

Research Area: Social Science

Paper Type: Research Paper

1. INTRODUCTION

Performance-based contracting (PBC) is a type of contract in which payment for deliverables is explicitly linked to the contractor's successfully meeting or exceeding certain clearly defined performance indicators. (Stankevic, Qureshi and Queiroz, 2005). It involves an important shift away from more traditional approaches to the delivery and maintenance of road infrastructure and associated services by a shift from the situation where the client has responsibility for the design and supervision of construction and maintenance activities, to a focus upon the key outcomes that the client wishes to achieve and incentivizing the achievement of those outcomes.

Payments made to the contractors are not based on quantities of works measured by unit prices for work "inputs" or physical works, but on measured 'outputs' reflecting the specified and target conditions of the roads under contract. Sultana (2013), however, asserted that the traditional method of maintenance contracts has been widely recognized as ineffective and expensive as a client (the road authority) has to supervise and pay both consultant and contractor. Sultana (2013) highlighted the problems associated with the traditional method, for instance, the common problems observed were an escalation of cost and time, poor-quality of work and inadequate motivation of contractors, no clear risk sharing between the road agency and the contractor, and delay in project completion. Anastasopoulos *et al.* (2009) also pointed out that in traditional method-based contracts, the road agency

specifies techniques, materials, methods, quantities, along with the time period for the contract. In contrast, in PBC, the road agency specifies minimum performance measures to be met or exceeded along the contract period.

The main aspect of PBC is that contractors are paid based on the result achieved and not by following any specified method of performing the work. Therefore, contractors are paid based on how well they meet the specified performance goals. Contrary to the traditional method of contracting out road maintenance based on work procedure and materials to be used rather than result oriented very much limiting the contractor in the application of new technology (Zietlow, 2005). Payments to contractors are made in instalments, usually monthly. Incentives and penalties can be introduced and consist of increases or decreases of a payment due to their exceeding or not meeting the specified performance goal (Ozbek *et al.*; 2011). Consequently, PBC defines success in terms of how well the contractor meets the set performance goals. The intent of PBC is to encourage contractor innovation and improve quality by encouraging value engineering and improved efficiency (Segal *et al.*; 2003, Gupta *et al.*; 2011). It gives room for long-term planning by providing the contractor with enough time horizon to deploy new technologies and recover the cost of research.

Performance based contract within the road sector can be pure or hybrid. Pure PBC is whereby all maintenance is paid out to the contractor upon meeting set output indicators. Hybrid PBC combines the features of both method and performance-based contracts. Some services are paid on unit rate basis while others are linked to meeting performance indicators. The level of complexity of PBC can range from simple to comprehensive depending on the number of assets and the range of services included. A simple PBC covers a single service e.g. only drainage or street light maintenance. These kinds of contracts are awarded for a relatively long period of time. A comprehensive PBC would typically cover all road assets and comprises the full range of services needed to manage and maintain the contracted road corridor. Such services would include re-servicing, re-gravelling etc. (Stankevich, Qureshi & Queiroz, 2005). According to Zietlow (2005), the main reasons for implementing PBC are; reduce maintenance costs through the application of efficient and effective technologies, provide transparency for road users, road agencies, and contractors, improve control and improve overall road condition.

According to Pinard (2015), the poor results of road agencies have called into question their capacity for undertaking road asset management. Roads continue to deteriorate prematurely and have to be rebuilt long before their design life. This implies that despite the road agencies implementing road asset management, the provided performance still fall way back below the expected service level. Greenwood, Porter, & Henning (2012) however suggested in their review paper of how performance based contracting delivers good asset management in Auckland, New Zealand and they asserted that performance based contracting is a better way of delivering good road asset management though this has not been empirically tested. The study, therefore, sought to test empirically the role of performance based contracting in delivering a better road asset management.

2. ROAD AGENCIES IN KENYA

The three major road agencies in Kenya include Kenya National Highways Authority (KeNHA), Kenya Urban Roads Authority (KURA) and Kenya Rural Roads Authority (KeRRA). KeNHA is an autonomous road agency, responsible for the management, development, rehabilitation and maintenance of international trunk roads linking centers of international importance and crossing international boundaries or terminating at international ports (Class A roads), national trunk roads linking nationally important centers (Class B

roads) and superhighway with four to eight lanes (Class S roads). The mandate of KeNHA is to manage, develop, rehabilitate and maintain national roads.

KeRRA is a state corporation within the State Department of Infrastructure under the Ministry of Transport, Infrastructure, Housing and Urban Development and established through the Kenya Roads Act, 2007. Its core mandate is to construct, maintain, and manage the rural road network for sustainable socio-economic development.

Kenya Urban Roads Authority (KURA) on the other hand is a State Corporation under the Ministry of Transport and Infrastructure established by the Kenya Roads Act, 2007 with the core mandate of Management, Development, Rehabilitation and Maintenance of National urban trunk roads. The core functions of KURA include: Controlling urban roads reserves and access to roadside developments; Implementing road policies in relation to urban roads; Ensuring adherence by motorists to the rules and guidelines on axle load control prescribed under the Traffic Act CAP 403 and any regulations under the Act; Ensuring that the quality of road works is in accordance with such standards as may be defined by the Cabinet Secretary; in collaboration with the Ministry responsible for transport and the Police Department, oversee the management of traffic and road safety on urban roads; Monitoring and evaluating the use of urban roads; Planning the development and maintenance of urban roads; Collecting and collating all such data related to the use of urban roads as may be necessary for efficient forward planning; Preparing the roads works programs for all urban roads; Liaising and coordinating with other road authorities in planning and on operations in respect of roads and advising the Cabinet Secretary on all issues relating to urban roads.

3. STATUS OF ROADS IN KENYA

The Road Inventory and Condition Survey (RICS) undertaken by Roads Department of the ministry of roads (MoR) between the year 2000 and 2003 indicated that only 41% of paved unclassified roads (urban roads) is in fair and good condition while the rest 59% is in poor condition or has totally failed. For the unpaved classified roads, only 34% is in good or fair condition while the rest 66% is in poor condition (KRB, 2013). The report further emphasized that the major drawback in the performance of the road sector has been poor management of funds and poor delivery of services to the road user.

According to (KRB) report of 2017, ninety-three percent (93%) of all freight and passenger traffic in Kenya is carried by road. The road network is extensive, consisting of approximately 161,451.4 kilometres (out of which 10% is paved, while the rest of the network is either gravel or earth roads). It is estimated that about 30% of the paved roads are in good condition while only about 20% of the unpaved roads are in maintainable condition. Hence, a large portion of the network is in either poor or failed condition and requires urgent rehabilitation to restore it to a maintainable condition. (KRB, 2016).

The Government of Kenya has a Road Sector Investment Plan that provides the framework for work prioritization for the Road Network with maintenance as a priority consideration, to ensure the Road Asset is preserved to maximize on the value of this investment. In the past, there has been a lack of a lifecycle management strategy, giving rise to a poor road network with low standards of safety, poor access and travel time unreliability with increased costs of travel. In order to reap maximum benefits from the road network and ensure sustainability, proper maintenance and management strategies must be put in place.

From the foregoing, it is clear that a large portion of the road networks is still in poor or failed condition despite the efforts by the road agencies to maintain the roads using a

traditional engineering approach to road maintenance. It is however envisaged that the application of the team approach to road assets management can offer a lasting solution to this so that the general road condition improves. According to Greenwood (2012), good road asset management can be delivered through performance based contracting (PBC).

The traditional method-based contract involves measurements of the quantity of inputs upon which payments are made without due regard to quality of work. The method provides the contractor with the incentive to maximize the quantity of inputs up one which payments are made without due regard to the quality of works. The contractor does not focus on quality since he does not bare any long-term risk associated with compromised quality. The contractor bears short-term risks which are limited to defect liability period of the contract usually a few years or months. All the long-term risks are borne by the road agency. The public procurement and asset disposal act 2015 laws of Kenya gives effect to article 227 of the constitution which provides for a system that is fair, equitable, transparent, competitive, value for money and cost-effective. Due to raising challenges associated with the traditional model of delivering road maintenance services. The common mandate of road agencies is to have a cost-effective mode of managing and maintaining public roads

4. EMPIRICAL REVIEW

Sultana, Rahman, & Chowdhury (2013) did a review of performance-based maintenance of road infrastructure by contracting. In their study, they highlighted issues of interest to road authorities in the context of saving maintenance costs and managing contracting times effectively. The purpose of the paper was to carry out a comprehensive state of the art review of the literature that has been conducted in recent years. The paper analyzed the literature on PBMC and presented examples of developed and developing countries that have been successfully maintaining their road network systems using PBMC as their preferred method of contracting. The study concluded that PBC has a potential of reducing maintenance costs, increasing the quality of works and reducing the chance of corruption in the long run in developing countries are the challenging issues for PBMC, which needs more attention.

Susanti, Wirahadikusumah, Soemardi, & Sutrisno (2016) investigated the impact of performance based contract implementation on national road maintenance project to road functional performance in Indonesia. This study aimed to measure the impact of PBC implementation on the national road maintenance project in Indonesia with the type of flexible pavement. The impact of PBC was focused on functional performance, which was measured using a model of IIRMS and expressed in the international roughness index (IRI) value. The case study was conducted on one of the PBC pilot projects that were in the segment of the northern coast of West Java. The results showed that the implementation of PBC for national road maintenance projects proven to ensure the quality and road service performance for the long term.

Takim & Akintoye (2002) conducted a study on performance indicators for successful construction project performance in the United Kingdom. The study identified key performance indicators that were to be used as parameters for benchmarking projects, in order to achieve a good performance. The study identified seven project performance indicators, namely: construction cost, construction time, cost predictability, time predictability, defects, client satisfaction with the product and client satisfaction with the service; and three company performance indicators, namely: safety, profitability and productivity. The study affirmed that successful construction project performance can be achieved if these performance indicators are taken care of.

Schoenmaker & de Bruijn (2016) investigated the complexity in performance-based contracts for road maintenance. The purpose of this paper was to answer the question of how to achieve as much as possible the expected advantages of PBC while limiting the possible disadvantages and explore how PBC of maintenance can be improved. This study investigated the strategies of the English Highways Agency and the Dutch government when outsourcing the maintenance of their existing road infrastructures and the effects of their strategies. The paper found out that road agencies should focus on the process of interaction of the main actors involved, rather than the performance measurement systems (PMS) itself. It recommended that the road agencies should adjust their governance to the degree of uncertainty. PBC requires an informed and knowledgeable principal.

Glas & Kleemann (2017) did a study on performance-based contracting: Contextual factors and the degree of buyer-supplier integration in Germany. This paper aimed to provide a deeper understanding of the contextual factors of PBC and how providers assess them. This paper conducted a multiple-case study evaluation and analyzed data from 21 cases. Risks, opportunities and contextual factors were identified through interviews, and the case data were analyzed with several methods, including border count and cross-tabulation. The results showed that the most important factors of PBC are clear responsibilities, clear performance indicators, transparent measurement, cooperative culture and a precise utilization profile of core assets. Surprisingly, incentives were of minor perceived relevance. The analysis supported the differentiation of PBC into two subcategories: lean (low integrated) and customized (high integrated) PBC.

Sultana, Rahman & Chowdhury (2012) did an investigation on performance based maintenance of road infrastructure by contracting: A challenge for developing countries. The paper discussed and analyzed the problems and difficulties in the successful implementation of PBMC in developing countries. The study concluded that a strong road infrastructure system is the backbone of poverty eradication and maintaining a sustainable socio-economic structure in developing countries. It found out further that PBMC is a new concept designed to resolve the problems related to traditional methods of contracting and has significant potential to improve the maintenance and management of road infrastructure.

Anastasopoulos, Mc Cullough, Gkritza, Mannering & Sinha (2009) did a research on cost savings analysis of performance-based contracts for highway maintenance operations. The paper presented a methodology to estimate the likelihood and amount of cost savings associated with the application of PBC for highway maintenance operations. Using data on maintenance contracts from around the world, it developed models that can be used to compare several contracting methods and include variables such as contract duration, activity type, and contract size. The results revealed that large projects with strong competition, long duration and extension periods, long outsourced road sections that incorporate crack sealing, pothole repair, illumination repair/maintenance, and mowing activities, favor outsourcing under PBC.

Mochtar, Parung, Patanduk, & Ali (2006) did an investigation on risk analysis for performance based contracting on the road construction work in Indonesia. The purpose of this study was to identify and analyze risks that occur and its influence on the PBC project performance. The study was conducted using the survey method where questionnaire as data collection instruments was distributed to the parties involved in the PBC projects in Indonesia, either the contractors or the owners. The results showed that form of the 15 most important risks that highly influence on the PBC performance, most of them were borne by the contractor. The study concluded that The PBC is applied to establish a condition that

encourages contractors as providers of construction services to be able to properly manage risk, where during the time, the risk that caused by poor quality work of service providers has been always being a risk of project owners. But in the PBC, this risk will be under contractors' responsibility.

Radović, Mirković, Šešlija & Peško (2014) focused on output and performance based road maintenance contracting: a case study of Serbia. The paper described the main features of contract work for road maintenance and improvement under the output and performance-based contracting for roads (OPBC). Experiences in the application of such contracts for the roads were reviewed. The results showed that Road agencies that have adopted an OPBC approach have achieved cost savings from 10 % to 40 % compared to traditional method-based contracts. It also found out that during the period 2004 – 2008, Serbia implemented the output performance-based maintenance Contract (OPBC) for routine road maintenance pilot project within transport rehabilitation project financed by World Bank.

Imi & Gericke (2017) did an investigation on output-and performance-based road contracts and agricultural production: evidence from Zambia. The paper examined the impacts of output- and performance-based road contracts on agricultural production where output- and performance-based road contracts are an instrument to ensure the sustainability of road maintenance. Contractors are required not only to improve roads but also to maintain them. The results showed that the contracts have a significant impact on crop production. The paper also found that the measured impacts are associated with actual road maintenance works, regardless of contractual methods. Any road work can improve people's connectivity, even if it is not an output- and performance-based road contracts. The impact of the contracts is catalytic: more road works were implemented on contract roads than non-contract roads. This was an important contribution to the sustainability of road maintenance. Finally, road improvement works were found to facilitate farmers' market participation, but the impact seemed weak.

Lancelot (2010) did an investigation on performance based contracts in the road sector: towards improved efficiency in the management of maintenance and rehabilitation-Brazil's experience. The study aimed at providing feedback on Brazil's successful experience in using performance based contracts in the rehabilitation and maintenance of the road networks. It highlighted the context which led to the introduction of PBC in the road sector and the strategic orientations adopted in their structuring. It also provided an evaluation of the positive achievements resulting from these contracts. The results of the study showed that the evaluation, comparing objectively performance based contracts to the traditional input-admeasurements approach, shows that PBC brought an overall improved efficiency to the road sector, which translated to better road conditions at lower costs for the governments and reduced management burdens on the administrations.

Kashiwagi, Bari & Sullivan (2003) carried out a study on the application of performance based system in the pavement contracting in America. This study aimed at establishing the efficiency of performance based contracting in pavement management in America. The study was motivated by the low bid contracting system which had difficulty in addressing performance issues. The current contracting practices in the pavement industry were critically investigated and were ranked according to their mode of practice. The results showed that performance information procurement system (PIPS) and design-build-maintain (operate) came out as the two highest ranking contracting systems, respectively. The study envisioned that the pavement industry could improve paving quality by continuing to test and implement best-value systems.

Carpenter, Fekpe, & Gopalakrishna (2003) carried out an investigation on performance-based contracting for the highway construction industry- an evaluation of the use of innovative contracting and performance specification in highway construction. The research synthesized information on the shortcomings and limitations of traditional methods of highway construction and maintenance contracting and identified new and innovative alternatives. The findings were based on a literature review and a survey of officials of the state departments of transportation, representatives from the highway construction industry and experts in highway construction management. The findings suggested that any contracting approach that departs from the traditional design-bid-build approach results in construction time reductions, lower costs, and comparable or better quality. It further found out that short warranties are the most common form of innovative contract for highway construction projects. It was concluded that performance-based specifications are easier to implement with innovative contracting approaches in which the risks of ensuring a high-quality product are shifted to the contractor.

Zietlow (2004) did a study on implementing performance-based road management and maintenance contracts in developing a countries an instrument of German technical cooperation. The article provides an overview of the scope and the experiences gained with performance-based road management and maintenance contracts in Latin America as well as in other continents and gives recommendations for the implementation of future contracts. The conclusions were that most of the performance contracts have left the pilot project stage and have matured over the period of 6 to 8 years. In general, the experiences have been very good, which is reflected in the fact that countries like Argentina or Uruguay are now managing and maintaining more than 50% of their national road network with this new kind of contracts. Based on the experiences gained with the Performance Contracts in Latin America, it was concluded that performance contracts should be long enough to include at least one periodic maintenance application in order to maximize the potential benefits.

The works reviewed above on performance based contracting were inconclusive as regards its effects on road agency performance. A majority of the studies delved on the advantages of performance based contracting (Sultana, Rahman, & Chowdhury 2013; Schoenmaker & de Bruijn, 2016). Susanti, Wirahadikusumah, Soemardi, & Sutrisno (2016) investigated the impact of performance based contract implementation on national road maintenance in Indonesia. Glas & Kleemann (2017) in their study just aimed to provide a deeper understanding of the contextual factors of PBC and how providers assess them. Sultana, Rahman & Chowdhury (2012) merely discussed and analyzed the problems and difficulties in the successful implementation of PBMC in developing countries and they also conducted an overview of issues to consider before introducing performance-based road maintenance contracts. Lancelot (2010) in his study just aimed at providing feedback on Brazil's successful experience in using performance based contracts in the rehabilitation and maintenance of the road networks but did not link that experience with agency performance Zietlow (2004) also provided an overview of the scope and the experiences gained with performance-based road management and maintenance contracts in Latin America as well as in other continents and gave recommendations for implementation of future contracts. He also failed to examine how contractor performance can be linked to such experiences. From the analysis of the above-outlined studies, it is clear that no attempt has been made to link to road agency performance.

5. PERFORMANCE BASED CONTRACTING AND ROAD AGENCY PERFORMANCE

The study conceptualised that road agency performance in Kenya is a function of performance based contracting (PBC). Performance based contracting was measured in terms of performance indicators and fixed-price contracts. Similarly, a multiple regression was hypothesised and the construct scores were estimated by obtaining the average response score of all items per case under each construct. The results were as shown in the table below:

Table 1.0. Effect of Performance Based contracting on Performance of Road Agencies in Kenya

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.				
(Constant)	1.639	.100		16.422	.000				
Performance indicators	.146	.036	.252	4.095	.000				
Fixed price contracts	.353	.031	.709	11.533	.000				
Model	R	R Square	Adjusted R Square	Std. Error of the	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.912 ^a	.832	.829	.18642	.832	250.391	2	101	.000
a. Predictors: (Constant), Performance indicators, Fixed price contracts									
a. Dependent Variable: Road assets management									

Source: Survey Data 2018

The positive unstandardised coefficients for performance indicators and fixed price contracts indicate that a unit percentage change in performance indicators is likely to lead to road agency performance by 0.146% while a unit percentage change in fixed price contracts is likely to lead to a change in road agency performance by 0.353%. The results further revealed that PBC in road maintenance accounts for 83.2% of road agency performance in Kenya. The analytic model for the above relationship is shown below:

Road agency performance = 1.639 + 0.146 performance indicators + 0.353 fixed price contracts

The results that the use of performance indicators and fixed price contracts are positive and significant predictors of road agency performance are in agreement with the findings of the study by Takim & Akintoye (2002) on performance indicators for successful construction project performance in the United Kingdom. The study identified key performance indicators in the construction sector as construction cost, construction time, cost predictability, time predictability, defects, client satisfaction with the product and client satisfaction with the service; and three company performance indicators, namely: safety, profitability and productivity. The study affirmed that successful construction project performance can be achieved if these performance indicators are taken care of.

Similarly, the results that PBC is a positive and significant predictor of road agency performance concurred with the findings of a study by Sultana, Rahman, & Chowdhury (2013) who did a review of performance based maintenance of road infrastructure by contracting and they concluded that PBC has a potential of reducing maintenance costs, increasing the quality of works. Susanti *et al* (2016) also found out in their study that the implementation of PBC for national road maintenance projects proven to ensure the quality and road service performance for the long term. In a survey of the output and performance based road maintenance contracts in Serbia, Radović, Mirković, Šešlija & Peško (2014)

described the main features of contract work for road maintenance and improvement under the output and performance-based contracting for roads (OPBC). Experiences in the application of such contracts for the roads were reviewed. The results showed that Road agencies that have adopted an OPBC approach have achieved cost savings from 10 % to 40 % compared to traditional method-based contracts.

According to Lancelot (2010) in an investigation on performance based contracts in the road sector in Brazil, PBC brought an overall improved efficiency to the road sector, which translated to better road conditions at lower costs for the governments and reduced management burdens on the administrations or better quality. Carpenter, Fekpe, & Gopalakrishna (2003) concurs in his review of the literature by suggesting that in highway construction management, any contracting approach that departs from the traditional design-bid-build approach results in construction time reductions, and lower costs.

6. CONCLUSION

From the findings of this study, it can be concluded that performance based contracting as a practice in road maintenance has a significant contribution to the performance of road agencies in Kenya. Similarly, performance indicators and fixed-price contracts explain the performance of road agencies (KeNHA, KERRA, KURA) either individually or combined. An enhancement in the adoption and use of PBC by road agencies would ultimately lead to an improvement in the performance of road agencies in terms of attainment of expected deliverables at a reduced cost and within a short time.

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