

# Public Private Partnerships

## CIB TG72 /ARCOM DOCTORAL RESEARCH WORKSHOP

Wednesday, 12<sup>th</sup> October 2011  
University of Central Lancashire, United Kingdom

**Editors:**  
Professor Akintola Akintoye  
Dr Champika Liyanage  
Dr Suresh Renukappa



University of Central Lancashire



International Council  
for Research and Innovation  
in Building and Construction

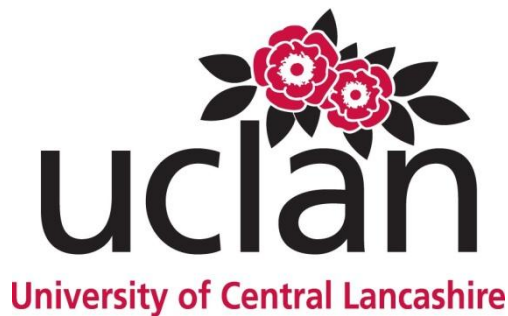


TG72 - Public Private Partnership



Association of Researchers in Construction Management





Proceedings of the

**CIB TG72 /ARCOM  
Doctoral Research Workshop**

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Dr Champika Liyanage  
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Organised by

School of Built and Natural Environment,  
University of Central Lancashire,  
Preston, PR1 2HE, United Kingdom.



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School of Built and Natural Environment,  
University of Central Lancashire,  
Preston, PR1 2HE, United Kingdom.

Tel: + 44 (0) 1772 895785

Fax: + 44 (0) 1772 892916

Email: [schoolbne@uclan.ac.uk](mailto:schoolbne@uclan.ac.uk)

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UNIVERSITY OF CENTRAL LANCASHIRE

# FOREWORD

In many developed and developing countries there has been a move toward increased reliance on Public Private Partnerships (PPPs) for infrastructure development. This involves an engagement with, or participation of, private companies and the public sector in the financing and provision of infrastructure. In most countries these PPP arrangements have been aimed at overcoming broad public sector constraints in relation to either a lack of public capital; and/or a lack of public sector capacity, resources and specialised expertise to develop, manage, and operate infrastructure assets.

Public Private Partnerships are now commonly used to accelerate economic growth, development and infrastructure delivery and to achieve quality service delivery and good governance. The spectrum of nature and types of public private partnerships (PPPs) are overwhelming, making a definition of a PPP difficult. In addition, there have been tremendous developments in the use of PPP in many countries that has made it increasingly important to understand these practices.

Given the changing economic, social and political environment, coupled with globalisation and budgetary constraints, PPP has become unavoidable and indeed desirable in many countries worldwide. The need for PPP in many countries has been exacerbated by the public sector's recognition of the vital role of modern infrastructure in economic growth.

PPPs are now accepted as an important avenue for funding major public sector infrastructure projects. PPPs are joint ventures in which business and government co-operate, each applying its strengths to develop a project more quickly and more efficiently than government could accomplish on its own. The private sector may be responsible for the designing, financing, constructing, owning and/or operating the entire project. The private sector may want to be assured that the public-private partnership structure is designed to provide competitive rates of return commensurate with a financial rate of return that they could earn on alternative projects of comparable risk.

This doctoral workshop provides an opportunity to explore on-going research across diverse issues of PPP. The research presentations will facilitate discussions on aspects of research methodological approaches, data collection and analysis, perceived research outcomes and contributions to the body of knowledge, which, while focused on PPP, will also interface with related knowledge domains in procurement and performance.

Nine papers are presented in the workshop proceedings. Three of the papers deal with elemental issues of PPPs such as safety, risk and value for money. Three other papers present the need for PPP implementation in Nigeria for transport projects, housing projects and for construction craft careers. The final three papers talk about mechanisms in dealing with core issues of PPPs such as public services reformed agendas, underinvestment in PPPs and performance. Likewise, all the papers present a wide range of issues surrounding PPPs.

Finally, we are indebted to the organising committee and scientific committee in making this workshop a success. The refereeing provided by the scientific committee was pertinent and useful, which helped authors to sharpen their papers.

Akintola Akintoye and Champika Liyanage  
University of Central Lancashire

## **ORGANISING COMMITTEE**

Professor Akintola Akintoye, CIB TG72 joint co-ordinator, University of Central Lancashire, U.K.

Professor Paul Stephenson, ARCOM workshop convenor, Sheffield Hallam University, U.K.

Professor Mohan Kumaraswamy, CIB TG72 joint co-ordinator, The University of Hong Kong, Hongkong.

Prof. Jack Goulding, Centre for Sustainable Development, University of Central Lancashire, U.K.

Dr Champika Liyanage, University of Central Lancashire, U.K.

Dr Suresh Renukappa, University of Central Lancashire, U.K.

### **This is a joint doctoral research workshop of:**

International Council for Research and innovation in Building and Construction (CIB): Public Private Partnership Task Group (TG72)  
<http://www.cibworld.nl>

and

Association of Researchers in Construction Management (ARCOM)  
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# CIB TG72/ARCOM Doctoral Research Workshop Programme

**Date:** Wednesday 12 October 2011

**Venue:** HB123, Harris Building, University of Central Lancashire, Preston, England, U.K.

09.00 - 09.30	<b>Registration and Tea/Coffee</b>
09.30 - 09.35	<b>Introduction</b> by Prof. Paul Stephenson, Sheffield Hallam University, U.K. and Prof. Akintola Akintoye, Dean, School of Built and Natural Environment, University of Central Lancashire, Preston, U.K.
09.35 - 10.15	<b>Keynote speech</b> by Dr. Sheila Farrell, Visiting Professor, Imperial College London, U.K.
<b>Presentation Session 1 – Facilitator Dr. Champika Liyanage, University of Central Lancashire, Preston, U.K.</b>	
10.15 - 10.30	<b>PFI – Why value for money remains elusive?</b> by Andrew Arewa – University of Bolton, Bolton, U.K.
10.30 - 10.45	<b>Implementation of safety based incentives in PPPs - An empirical analysis for the case of Spain</b> by Thais Rangel – Technical University of Madrid, Spain.
10.45 - 11.00	<b>Identifying demand risk in PPP infrastructure projects</b> by Rajaa Alasad – Heriot-Watt University, Edinburgh, U.K.
11.00 - 11.30	<b>Discussion for Session 1</b>
11.30 - 11.45	<b>Break - Tea/Coffee</b>
<b>Presentation Session 2 – Facilitator Prof. Jack Goulding, University of Central Lancashire, Preston, U.K.</b>	
11.45 - 12.00	<b>Identifying and tackling problems militating against youth interest in construction crafts careers – Panacea for effective PPP implementation in Nigeria</b> by Ezekiel Awe – Sheffield Hallam University, Sheffield, U.K.
12.00 - 12.15	<b>PPP Approach : Panacea to urban housing inequalities in developing counties – A case study of Nigeria</b> by Akanbi Oyebanji – University of Central Lancashire, Preston, U.K.
12.15 - 12.30	<b>A critical appraisal of road transport infrastructure management in Nigeria</b> by Alaba Adetola – University of Central Lancashire, Preston, U.K.
12.30 - 13.00	<b>Discussion for Session 2</b>
13.00 - 13.45	<b>Break - Lunch</b>
13.45 - 14.15	<b>Keynote speech</b> by Prof. David Eaton, University of Salford, Salford, U.K.
<b>Presentation Session 3 – Facilitator Prof. Paul Stephenson, Sheffield Hallam University, U.K.</b>	
14.15 - 14.30	<b>Changing in reform agendas and PPPs</b> by Santi Jintamanaskoon – University of Manchester, Manchester, U.K.
14.30 - 14.45	<b>Mechanisms to prevent underinvestment in PPPs</b> by Robert Argen – Lund University, Sweden.
14.45 – 15.00	<b>PFI: Robustness model</b> by Gerald Sundaraj – University of Salford, Salford, U.K.
15.00 - 15.30	<b>Discussion for Session 3</b>
15.30 - 15.45	<b>Break – Tea/Coffee</b>
15.45 - 16.30	<b>PhD surgery and Closing remarks</b>

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# **THE PRIVATE FINANCE INITIATIVE: WHY VALUE FOR MONEY REMAINS ELUSIVE**

**Andrew Arewa and Peter Farrell**

*Department of the Built Environment and Engineering,  
University of Bolton, Bolton. BL3 5AB*

*Email: aa1gta@bolton.ac.uk*

It is argued that governments alone are not able to procure the volume of infrastructure required to establish and maintain sustainable communities. PFI is used as a tool to develop projects that would otherwise not come to fruition. It seems to be promoted by political parties in power, but criticised by those in opposition. The continuing debate is about value for money, and whilst attempts are made to measure this facet, definitive judgments seem elusive. High bidding costs, including legal and consultancy fees are deterrents to the use of PFI. Evidence suggests that PFI provides greater cost and time predictability than other procurement routes. Whilst there are many flagship examples of resounding success, there are also some high profile failures. This study is based on a literature review. It assesses key facets of the PFI process, such as value for money and governments' addiction to the PFI ethos. There is an appraisal of competing views in an international context, and a review of whether some types of projects are more suited to PFI than others. The paper forms part of an ongoing PhD study to appraise investment in health and safety in a variety of procurement routes.

Key words: PFI, procurement, value for money.

## **INTRODUCTION**

The use of the Private Finance Initiative (PFI) to deliver infrastructure in the UK has come to stay because governments alone cannot provide the needed volume of infrastructure. PFI is a major project delivery method that is in vogue. It seems to be promoted by politicians in power and a debate about value for money appears to be ongoing.

According to Barrie and Mitchell (2011: 6) PFI has proven to be an effective vehicle for the transfer of delivery and operation risk to the private sector. In addition, recent project audits conducted by the National Audit Office (NAO 2010a: 3-7) have demonstrated that PFI projects have much greater certainty

of timely delivery, increased customer focus and success in transferring risk associated with the cost of construction and operation. The UK Treasury Select Committee (2011: 58) stated that 'for too long PFI has been the only game in town' meaning governments are addicted to the use of PFI contracts. Perhaps, this addiction is necessitated by the need to integrate 'build-operate, maintain and transfer' concepts and the 'debt' off balance sheet ethos.

The PFI model has earned itself a firm place in the public procurement toolkit based on the evidence of successful delivery (Marique 2011: 2 and Barrie and Mitchell 2011: 3-4). The Confederation of British Industry (CBI 2011) asserted that 'PFI has enabled a great number of infrastructure/projects to be delivered that, otherwise would not have been possible using traditional procurement methods'. The CBI report further claimed that 'between 2000 and 2010, over 500 PFI projects reached financial close and over 120 hospitals were built'. In terms of future opportunities, Infrastructure UK (2011) stated that an 'estimated £200 billion of investment is required over the next five years and, with public finances under pressure, it is of paramount importance that private finance can be leveraged to fund new projects'.

However, the use of PFI to deliver needed infrastructure, has been fiercely criticised. The criticisms appear to come mainly from those in opposition political parties and trade unions. The major issue is that the initiative is not providing value for money, coupled with its inflexibility and unclear processes involved in contracts (Triggle 2010). In addition, the British Medical Association (BMA 2011: 4) stated that 'the structure of PFI makes it difficult to evaluate risk'. Pearson (2009) and Gardiner (2010) claimed that, in the UK, £245 billion has been spent on UK infrastructure using PFI between the years 1997 to 2010. Comparatively UNISON (2010: 4) and the UK Treasury Select Committee (2011: 29-32) further averred that, cost estimates are more expensive, than if infrastructure were to be procured using alternative traditional procurement means. Monbiot (2010) referring to excessive profit made by PFI contractors in an article titled 'The UK's Odious Debts' asserted that, 'as the new public spending data released by the government show, a £267 billion bill has been both ring-fenced and index-linked to offset PFI debts.

Recently Globalise Resistance (GR 2011) claimed that one notable case where a PFI contract failed to provide value for money is the M25 motorway widening project in London. A review of the project shows that £50 million of the capital cost was spent on consultancy, out of the original proposed cost of £660m (Gardiner 2010). The main reason given for this astonishing cost is that, the deal was done during 2008/09 economic meltdown; as a result,

banks were taking a risk-averse view. It could be argued that, the construction of the M25 was not in any way more risky at that stage than in the period of consultations. Furthermore, the NAO (2010) asserted that, the eighteen months' delay in preparing and finalising the widening of the procurement arrangement meant the contract was late in May 2009 at the height of credit crisis, which led to net present costs of £3.4 billion.

Despite stern criticism about PFI not providing value for money, its use as a form of project delivery is on the increase (UK Treasury Select Committee 2011: 40-46). Perhaps, PFI has become an easy vehicle used to provide needed infrastructure, and a tool used by governments/politicians to boost political image. According to the BMA (2011: 3) 'a powerful motivation for Government's approval of PFI over the years is that, it enables the Treasury to borrow money without the debt appearing on the public balance sheet'. In contrast, Stewart (2011: 27) argues that 'the reason for the Treasury's comparative zeal for PFI has less to do with taking debt off the government balance sheet' but has everything to do with transferring of operational and financial risk to the private sector. Stewart (2011) further emphasised that a good example of how wrong traditional public projects can go is the Edinburgh Tram project which was originally estimated to cost £375m but has risen to £770m plus hefty additional interest costs, with a revised completion target from 2011 to 2014. Regardless of the circumstances surrounding PFI, some other countries like Australia and Canada have fully embedded PFI into government procurement portfolios (HM Treasury 2009 and Love et al 2008). Thus, PFI as a form of procurement has had a lengthy and somewhat chequered history (Miller et al 2009 and Morledge et al 2006), principally due to the number of parties attempting to exploit the concept in a rather cynical way (Morledge et al 2006 and Uher 1999).

Apparently, not all PFI projects fall short of not providing value for money (KPMG 2011, Pollack 2000 and 2011: 4-5). The CBI (2011: 6) argues that 'PFI is suitable for large projects, which justify the comprehensive commissioning process that is typical of this model. It is less likely, to be appropriate for projects with a capital value under £30 million'. There are lists of various projects where PFI has been confirmed to provide great value for money. For instance, the NAO (2010a: 8) claimed that, most of the PFI contracts for hospitals investigated recently show that, they were well managed and provided good value for money. In terms of satisfaction derived from using PFI facilities, NAO (2010a) stated that '...low level of periodic payments and high levels of satisfaction indicate they are currently achieving/providing value for money....'.

The much ado about PFI not providing value for money seems to concentrate on the capital cost of PFI projects with little or no considerations for other value propositions such as satisfaction, efficiency and effectiveness of facilities. Newville et al (2007) asserted that, the value concerns for projects are predicated on three components: construction cost, operation/maintenance cost and operational benefit/revenues of such projects. Furthermore, a study by McKee et al (2006) which examined cost effectiveness of PFI projects in relation to construction costs reveals that PFI projects provide real value for money. Conversely, the recent UK Treasury Select Committee (2011: 35) claimed that, PFI projects are 'poor value for money'. Also, UK Local Government Lawyers (UKLGL 2011: 1-2) referring to the UK House of Commons Public Accounts Committee (2009) stated that, investigation of 76 operational PFI hospitals in England and more than 13,000 homes shows that, there is 'no clear evidence on whether PFI offers value for money'.

In terms of maintenance and performance of PFI projects after construction, Van and Koppenjan (2001), Newville et al (2007: 2) and Khanom (2009) all agreed that, PFI projects (facilities) perform satisfactorily after construction. Their findings were based on the fact that, PFI contracts compel contractors (private consortiums) not only to build infrastructure but maintain it during the concession period as well, before handing it back to the principle partner. With such an arrangement, it is therefore in the interest of the private consortium to strike a balance between spending money upfront for a strong and healthy infrastructure, and to spend money later on intensive maintenance of infrastructure during the concession period. In addition, Barrie and Mitchell (2011: 1) opined that, PFI can be extremely effective for the delivery of services.

## **LITERATURE**

That PFI may not be considered a form of construction procurement has generated strong debate in recent time. Hitherto, is still not clear, though its use as a form of construction project delivery method seems indispensable (Hodge and Greve 2007: 545 - 558, Khanom, 2009 and UK Treasury Select Committee, 2011: 35). The evolution that engulfs procurement practice in the construction industry in the past fifty years is believed to be driven by construction clients. These clients (government) from time immemorial have always found a way to ensure their demands in terms of infrastructure development are met (Murdoch and Hughes, 2008: 96-110).

Appiah et al (2010: 3) and Turner (1998: 9) asserted that, the ever changing needs and characteristics of clients have made practitioners in the construction field to develop various ways of getting projects done to suit

individual client. It has been established that, the way a project is procured dictates its success, as well as the value for money of such projects (Bennett and Grice 1990, Morledge, et al 2006). This has also influenced the view of researchers as to what procurement of a project actually entails, which has made the topics 'construction procurement' and 'PFI' complex and difficult to understand (Hughes et al, 2006). Although, it is comparatively hard to determine what entails a successful project or what parameters makes up value for money in projects, client satisfaction is increasingly seen by all concerned as a measure for project success. Arguably, client satisfaction is another contextual issue that is hard to elucidate.

One intriguing aspect of PPP and PFI is that, both are used as tools for managing construction projects. Perhaps governments is exploring and looking for means of transferring risk, at the same time providing infrastructure to the public, without having to pay huge amount initially, for the facility. The dominant theme about PPP and PFI are; they both provide a novel approach to delivering goods and services to citizens, and the novelty being the mode of managing and governing (Hodge and Greve 2007: 545-558. ). This implies that politic is highly associated with both. One definition of PPP which gives it a clear distinction from PFI is provided by Van Ham and Koppenjan (2001: 598) which identified PPP as 'cooperation of some sort of durability between public and private actors in which they jointly develop products and services and share risks, costs, and resources which are connected with these products through an institutional lens'. PPP is more like a partnering arrangement in that, the parties involved have to bear parts of the project risks. Klijn and Teisman (2000 and 2005) and Khanom (2009) asserted that, the spirit of "win-win" is evident in PPPs compared to PFI. In addition, the UK Commission for Public Private Partnerships (2001) described PPPs as 'sustainable cooperation between public and private actors in which joints and/or services are developed and wherein risks, costs and profits are shared'. Arguably, the focus on co-operation in PPP which may not be found in PFI is to ameliorate the many problems that arise from the often highly competitive and adversarial practices within the construction industry especially in PFI contract (Klijn and Teisman 2000/2005 and Salamon 1995). Though the differences between PFI and PPP may not be too clear, Table 1 attempts to draw a clear distinction between them.

According to Takim and Akintoye (2002: 552) 'It is difficult to give an unequivocal verdict on the success or failure of a project, as some criteria are successfully met while others are not.' Likewise, benchmarking value for money in PFI projects can be ambiguous and extremely complicated if all parameters are not studied carefully. Moreover, different views of stakeholders in the development of construction (PFI projects) may explain

the reason why the theme value for money remains elusive. The overall objective for developing a robust benchmarking framework for PFI projects vis-à-vis value for money concern should take into account client satisfaction, project cost, risk transfer and performance of facilities.

Table 1: differences between PPP and PFI adapted from Salamon (1995), Van Ham and Koppenjan (2001) and Klijn and Teisman (2000 and 2005)

PFI	PPP
Financial contribution prior to PFI project are purely private sector business	In terms of capital: there is usually an arrangement on a percentage ratio amount to be contributed by both parties, say on a percentage of 51% to 49% public to private sector contribution.
Collaboration is minimal private sector rule is more pronounced because they are in charge	Collaboration is a common feature and is clearly noticed
In terms of value for money: controversial and difficult to define	In terms of value for money: there is less argument when it comes to VFM
In terms of overall project cost: generally believed to be expensive	Project cost is mutually agreed upon because win-win is the name of the game.
Origin of PFI: arguably criticism of traditional forms of procurement gave birth to PFI	Origin of PPP: arguably criticism and reforms to PFI gave birth to PPP
Risk: financial risks are usually shared on agreed percentage	Financial risk is usually private sector business
Concession period span between 25 - 30 years.	Concession periods vary considerably depending on agreement

Authoritative sources such as Fryer (2004: 291-299), Hughes et al (2006) and Eriksson et al (2008) have argued that, it is not only inefficiencies and cost of projects on the parts of traditional procurement methods that have brought about changes noticed in today's construction procurement. In line with this argument Miller et al (2009) asserted that emerging market drivers such as, climate change policies, infrastructure investment, sustainable communities programs, economic and political reasons may be behind the sporadic changes witnessed in construction procurement in recent times. Therefore it may be argued that, the drive for PFI in recent years is propelled by Governments' obligation to investment on needed infrastructure, though economic and political reasons is probably a contributing factor.



According to Andrew Tyrie, the chairman of the House of Commons Treasury Select Committee (2011), 'PFI means getting something now and paying later'. Fundamentally, PFI is an initiative which helps in procuring basic infrastructure by providing finances and in most cases design, construction and maintenance under an agreed concession period (HM Treasury 2009 and Morledge et al 2006). Basically, the underlying principle behind PFI is to ensure that, risk is transferred from the public to the private sectors 'to take advantage of private sector management skills, incentivised by having private finance at risk' (HM Treasury 2000).

Since the use of PFI in the early 1990s in the UK, the initiative has received overwhelming patronage by governments all over the world. The link of PFI to partnering is one aspect of construction management that has generated robust debate in recent times. Thus far, the use of PFI as a form of partnering has had a protracted and to some extent plaid history, (Miller et al 2009), mainly due to the number of parties attempting to take advantage of the concept (Lonsdale 2011, Morledge et al 2006 and Uher 1999).

The shortcoming against PFI schemes is not peculiar to the UK alone; in Canada and Australia Sanger and Crawley (2009) asserted that PFI projects are five times more expensive to procure when compared to other traditional options. In Canada, a school project at the Université de Québec à Montréal failed; it doubled in cost to the public from C\$200 million to C\$400 million. Also, the west coast highways B.C. Sea-to-Sky Highway cost the taxpayers \$220 million more than, if it were financed and operated publicly (Sanger and Crawley 2009). In Australia, Miller et al (2009) claimed that, PFI projects formed 6 to 10% of public (government) total investment in the years 2006 to 2007. Their findings revealed that, PFI projects have a cost variant that is four times higher in New South Wales of Australia and five times higher in the Victoria region of the country. Compared to alternative procurement methods Miller et al (2009: 17) further stated that, whether this mode of project delivery represents value for money is still a subject of debate.

Arguably, evidence suggests that, some types of public service projects such as schools, roads and prisons may be more suitable for PFI scheme than others (Pollack 2000 and House of Commons Committee, 2001). The basis for justifying this suggestion is anchored on the fact that, there is no demarcation of core and supplementary services compared to hospital projects. This simply enables PFI contractors to do design, build and carry out maintenance without being tied to rigorous hospital and health service bureaucratic bottlenecks. However, GR (2011) has a contrary view by arguing that, it is not the nature of project that matters but the cost

formulation and justification of PFI projects. GR (2011) further argued that, PFI does not represent value for money because it involves higher set-up costs, higher borrowing costs coupled with expensive legal processes involved in getting PFI contracts signed. It is often argued that, the employment of consultants to oversee PFI contract negotiations and initial pre-contract running costs has the tendency of escalating PFI contract cost, up to the turn of 7-15% of total PFI contract value (UNISON 2001, 2003, 2010 and Gardiner 2010).

Nevertheless, using initial construction project cost as sole criteria for judging PFI projects against value for money may not be sufficient. It is imperative to know that, two inherent costs types are bound to arise under PFI contracts, if the issue of value for money is to be critically considered; the cost/risk of construction and the cost/risk of running/maintaining facilities. Regardless of the kind of cost incurred in PFI contracts, the NAO (2010b) report claimed that, there is a guaranteed kind of satisfaction (assured maintenance) derived from the use of PFI projects per se after the construction stage. Therefore, PFI can be said to represent value for money under guaranteed maintenance arrangements. In considering PFI projects against value for money, construction cost should not be the only parameters used. Improvement Network UK (INUK 2010) argued that issue of PFI projects with regards to value for money should be anchored on the balance between economy (cost), efficiency and effectiveness. Thus, PFI value for money can be expressed as:

$$\frac{\text{Total cost (construction/maintenance cost) of PFI projects}}{\text{Satisfaction derived from the use of PFI projects}}$$

Adapted from INUK (2010) and Morledge et al (2006)

Moreover, previous studies shows that, PFI projects are deemed to have greater certainty in the delivery within budget, on time and within specified quality as such, providing value for money (C and AG 2003: 4-7, HC-Committee on Public Accounts 2003 and CBI 2011: 5). However, one argument that, can be easily sustained when it comes to value for money is that, risks are easily allocated to those that are best able to manage them. The process of risk transfer, from public to private sector acts as an essential explanation that PFI does provide value for money.

It could be alleged that, PFI projects are merely a political tool in the hands of politicians. The use of PFI by governments all over the world, particularly promoted by politicians to provide needed infrastructure, appears to cause difficulties in defining and ascertaining whether PFI provides genuine value

for money. Thelwell (2011) and L Express Media (LEM, 2011) in conjunction with UK Channel 4 News (2011) claimed that, the truth about PFI projects with regard to value for money will remain completely elusive in as much as, politicians continue to play politics with PFI projects. Based on this observation, LEM (2011) and Channel 4 News (2011) further asserted that, ‘George Osborne, the UK present chancellor, is pressing ahead with PFI projects on a multi-billion-pound scale despite having dismissed the infrastructure funding mechanism as ‘discredited’ when he was in opposition....’. The research further revealed that the present Conservative Government lead by UK Prime Minister, David Cameron has signed 61 PFI contracts within one year in office. This would seem to illustrate that, opposition political parties seems to carry the banner of PFI not providing value for money.

## **FINDINGS AND CONCLUSIONS**

The literature identifies that, there is considerable debate as to whether PFI contracts/projects provide value for money. The UK Treasury Select Committee (2011: 35-37, 56) asserted that PFI may have delivered many new hospitals and homes which might otherwise not have been delivered, but there is no clear evidence whether PFI is any better or worse value for money than other procurement routes. Whilst, attempts are made to measure this facet, the use of PFI as a form of project delivery method by governments appears to be on the increase (Monbiot 2010). Perhaps, the UK government is addicted to the use of PFI (Thelwell 2011, UK Treasury Select Committee 2011 and Duffield et al 2008). Moreover, the use of PFI contracts by politicians as a political tool to provide infrastructures in order to fulfil political manifestoes seem to contribute to addictiveness and the elusiveness of PFI not providing value for money. The literature highlights high bidding cost, including legal and consultancy fees as limitations to the use of PFI. There are indications suggesting that PFI contracts in hospitals provide good value for money. Also, the literature seems to recognise that, if well practised, PFI contracts have the potential to enhance delivery of needed infrastructure required to achieve sustainable communities.

Due to some constraints, this study was unable to cover all social and economic problems that are currently bedevilling PFI contracts. There is need for further studies to examine other socio-economic hindrances, especially evaluating if PFI debts are to be on or off balance sheets. Other possible areas that need examining are investment and commitment to health and safety by PFI contractors.

PFI contracts have the potential to provide needed infrastructure in a sustainable way if well implemented. Timely project delivery, assured quality and guaranteed maintenance ethos constitute what make PFI contracts suitable for sustainable communities. However, what appears to make some PFI contracts not sustainable is the cost formulation of footing such projects. Thus, restructuring PFI financial arrangements especially risk allocation, throughout PFI project life cycles is essential.

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# IMPLEMENTATION OF SAFETY BASED INCENTIVES IN PUBLIC PRIVATE PARTNERSHIPS (PPPS): AN EMPIRICAL ANALYSIS FOR THE CASE OF SPAIN

**Thais Rangel<sup>1</sup>, José Manuel Vassallo<sup>2</sup> and Blanca Arenas<sup>3</sup>**

*1, 2 Transport Research Centre (TRANSyT), ETSI Caminos, Canales y Puertos, Technical University of Madrid*

*3University Institute for Automobile Research (INSIA), ETSI Industriales, Technical University of Madrid*

*Email: trangel@caminos.upm.es*

Public Private Partnerships (PPPs) are mostly implemented to circumvent budgetary constraints, and to encourage efficiency and quality in the provision of public infrastructure in order to reach social welfare. One of the ways of reaching the latter objective is by the introduction of performance based standards tied to bonuses and penalties to reward or punish the performance of the contractor. This paper focuses on the implementation of safety based incentives in PPPs in such a way that the better the safety outcome the greater larger will be the economic reward to the contractor. The main aim of this paper is to identify whether the incentives to improve road safety in PPPs are ultimately effective in improving safety ratios in Spain. To that end, Poisson and negative binomial regression models have been applied using information of motorways of the Spanish network of 2006. The findings indicate that even though road safety is highly influenced by variables that are not much controllable by the contractor such as the Average Annual Daily Traffic and the percentage of heavy vehicles, the implementation of safety incentives in PPPs has a positive influence in the reduction of fatalities, injuries and accidents.

Keywords: Pubic Private Partnerships, performance based standards, road safety, incentives, motorway concession contract.

## INTRODUCTION

One of the most common ways of implementing PPPs in managing infrastructure is through the concession approach, which consists basically in transferring final design, construction, maintenance, and operation of the

infrastructure to a private consortium, in exchange for which that consortium receives the right to charge a fee to the user or to the government on behalf of the user, for a period of time contractually agreed in advance (Vassallo and Gallego 2005).

One of the key aspects of PPPs is to encourage the private sector to manage and operate the infrastructure in the best way. To that end, in the last few years, PPPs are evolving from mere demand-based contracts (when the revenues of the contractor are related to the traffic demand) to performance-based contracts referred to different aspects such as availability, congestion, state of the pavement, safety, and so on. Consequently, the revenues of the contractor tend to depend more and more to the quality of the services rather than on traffic demand (Harding *et al* 2010).

Two reasons lie behind this trend. First, PPP contractors can manage better the service performance they offer than the traffic flows in the infrastructure. And second, by encouraging the PPP contractors to provide a better service, by aligning the social and the private benefits, they will end up producing a more efficient outcome for society.

Traditionally, most of the infrastructure management contracts, including PPPs, had not introduced explicit incentives to improve quality. However, nowadays most PPP contracts are encouraging the introduction of incentives to foster the contractor to provide an optimal quality level. In this way, the contracts incorporate a set of standards that the contractor must fulfill. If the contractor fails to comply with these requirements, the public authority will penalize the contractor or even rescind the contract. There are two ways of rewarding or penalizing the contractor: incentives related to the extension of the deadline of the project, and incentives related to increase the fee to be paid to the PPP contractor.

This approach has moved many countries to introduce performance based indicators tied to bonuses and penalties in their PPP contracts. Some countries such as United Kingdom, Finland, Portugal and Spain have introduced these kind of incentives.

The aim of this paper is to identify whether the incentives to improve road safety in PPPs are ultimately effective in improving safety ratios with an empirical analysis for the case of Spain. The results show that there are more fatalities, injuries and accidents on road segments without incentives when they are compared with other segments with incentives.

The authors have not found any empirical study about safety incentives offered to the PPP contractors.

## **ANALYSIS OF EXPERIENCES IN THE INTRODUCTION OF ROAD SAFETY INCENTIVES IN EUROPE**

Europe is the world's region with the greater tradition of incorporating performance-based incentives in PPPs. There are few countries with PPP roads that introduce positive incentives based on explicit road safety indicators. These countries where this was done, it became a normal practice and the latest PPP contracts continue to introduce and improve these incentives. This happens in Spain, Finland, Hungary, Norway, Portugal and United Kingdom. Italy introduced price-caps tied to road safety indicators in such a way that the concessionaire is allowed to set higher tolls if the safety ratios are better. In Ireland, PPP road contracts include some road safety indicators but they do not provide bonuses. In other countries, like Denmark, the Netherlands and Belgium, there are new and sophisticated PPP contracts, but they do not have positive incentives based on explicit road safety indicators.

The design of the road safety indicators is quite heterogeneous across different countries. There are differences both in the variable adopted to measure the outcome and in the final formula employed. Most of the PPPs include number of injuries, number of fatalities or a combination of number of light accidents, serious accidents and fatal accidents to build the indicator.

On the other hand, including the exposure to the risk (expressed by traffic) is a generalized practice. Very often, the initial accident data is divided by the annual traffic, usually measured in terms of millions or billions of vehicles-kilometers. E18 road (Muurla–Lohja) in Finland, the M6 road in Hungary, several PPPs in Portugal (the IP-4, for instance) and the latest PPP roads awarded in Spain use this methodology. The advantage of introducing the exposure to the risk (traffic) explicitly is that distortions in road safety results are reduced.

With the same aim, in many other PPP contracts the assessment of the indicator is done by comparing similar roads, in terms of traffic, number of carriageways, etc. With this methodology it is possible to control the global evolution of casualties by many factors, most of them not manageable by the road operator. Some road contracts where the indicator is set in this way are E-18 road (Grimstad – Kristiansand) in Norway, the latest PPP roads awarded in the United Kingdom (for example, A1 & M25) and some PPP roads in Spain (like the M-407 motorway).

Regarding the way of rewarding or penalizing the contractor, it was identified two trends: incentives related to the extension of the deadline of the project, and incentives related to increase the fee to be paid to the PPP contractor.

## **CHARACTERISTICS OF MOTORWAYS IN SPAIN**

Spain has extensive experience in managing and financing motorways through public-private-partnerships (PPPs). Most of the PPPs have been put into effect through concession contracts that have a long tradition in Spanish administrative law. Most of the motorway concessions awarded in Spain have been toll motorways. However, in the last few years, there was a large increase in the number of other PPP approaches, such as shadow-toll or performance-based contracts.

Three different periods regarding the implementation of motorway concessions in Spain can be identified: from 1967 to 1975, from 1976 to 1995, and from 1996 to the present. Between 1967 and 1975, 2,042 km of toll motorways were granted by the central government of Spain. The results of the implementation of concession contracts in Spain during this period were rather controversial. On the one hand, motorway concessions achieved the goal of providing the country with a modern motorway network at a time when the public budget of Spain was not sufficient to afford such a huge cost. On the other hand, the guarantees made by the government to facilitate concessions' funding over time became very costly for the country (Izquierdo and Vassallo 2004).

The second stage of motorway concessions is from 1976 to 1995. In this period, no motorway concessions were awarded. There were several reasons for this. First, the two petroleum crises in the 1970s destabilized the Spanish economy. Second, after Franco's death, the political atmosphere in Spain was uncertain. Third, and most important, the Socialist government, which took office in 1982 and remained until 1996, was politically opposed to promoting private concessions as a means to finance motorways. Instead, the socialist government opted for modernizing the Spanish road network by widening and upgrading the most important roads, turning them into dual-roadway fast lanes. These free motorways were called "*autovías*".

The term "*autovías*" was used in Spain for identifying any free motorway with physically separated lanes in each direction. The first *autovías* in Spain were built by doubling lanes out of single carriageways. The design standards of these motorways (known as first generation *autovías*) had design standards well below those of the toll motorways.

Since 2000, the quality standards in the construction of *autovías* improved notably to make comparable with toll motorways. These are called second generation *autovías*. There is no technical difference between second generation *autovías* and toll motorways. The first generation *autovías* and second generation *autovías* were built, funded and managed by the Spanish government. None of the public motorways (*autovías*) has economic incentives to improve road safety though the government is committed to building and maintaining the *autovías* with socially expected quality standards.

The third stage began in 1996 and continues into the present. In 1996, the conservative Popular Party took office in Spain. The need to contain Spain's public deficit was the most difficult challenge facing the new government. This was the main reason why the new government decided to implement once again the policy of offering concessions so as to encourage the participation of the private sector in financing new transportation infrastructure. From 1996 to now, 1,003 kilometers of new toll motorway concessions have been awarded by the central government of Spain through this approach. Another novelty of the period since 1996 is that not only the Spanish central government, but also the regional and even the local governments have started using the concession approach to implement both toll and shadow-toll motorways.

Most of the PPPs implemented in the last stage include a provision to extend the contract duration up to four years if several performance-based indicators tied to quality aspects like queuing in toll plazas, congestion, state of the pavement, safety, and satisfaction of the users are ultimately fulfilled. Other PPP's awarded recently in Spain also include incentives in terms of annual bonuses to be incorporated to the periodic fee paid by the government to the contactor.

Regarding safety, the PPP contractor can be granted an extension of the contract if safety indicators remain below an accident benchmark for similar roads. To that propose the government measures in a yearly basis the Risk Index (RI) and Mortality Index (MI) of the motorways and compare it with other motorways with similar characteristics in terms of alignment and traffic flow.

## **MODELS THAT EXPLAIN ROAD SAFETY: A LITERATURE REVIEW**

This paper analyzes whether the incentives to improve road safety in PPPs are effective. The statistical models most commonly used to explain the relationship between motor vehicle accidents and a set of predictor variables are the Poisson and NB regression models (Miaou and Lum 1993; Noland and Oh 2004; Chang 2005; Caliendo *et al* 2007).

From an empirical stand-point, the relationship between accident frequency and traffic flows can be found in Jovanis and Chang (1986), Abdel-Aty and Essam Radwan (2000) and Persaud *et al* (2000); and the relationship between accident rate and traffic flow can be found in Vitaliano and Held (1991) and Hauer and Bamfo (1997). The relationship between accident frequency or accident rate and traffic flows show a great variation in their results.

Jovanis and Chang (1986), Abdel-Aty and Essam Radwan (2000) and Persaud *et al* (2000) point out that accident frequency increases with Average Annual Daily Traffic (AADT). On the other hand, Vitaliano and Held (1991) cannot detect any significant increase in the accident rate when AADT increases. According to Hauer and Bamfo (1997) the accident rate even decreases with an increasing AADT.

Few studies have analyzed the effect of heterogeneous flows, and specifically the effect that the presence of heavy good vehicles (HGVs) in the traffic flow has on accidents. Hiselius (2004) analyzed the relationship between accident frequency and traffic flow in four different road types according to speed limit and road width in two conditions: homogenous and heterogeneous traffic. The results show that the expected number of accidents increases less than proportionally with the traffic flow, in the homogenous case. For the heterogeneous case, the expected number of accidents decreases with increasing number of trucks. According to Arenas *et al* (2009), the expected number of accident increases with the addition of one vehicle in AADT, and increases with one additional HGV when comparing high capacity roads to single carriageway roads.

Other studies have been carried out to establish relationships between accidents and the frequency of intersections (Ivan and O'Mara 1997), environmental factor (Fridstrøm *et al* 1995; Shankar *et al* 1995; Chang 2005; Caliendo *et al* 2007), geometric infrastructure characteristics (Hauer, 2004; Chang, 2005), number of lanes (Milton and Mannering, 1998; Noland and Oh, 2004), and speed limits (Fridstrøm *et al.*, 1995; Ossiander and Cummings, 2002). In this paper, Poisson and negative binomial (NB)

regression models were applied to know the relationship between safety incentives and road safety in Spain. This paper focuses on variables related to traffic flow, infrastructure characteristics (intersections), road operation and incentives given to the PPP contractors. The authors have not found any empirical study about safety incentives offered to the PPP contractors.

## DATA FOR THE CASE OF SPAIN

The models that were calibrated in this paper cover the year 2006. We chose this year because it is the most recent year where a complete database is available.

The data used for the empirical model came from two different sources: police-reported accident data supplied by the Ministry of Internal Affairs (Ministerio del Interior, 2006) and traffic data supplied by the Ministry of Public Works (Ministerio de Fomento, 2006). Using these databases it was necessary to build the final database combining both accident data and traffic data. The population for the models were made up of road stretches of the Spanish high-capacity network both PPP motorways (toll motorways) and public motorways (*autovías*).

Some exogenous variables that may potentially influence safety and do not depend on the concessionaire's ability to manage the road were selected. These are: continuous variables such as (1) Average annual daily traffic (AADT), (2) Percentage of heavy goods vehicles (%HGV) and (3) Number of intersections for each stretch (INT) and two selected variables that may explain any relation between PPPs and accidents, (4) Road operation (RO) and (5) Incentives (INC). Furthermore, in order to fit the model it was considered the vehicle exposure ( $vk$ ). It was measured in millions of vehicle-kilometers as  $vk_j = 365 l_j AADT_j / 10^6$ , where  $AADT_j$  and  $l_j$  are respectively the average annual daily traffic and length (km) of road section  $j$  obtained from traffic database.

The number of intersections for each stretch (INT) introduced as discrete value with 2 levels (it takes 1 for stretches with at least 1 intersection and it takes 0 otherwise) was obtained from the Geographic Information System (GIS), the analyses was performed using ArcGis 9.2. Each stretch of the sample was analyzed using the GIS application to count the number of intersections.

Data for Road operation (RO), introduced in models as categorical variable, was obtained from the Traffic map 2006 (Ministry of Public Works). The roadway segmentation is defined by the Ministry of Public Works (Ministerio

de Fomento, 2006b), which can be for the case of the Spanish high capacity network: second generation *autovías* (AV), first generation *autovías* (1AV) or toll motorways (TM). TH are PPPs, AV and 1AV are public motorways.

To know which segments had road safety incentives (INC) it was analyzed each concession contract in force in 2006. The first Spanish concession contract awarded with implementation of road safety incentives was in 2002. All of the contracts from 2002 to 2006 were analyzed. INC is a discrete variable with 2 levels (it takes 1 for stretches with safety incentives and it takes 0 otherwise).

For this study, the dependent variables are the fatal, injury and accident rates. 1,042 road segments were extracted out of a total of 6,293 from the 2006 traffic map, after selection criteria based on complete information for traffic flow and infrastructure variables. It was considered stretches with and without accidents to avoid selection bias. The study includes PPPs (toll motorways) and public motorways (first and second generation *autovías*). For this study was considered only stretches of the Spanish Interurban Road State Network. The final data base represents 62% of the total Spanish high-capacity network. The total number of segments (with and without accidents) and the length by road operation are presented in Table 1.

Table 1. Road segment data

Road operation	Segments						Length (Km)
	N°			%			
	with accidents	without accidents	Total	with accidents	without accidents	Total	
AV	275	287	562	26.39	27.54	53.93	3,790.46
1AV	43	266	309	4.13	25.53	29.66	2,285.02
TM	60	111	171	5.76	10.65	16.41	1,372.24
Total	378	664	1,042	36.28	63.72	100	7,447.72

The descriptive statistics are represented in Table 2. The descriptive statistics indicate that the mean traffic intensity (AADT) is higher on 1AV than AV and TM. The low traffic intensity in TM could be explained because the users pay tolls.

There is more heavy good vehicles traffic in public motorways (AV and 1AV) than PPPs (TM). The range and the standard deviation in AV and 1AV are higher than TM, which indicates more heterogeneity in traffic flow.



Table 2. Descriptive statistics by road operation and total. Year 2006

Variables	Road operation	Mean	S.D.	Range	Minimum	Maximum
<b>AADT</b>	AV	23,686.04	21,875.96	139,040.00	1,270.00	140,310.00
	1AV	35,735.05	34,262.09	186,365.00	5,135.00	191,500.00
	TM	16,508.43	12,950.00	58,093.00	1,094.00	59,187.00
	Total	26,080.92	26,046.31	190,406.00	1,094.00	191,500.00
<b>%HGV</b>	AV	18.53	10.12	72.40	2.80	75.20
	1AV	23.37	8.95	48.10	4.60	52.70
	TM	10.35	5.39	32.60	1.50	34.10
	Total	18.63	10.08	73.70	1.50	75.20
<b>INT</b>	AV	2.08	1.21	8.00	0.00	8.00
	1AV	2.38	1.59	12.00	0.00	12.00
	TM	1.54	0.70	3.00	0.00	3.00
	Total	2.08	1.29	12.00	0.00	12.00
<b>vk</b>	AV	52.28	56.22	451.28	0.42	451.70
	1AV	79.25	70.65	355.89	3.13	359.02
	TM	42.51	42.91	250.19	0.48	250.67
	Total	58.68	60.60	451.28	0.42	451.70

## METHODOLOGY AND RESULTS

Poisson and NB regressions were applied to determine the relationship between fatalities, injuries and accidents and traffic variables, number of intersections for each stretch, road operation and road safety incentives offered to the concessionaire. In this work the response variables are number of fatalities, injuries and accidents.

The Poisson overdispersion parameter indicates that the data may be overdispersed. When Pearson's chi-square divided by the degrees of freedom is greater than 1, the data may be overdispersed, otherwise the data may be underdispersed. All Poisson models presented Value/df greater than 1, therefore it was necessary to test the NB as an alternative model, which enables the variance of the dependent variable to differ from its mean.

The accident rate of the  $j$  segment ( $\lambda_j$ ) is defined as the expected number of accidents ( $E[Y_j]$ ) per million-vehicle km. Therefore the regression model is

then expressed as  $E[Y_j] = \lambda_j vk_j$ , using the log-link function to relate the response to the linear predictor.

The general expression for the estimated model is:

$$\widehat{E[Y_{ij}]} = \exp\left(\widehat{\beta}_0 + \sum_{m=1}^M \hat{\beta}_m X_{mj} + \hat{\beta}_v \ln vk_j\right)$$

With the restriction  $\hat{\beta}_v = 1$

The accident rate is expressed as:  $\hat{\lambda}_{ij} = \frac{\widehat{E[Y_{ij}]}}{vk_j}$

Table 3 summarizes the estimated NB regressions. Each column refers to a model with the endogenous variables and every row to exogenous variables. There is an estimated parameters for each variable. The significance of coefficients was checked using Wald statistic (in bracket), which rejects the null hypothesis that the coefficient is zero with a level of 95% confidence. Different goodness-of-fit statistics were used to select the model such as deviance, log-likelihood and Pearson chi-square statistics. Other measures were also evaluated such as Akaike Information Criterion (AIC) (Akaike, 1974) and the Bayesian Information Criterion (BIC) (Schwarz, 1978).

A criterion for variables inclusion was used by testing the likelihood ratio (LR). In addition, the correlation coefficient between them was prevented.

After analyzing Table 3, it could highlight the following results:

1. Log(AADT) is statistically significant for the fatality, injury and accident rates. The coefficient signs are negative for all models (fatalities, injuries and accidents), suggesting that a greater AADT is associated with lower rates for fatalities, injuries and accidents. This result confirms the hypothesis proposed by Vitaliano and Held (1991) and Hauer and Bamfo (1997) that accident rates decrease when AADT increases.
2. Log(%HGV) was found to be statistically significant for injury and accident models. The coefficient signs are negative for all models. This means that the larger the percentage of heavy good vehicles the smaller the injury and accident rates. This could be related to the speed reduction that heavy vehicles impose to light vehicles on the traffic flow. This result is in line with Hiselius (2004), if this analysis was in terms of number of accidents.

3. INC variable showed the expected negative sign, suggesting that establishing incentives in the PPP contracts is associated with lower rates for fatalities, injuries and accidents. The coefficient signs do not change in all models. This variable was found to be statistically significant for injury and accident models.

4. The INT (intersection) variable showed the expected positive signs suggesting that the increased number of intersections is associated with the increased level of fatalities, injuries and accidents. There are more fatalities, injuries and accidents in stretches with at least one intersection than stretches without intersections. However, this variable was found to be statistically insignificant.

The main reason for the insignificance of INT in the models could be that the kind of roads used for the analysis does not have at grade intersections which are those that most affect road safety. The Spanish high capacity network only has grade-separated intersections. These types of intersections reduce the accident potential due to vertical separation of traffic. This result is in line with the findings of Ivan and O'Mara (1997).

5. RO indicates that there is a differentiated behavior among toll motorways, second generation *autovías* and first generation *autovías*.

Toll motorways (TM) showed the expected negative sign in all models suggesting that there are fewer fatalities, injuries and accidents in toll motorways compared to AV, which is the reference class. In other words, toll motorways managed and operated by the private sector turn out to be safer than free motorways managed and operated by the public sector.

The only odd result that was found in the analysis is that the variable 1AV has an unexpected negative sign suggesting that 1AV has fewer fatalities, injuries and accidents compared to AV. This result is strange because, as mentioned earlier in this paper, first generation *autovías* (1AV) have poorer design standards than second generation *autovías* (AV). The main reason for that is that first generation *autovías* are among the busiest motorways in Spain in terms of traffic so the AADT in these motorways is often close to their capacity and consequently the speed of the flow is lower, which improves safety ratios.

The expressions of fatality, injury and accident rates for different road operations can be determined by the parameters estimated in Table 2. As one example, the equations of toll motorways by segment ( $j$ ) in specific scenarios are:

Toll motorways segments with incentives – without intersection:

$$\hat{\lambda}_{TM_j} = 0.139(AADT)^{-0.106}(\%HGV)^{-0.507} = 0.015$$

Toll motorways segments with incentives – at least 1 intersection:

$$\hat{\lambda}_{TM_j} = 0.164(AADT)^{-0.106}(\%HGV)^{-0.507} = 0.018$$

Toll motorways segments without incentives – without intersection:

$$\hat{\lambda}_{TM_j} = 0.357(AADT)^{-0.106}(\%HGV)^{-0.507} = 0.040$$

Toll motorways segments without incentives – at least 1 intersection:

$$\hat{\lambda}_{TM_j} = 0.423(AADT)^{-0.106}(\%HGV)^{-0.507} = 0.046$$

Table 3. Negative binomial regression models for fatalitites, injuries and accidents

Variables	Measureme nt level		FATALITIE S	INJURIE S	ACCIDENT S
Intercept			0.936 (0.403)	0.334 (0.269)	-0.677 (0.947)
Log(AADT)	S		-0.700 <sup>a</sup> (37.977)	-0.157 <sup>a</sup> (10.016)	-0.106 <sup>b</sup> (4.031)
Log(%HGV)	S		-0.084 (0.236)	-0.470 <sup>a</sup> (37.863)	-0.507 <sup>a</sup> (37.781)
INC	C	stretch with incentives	-0.818 (0.552)	-0.676 <sup>c</sup> (2.670)	-0.943 <sup>b</sup> (3.946)
INT	S		0.817 (2.360)	0.125 (0.629)	0.167 (0.880)
ROAD OPERATION	C	TM	-0.461 (2.954)	-0.398 <sup>a</sup> (11.809)	-0.351 <sup>a</sup> (7.562)
		1AV	-0.511 <sup>b</sup> (6.545)	-0.405 <sup>a</sup> (23.900)	-0.423 <sup>a</sup> (22.610)
Log(vk)	S		1	1	1
Deviance (D <sup>p</sup> )			579.862	2,562.148	1,933.346
Pearson Chi-Square (X <sup>2</sup> )			1,669.727	4,202.451	2,784.678
Log Likelihood			-486.091	-2,462.047	-1,978.212
AIC			986.183	4,938.093	3,970.424
BIC			1,021.121	4,973.032	4,005.362
Overdispersion parameter (k)			1.546	3.891	2.578

Measure level: Scale (S), Categorical (C)

<sup>a</sup> p<0.01

<sup>b</sup> p<0.05

<sup>c</sup> p<0.10

From these expressions it can observe clearly that the incentives given to the concessionaires have a positive impact on reducing accident rates. For

stretches without intersection, the number of accidents per 1 million vehicle-kilometers is about 2.66 times higher in toll motorways without incentives compared to toll motorways with incentives. And, for stretches with at least 1 intersection, the number of accidents per 1 million vehicle-kilometers is about 2.55 times higher in toll motorways without incentives compared to toll motorways with incentives.

## **CONCLUSIONS AND FUTURE RESEARCH**

The most important result from this research is that safety-based incentives in PPPs is an effective measure to manage motorways. In other words, there are more fatalities, injuries and accidents on motorways segments without incentives than on motorways segments with incentives.

The INC variable was found to be statistically significant in the injury and accident model. However, if incentives have an impact on road accidents, they have an impact on fatalities as well, because of the negative sign in fatal models. If incentives given to the concessionaires avoid accidents, they avoid fatalities which are a consequence of accidents. The results indicate that incentives have an influence on road safety.

This paper has paved the way for new topics that undoubtedly would require further research. First, the analysis of the size of the economic incentive set up in the PPP contract on the ultimate improvement of safety ratios is a crucial aspect. Second, it would be useful to analyze the evolution of safety performance over the years in PPP motorways with safety-based incentives. Third, a cross-cutting comparison of the different types of incentives (incentives related to the deadline of the project vs incentives related to payments) would be of the greatest interest.

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# **IDENTIFYING DEMAND RISK IN PUBLIC PRIVATE PARTNERSHIP (PPP) INFRASTRUCTURE PROJECTS**

**Rajaa Alasad, Ibrahim Motawa, and Stephen Ogunlana**

*School of Built Environment, Heriot-Watt University, EH14 4AS, UK*

*Email: Ra280@hw.ac.uk*

The Public-Private Partnership (PPP) method has become a favoured approach for delivering public infrastructure projects. PPP arrangements, in which the revenues are derived directly from the end users, are now widely used for the procurement of economic projects. The success of this kind of project depends heavily on the volume of demand for the service on offer, which places demand risk at the top of the project's risk list. Few studies have addressed the area of demand risk; pointing to the need for further investigation. This paper aims to identify the main factors which affect demand for those services provided by PPP projects. Based on broad case study literature, the paper identifies a number of qualitative and quantitative factors.

Keywords: Demand risk, financially free-standing projects, PPP.

## **INTRODUCTION**

Governments' willingness to decrease borrowing and spending, as well as the awareness that private sector can supply assets and services at lower costs and in a more efficient way, have resulted in the introduction of various forms of Public private partnership (PPP). The PPP procurement route has been increasingly employed to deliver many large scale and capital-intensive public infrastructure projects such as toll roads, ports, stadia, power stations, water utilities, etc. Unlike social projects (hospitals and schools) in which the private sector is to recover its initial investment by getting performance-based payments from the authorities, PPP economic projects allow the private sector operator to recover its capital investment from the revenue produced by charging the end users. These kinds of projects can be defined as financially free-standing; Chiu and Bosher (2005) argue that this method of financing is particularly favoured by the public sector for contracting water and wastewater services, as it allows a radical change to the sector without

relinquishing facility ownership. Indeed, as a result of transferring the tariff collection process in this kind of project to the private sector, the demand risk is also borne by the private sector.

Demand in economic projects is not easy to appraise as it requires several quantitative and qualitative factors to be taken into account. These factors may be non-specific to the project, such as capacity of the user to pay. However, if these factors and other project-specific factors are ignored, risk is increased; especially in terms of revenues, as they would then be estimated according to an incorrect and unreliable demand forecast. Hence, a systematic way in which to make the project financially viable while, at the same time, addressing public concerns and interests is to identify all the main factors that affect demand at an early stage in the project's lifecycle.

Previous studies on risk management in PPP projects have classified risk in terms of categories such as: site acquisition risk, design risk, construction risk, demand risk, political risk, operation risk, financial risk and force majeure risk. Despite the wide scope of the studies into risk categories in general, only a few attempts have focused on demand risk. An example of this is the study by Cabral and Junior (2010), which used real options theory as a tool to mitigate demand risk in PPP for football stadia. Another study was that of Li and Ren (2009), who adopted Bayesian techniques to provide a method for allocating demand risk in PPP projects, this approach concentrated on how to assign risk management responsibility between the public client and the private partners.

This paper will identify the main factors affecting the demand in PPP infrastructure facilities, as the recommended first stage of demand risk management procedure for PPP infrastructure projects. It will first review financially free-standing PPP projects. The demand risk in these kinds of projects will then be introduced as one of the main risks that can impact on project viability. The paper also discusses the quantitative and qualitative factors that are likely to affect the demand for infrastructure projects.

## **PPP FINANCIALLY FREE-STANDING INFRASTRUCTURE PROJECTS**

The notion of charging the public for using infrastructure facilities (e.g. toll roads) is not new (Hensher and Puckett 2005). However, recently these kinds of projects have become popular in many countries and are diverse; tunnels, bridges, highways, power station, water station and many other types of infrastructure facilities are in the hands of PPP developers. It can be argued that the *raison d'être* of these kinds of PPP schemes is to compensate for the

inadequacies and weaknesses in existing infrastructure projects on the public' (users') expense. Choi et al., (2010) stated that the excessive demand for new water facilities was the reason behind the dramatic increase in instances of the PPP approach for the purpose of delivering water facilities throughout China.

Financially free-standing PPP schemes include the task of constructing necessary modern facilities in specific regions in more efficient and fast ways than those -traditionally available. To achieve this, the private sector borrows the capital investment necessary to build and operate new assets. This investment is intended to be reimbursed by the revenue collected from the fee charged to the end user over a predetermined period. Thus, toll/tariff rate and concession duration are the most significant provisions of the concession contract, affecting cash flow calculated based on demand-related returns and facility expenditures. However, as these facilities are self-financing projects, they have to achieve a balance between the public interest and the price being charged for the utility. Therefore, it is recommended that a reasonable tariff policy should be set to balance the investment recovery for the private sector whilst protecting public interest.

Even though these financially free-standing projects can be considered attractive investments for the private sector, the financiers and other project parties' exposure to demand risk can significantly reduce their attractiveness. Ward and Sussman (2006) consider that demand or traffic in a toll road PPP project is the main risk factor which is, most often, not easy to assess. In addition, Chiu and Bosher (2005) argue that the demand risk in the water provision service is a main concern for the service provider (private sector), where users are charged on the basis of water usage. Locke (2010) argues that demand as related to an infrastructure project is not easy to assess; nevertheless, at the same time, financiers keep asking for robust demand forecasts. Thus, it can be argued that poor assessment of the demand risk can constitute a real threat for PPP contract partners.

## **DEMAND RISK IN PPP PROJETS**

Employing PPP procurement as a way to deliver infrastructure projects has placed demand risk at the top of the risks list. Norton Rose international legal practice conducted a survey in 2006, in which they gathered responses from stakeholders in economic PPP projects in five Asian countries. The results showed that demand risk is the most critical risk facing the project partners, regardless of the country or the sector (Norton Rose 2006). Demand volume in the case of PPPs is the most significant factor in determining the project's future cash flow and, consequently, the features of the debt service

repayment. Hence, the demand volume is the principal determinant of project viability. It can be argued that transferring the responsibility of financing such large facilities to the private sector in addition to the uncertainty about demand are the primary reasons behind the engagement of the public sector in these long-lasting concession contracts.

For the kind of PPP projects in which the fares paid by end users are the main source of revenue, the demand risk is entirely allocated to the private sector operator. However, in many cases the government prefers to share this risk with the concessionaire by providing minimum revenue guarantees, paying availability fees (to allow the private sector to recover capital investment and operational expenses as in the UK) and issuing capital grants (Menzies and Perrott 2010). However, these kinds of guarantees may result in transferring the risk back to the public sector in the case of the project falling into distress.

Variations in demand volume have been observed in many infrastructure projects. Bain (2002) explored 32 toll road projects all worldwide, including bridges, highways and tunnels. The study illustrated that actual traffic volume for 28 projects was below projections. This core sample was then extended to include 104 international PPP toll road projects in 2005. The main results regarding the discrepancy between actual and forecasted traffic volume did not change. The range of ratios of actual/forecast is between 86% below predicted and 51% above predicted volume (Bain 2009). Based on these findings Bain (2009) concluded that the majority of studies related to traffic forecast in the case of toll projects tend to be optimistic.

Projects in the railway sector, such as the Sydney Airport Link Line (Australia), Skytrain project (Bangkok, Thailand), STAR and PUTRA project (Kuala Lumpur, Malaysia) are examples where out-turn demand was largely under projections. For example, the Skytrain in Bangkok recorded only one-quarter of the predicted demand in its first year of operations (150,000 user per day compared with an estimated 600,000–700,000) (Halcrow Group 2004).

Based on the statistics and case studies outlined above, it is apparent that the demand in a specific project is unstable, having the potential to be inconsistent with that forecasted. Demand can slow down or increase during the concession period in a way that can seriously affect the project's revenues. In PPP projects, when the demand is under predicted the private sector will not be able to gain the expected benefits and may even not be able to recover its investment. In this case, it is often the government which will bear the final responsibility for this risk and be required to compensate the

private sector for the low demand for the project. This is typically based on any contract arrangements such as: a guaranteed minimum usage for the facility or a minimum return on investment. Conversely, in the case of inordinate demand performance, the project would generate strong profitability which could far outperform that predicted. Thus, the project company would then be able to recover all of its investments before the end of the concession period. However in this case, the public would continue to be charged for using the facility during the full concession period, which could represent a compromise of public interests.

Viegas (2010) suggested that the considerable level of difficulty associated with monitoring the demand in transport projects has caused serious problems in respect of many contracts, forming a key reason for renegotiations at the operation stage. Choi et al., (2010) reported that the bulk water supply contract of Shenyang Public utility in China was terminated because actual demand was under that predicted. Therefore, managing demand risk should consider the dynamism of demand during the entire operation period and employ an efficient mechanism for demand forecasting in order to strike a balance between public and private partners' interests.

The research from which this paper is derived considers aims to develop a dynamic model to identify demand risk in economic PPP projects. The proposed model will help to simulate the effects of different factors on demand risk. This will help the project partners to make the right decision on actions related to concession periods or toll rates. The proposed model is first required to identify the main factors that influence the demand for a specific facility, which is the main purpose of this paper. These factors can differ in nature; they may be either qualitative or quantitative. These factors can also be correlated. The next section will define and discuss the main factors influencing demand in financially free-standing PPP infrastructure projects.

## **FACTORS AFFECTING DEMAND IN FINANCIALLY FREE-STANDING INFRASTRUCTURE PROJECTS**

Due to the complexity of the contracting arrangements and the operations of financially free-standing PPP projects, the wider literature discussing these projects has shown that there are many factors which can explain why demand volume typically departs from that projected. Based on intensive case-study literature on PPP in toll road, water utility, railway and stadium sectors, the authors have identified the main factors which affect the demand for financially free-standing projects, which will be discussed in the following sections.

### **Capacity of customers to pay tariff (User wealth or income)**

It is important for the success of any self-financing infrastructure project to take into consideration whether the public can afford the user fee or not. While the fee charged for receiving the service made available by most of these projects may not be expensive for those in wealthier sections of society, it can form a significant proportion of the expenditure of those on low incomes. For example, Bansoll and Kelly (2005) suggest that introducing a user fee on the roads will form a real barrier to low income people driving; this has a consequent effect on service demand. Edward (1996) related the demand risk in the Chinese water market to the purchasing power of users to pay the proposed water toll over the period of the PPP contract. The work showed that risk can become more serious if the assumption regarding consumer's income is overly optimistic (Edward 1996).

### **Public acceptance for the project**

Bain (2002) argues that the public acceptance of a new toll road is significantly affected by tolling culture. In countries with previous experiences of PPP toll roads, it can be observed that it is comparatively easier to introduce a new PPP toll road, than in those which have only recently adopted a toll structure. To increase public acceptance, people should be given the chance to take part in shaping the project by participating in evaluating and assessing the scheme's proposal. In addition, public opinion regarding setting an appropriate tariff should be gauged by consulting the community representative and conducting public debates, for example. Ignorance of public views regarding the project design and tariff level is likely to anger the community causing it to exercise pressure on the government leading to cancellation of the project (Bain 2002). Hence, the extent of public consultation carried out in the case of a new project prior to the signing of a contract can play a significant role in increasing the level of public acceptability. Miranda (2007) argued that concession contracts need to be reformed to include more transparency and to involve public participation (Cited in Viegas 2010). Therefore, governments need to avoid being reticent on the subject of forming project proposals and imposing user fees in concession contracts. In recent years, many governments have developed mechanisms to allow the public to be involved in scheme forming and tariff imposition. In Chile, for example, the process of imposing or adjusting water prices began one year before the tariff was enforced. This process included disclosing to the public all the criteria taken into consideration in defining the tariff formulas (Calvo and Cariola 2004). However, it can be argued that although public involvement in the planning process may incur additional costs due to the need for design change and tariff amendments, the gain of

having less community disruption in the subsequent stages can, more often than not, outweigh this cost.

### **Willingness to pay**

Edward (1996) argues that in addition to the capacity to pay, the public must also exhibit the willingness to pay for the treated water. Bain (2009) has stated that uncertainty over the user willingness to pay toll, especially when those tolls are higher than average, is one of the major drivers of demand risk. Thus, the impact of this factor on facility demand should not be underestimated. Hensher and Puckett (2005) reported that in Edinburgh (UK) 74% of the residents voted against introducing a congestion charge scheme similar to that applied in London and this led to Edinburgh City Council cancelling its plans regarding the scheme. This reflects how important it is to consider the factor of public willingness to pay early in the feasibility study stage of the project. Ignorance of this can later lead to termination of the whole contract, or much lower than expected revenues being generated. However; public perceptions towards using facilities and paying user fees depends, to a large extent, on the benefits gained from utilising the facilities. In a toll road project, for example, it is important to understand that the public willingness to pay tolls depends first on a time saving benefit.

To gain public support and increase their willingness to pay a tariff, provisions should be made in the service for options including subsidies and/or discounts for using the service, or different fees for off-peak hours or weekends and for any other social welfare in general.

### **Economic growth of the facility area**

The economic growth of the facility area can cause both optimistic and pessimistic forecasts. When economic growth is high, forecasters tend to overestimate demand, which can lead to excessive costs and subsequent failure. On the other hand, decision makers might underestimate the economic growth, which can lead to very low projections for the project demand. Hence, economic growth in the facility area should be properly investigated to avoid any adverse consequences during the operational stage. All too often, the downturn in the economy and the local recession due to troubles in economic vitality can cause changes in demand volume. Niles and Nelson (2001) argued that changes to the economic mix, in the structure of some industries and in the levels of economic and social wealth nationally and regionally can lead to other reasons for demand discrepancy occurring.

Bain (2009) suggested, based on the technical report information of many international toll road projects, that the downturn in the economy is one of the main drivers behind variance in actual and forecast demand. However, the evidence shows a strong relationship between economic growth and behaviour.

Based on this, a reliable evaluation of the proactive performance of the economy in the future is a serious requirement for obtaining a more accurate demand forecast.

### **Competition from alternative facilities**

Since the benefits from financially free-standing facilities basically relies on the service demand, building a new facility or rehabilitating an existing one can seriously diminish the viability of a project. It is important to recognise and understand how existing facilities can influence a suggested project during its entire operations stage. However, this is challenging in PPP contracts due to their protracted duration (30 years and more) which makes the required forecast scope extremely long (Bain 2009). The existence of alternative facilities can increase the complexity of the demand estimation. In toll road projects, for example, this competition could be based on the same model, e.g. a toll road PPP asset with a parallel toll-free road, or from different models, e.g. a toll road with a railway project or ferries in the case of bridges for example. In either case, it is vital for the project partners to consider the market expansion both in a feasibility study and later in the project re-evaluation process.

### **Amount of user fee**

The public typically choose the cheapest alternative where one is available. Therefore, to guarantee a constant demand for a project the tariff should be set at a reasonable level. The expensive construction cost and the private sector's desire to speed up repayment of the debt and gain high profits are the main reasons behind imposing high tariffs. Lemos (2004) argued that in some cases, the private sector's excessive expectations of return on their investment (for example 21%-25%) leads to the imposition of a high user fee, which as a consequence causes low project demand. Bain (2002) considered setting the toll price to be the real challenge for decision makers. Bain's study suggested that this price should not be excessively high because of its strong relationship to the public willingness to pay.



Evidence shows that a very high tariff is off putting to potential users. In the UK, the public outcry against the high tariff for the Manchester Metrolink project has led to termination of the concession (Menzies and Perrott 2010). On the other hand, it should be noted that tariff level should not be set too low as the revenue from the toll must be adequate to cover construction and operation costs. Choi et al., (2010) argued that the high water price in China is one of the key risk factors for private investor in the Chinese water sector. However, they argue that those prices were set relatively low, disregarding the initial investment and desired profit by the private sector. While cheap fees can increase demand, they may also form a barrier to private sector involvement, due to the decreased likelihood of an acceptable profit being returned in view of the limited capacity of the facility.

### **Bailing or toll collection method**

The way in which the concessionaire intends to collect the tariff can also have an impact on project demand. Attention should be paid to selecting the most suitable method for toll collection early in the project's lifecycle. In the case of toll road facilities, manual tollbooths have been used for decades. However, due to the fast technological development and limited processing capability of human beings, the tendency of most toll collection points nowadays is towards automated systems. Hence, electronic toll collection technology has been introduced in many countries. Bonsall and Kelly (2005) argue that automatic toll collection was one of the factors fostering and supporting the increasing use of toll road. In addition, introducing a new method (transit smart cards) to pay for multiple forms of transport, as in the case of rail line projects such as: London's Oyster Card and Singapore Ez-link system, adds value to the project, increases public convenience and meets project demand (Menzies and Perrott 2010).

### **Population growth in the facility area**

This is one of the main factors affecting the future demand for the project concerned. Chiu and Bosher (2005) stated that the current and predicted population of a region represents the principle driver for demand in the water market. In 2002, Veolia's water company was obliged to close some of its facilities near Chengdu (China) when it faced hard financial problems due to severe decrease in water demand. This downsized demand performance was attributed partly to the overestimation of population growth in the project area.

## **Availability of supporting facilities**

When assessing the demand for a specific project, it is essential to evaluate the kind of supporting facilities which may affect the demand for the main project. Menzies (2010) argues that when designing the urban railways, the links available from other modes of transportation should be considered. Absence or shortage of supportive facilities, with which to ease access to the system like buses, taxis and park and ride, can contribute to a decline in demand. In the Bangkok Sky train project, for example, demand noticeably increased following the introduction of a feeder bus services to address the poor demand performance when the project was first in operation (Halcrow Group, 2004; Menzies, 2010). Moreover, in the case of stadia projects, existence of commercial and other welfare facilities surrounding the stadium area enhances the attendance numbers and, at the same time, the project's viability. Cabral and Junior (2010) argued that developing a shopping centre as a part of the stadium investment would be likely to improve demand and encourage the private sector to invest.

In addition to these factors which are common between many economic infrastructure projects, there are several project-specific factors which depend on the nature of the project. Examples of these factors include the specific characteristics of the facility, the value of time saving in transportation projects and the sports-team's performance in stadium projects.

## **MODELLING THE FACTORS**

Understanding the aforementioned factors and the interactions between them can lead to a more accurate and credible demand estimation. Despite the efforts spent on demand forecast, it remains a challenging issue. Many researchers have attributed the reasons for poor forecasting on modelling techniques that only consider some of the affecting factors. Niles and Nelson (2001) mentioned that although the mobility and dynamism of the urban system is noticeable, decision makers still utilise closed and static models for producing demand projections for transportation projects. They emphasise the necessity of embracing other techniques that consider the risk (and uncertainty) resulting from the variance in demand emerging from the urban system's complexity and mobility. In addition, Jong et al., (2007) have stated that most traffic forecast models for transport projects ignore the correlations between the variables. Therefore, more reliable and realistic estimates of future demand over the concession period require the user to employ a more advanced tool, which can take into consideration different quantitative and qualitative variables and consider the relationships among those variables to reduce the demand risk associated with PPP projects. One initial proposal is to use System Dynamics as the modelling tool. SD will allow us to capture

the dynamic interactions between the variables and does not suffer from problems of auto correlation. This research aims to develop a demand risk identification model that will consider the complexity and dynamicity of the identified factors and also explain how these factors can influence demand related behaviour.

## CONCLUSIONS

The PPP procurement route has increasingly been employed to develop infrastructure projects; as a result many arrangements using this method have emerged. Financially free-standing projects in which the revenues are collected directly from the end users are prevailed in the economic infrastructure sector. This method of project financing implies that the success of the project greatly depends on service demand volume. Therefore, these kinds of projects can be described as extremely sensitive to demand risk. Many of these financially free-standing projects may not become financially viable, as a result of being founded on an inaccurate or unreliable demand forecast. This research aims to model the effect of demand variation on the viability of financially free-standing PPP projects. Demand in the case of infrastructure projects is difficult to assess because it requires consideration of multiple qualitative and quantitative factors. This paper has identified the main factors affecting demand and concludes that these factors and the relationships between them should be considered when modelling the effects on concession period and project cash flow.

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# **IDENTIFYING AND TACKLING PROBLEMS MILITATING AGAINST YOUTH INTEREST IN CONSTRUCTION CRAFTS CAREERS: PANACEA FOR EFFECTIVE PPP IMPLEMENTATION IN NIGERIA.**

**Ezekiel M. Awe, Alan Griffith, and Paul Stephenson**

*Development and Society, Sheffield Hallam University, Sheffield, S1 1WB, UK.*

*Email: foluawe8108@yahoo.com*

‘Public-private partnership’ (PPP), also referred to as ‘private sector participation’ (PSP) or ‘privatization’; is a term that depicts a form of joint venture between the public and private sectors. PPP initiatives allocate tasks, responsibilities, and risks among the partners in the best possible way. The public partners in a PPP arrangement are government agencies such as ministries, departments, state-owned enterprises etc; while the private partners can be local and international business investors with technical or financial expertise relevant to the project in question. The Nigerian nation as a developing country has a lot of potentials for construction related PPP initiatives. In order to ensure the success of the PPP approach to projects procurement, the construction sector in Nigeria needs to devise means of recruiting and training the youths to acquire construction related crafts skills with the view to meeting the sector’s need for competent craftsmen both quantitatively and qualitatively. This study is an aspect of an on-going PhD research study, and it examines the problems militating against the interests of the youths in acquiring construction related crafts skills in Nigeria; with the view to proffering possible strategies for the motivation and mobilization of youths for construction crafts training and thus meet the crafts skills need of the sector to effectively fulfil its obligations under PPP contractual arrangements. Primary data for the study was collected through questionnaire and interviews, findings from the questionnaire survey identified amongst others; the lack of adequate guidance and counselling as to the importance and relevance of crafts skills as profitable careers as a major reason the youth are not showing interest in acquiring construction related skills with 84.8% agreement; a mean score of 4.1889; median score 4\*; and Cramm’s V value =.22. Other identified reasons include: the lack of adequate forum for mobilising youth for crafts skills acquisition with 79.8% agreement, mean score 4.1185, median 4\*; V=.17; and poor remuneration for construction site workers with 78.7% agreement and mean score 4.0517; median score of 4\*; Cramm’s V=.24. Findings from interview enquiry

also underscored these points along with poor image problem, and too-much emphasis on secular education at the expense of vocation education as factors working against youths' interest in choosing crafts as careers. The study recommends the pursuit of effective guidance and counselling among the youths and adequately promoting VTE as strategies for effectively motivating the youth generation as panacea for successful implementation of construction related PPP initiatives in Nigeria.

Key words: Construction sector, Crafts, Skills shortages, Training, Youths.

## INTRODUCTION

The concept of public-private partnership (PPP) describes an array of possible relationships established among public and private sectors for the primary purpose of execution of infrastructural projects and other services (Li and Akintoye 2003; Anvuur and Kumaraswamy 2006). Effective PPPs takes cognizance of the collective roles of both the public and the private entities in the achievement of developmental projects and other tasks that form the object of the partnership, including appropriate allocation and management of risks inherent in the contractual arrangements (Zou *et al* 2008; Ibrahim *et al* 2006). On the one hand, the contribution of the government in a PPP venture may take the form of financing or funding, provision of social responsibility, public sensitization and awareness and provision of relevant supports towards the success of the project. The private sector on the other hand utilizes its managerial and commercial acumen and relevant innovations to execute the project and run the facilities profitably and efficiently. The private partner in the venture, depending on the contractual arrangement, contributes part of the investment capital. In order to effectively play its role, the onus is on the private partner to mobilize the appropriate and competent skilled workforce to execute and run the business. The major crux of the PPP idea is to bring together the public and private sector organizations in mutual benefit (Trafford and Proctor, 2006). Nigeria as a developing economy needs a lot of affordable housing to meet the requirement of the teaming and yet growing population, and one of the common approaches that has emerged in the management of such projects in the recent past is the public-private partnership; which is a move toward privatization of public services (Li and Akintoye 2003).

Securing and sustaining the interests of the youth generation in acquiring construction related crafts-skills in Nigeria has been a daunting problem (Salami 2011; Awogbenle and Iwuamadi 2010; Omoruyi and Osunde 2004) which if not adequately addressed; will aggravate crafts skills shortages and in-turns militate



against the success of PPP initiations in the sector. The construction sector is a large entity with diverse specialities which together make major contribution to national economic activity (Oyegoke *et al* 2009). The various stages or processes of work in the sector ranges from site preparation, including demolition, through general construction or 'new builds', and repair or maintenance of both residential and non-residential buildings and civil engineering works; such as (roads, highways, airfields, harbours, utility works) and which constitute most of the PPP projects. The PPP approach has been increasingly used for the procurement of large-scale infrastructures such as power plants, tunnels, roads, railways and bridges in different parts of the world (Akintoye *et al* 2005; Zou *et al* 2008). HM Treasury (2000) informs that PPPs arrangement come in different variations and forms and can be used to describe different types of ventures which include: the introduction of private sector ownership into state-owned businesses, the Private Finance Initiative (PFI) and selling of government services into wider markets.

The construction process also involves different trades such as bricklaying, concreting, carpentry, joinery, welding and fabrication, painting, glazing, and plumbing amongst others. The industry is a labour-intensive sector, and its output relies heavily on the availability of the required trades' people for the particular project (Oyegoke *et al* 2009). CIOB (2009) submits that the construction industry has a long history of skill shortages which can be viewed as a reflection on economic and societal stability. The construction sector as one of the major development drivers in the economy of any nation cannot afford to treat the challenges of crafts skilled shortages with levity or impunity.

In order for the Nigerian construction industry to effectively tackle the challenge of craft skills shortages, and accomplish its objectives, discharge its obligations and profitably and successfully participate in PPP contracts; it is imperative for the sector to develop a dynamic and effective strategy of harnessing available human resources by mobilizing the youth population and re-directing their focus towards choosing construction related crafts as careers instead of scavenging for 'white-collar' professions which are insufficient and difficult to come by in most cases. Youths play a significant role in economics activities in developing countries (Joel-Osebo 2004), even in developed economies, the role of the youth population in national economic development cannot be undermined or relegated to the background. However, in Nigeria, myriads of youths remain without employable skills and unemployed (Salami 2011; Awogbenle and Iwuamadi 2010; Omoruyi and Osunde 2004); while their youthful zest remains untapped. Nigeria as a developing country and the most populated black African nation with an estimated population of nearly 150 million people (CIA 2011), need PPP project approach for development of public housing, schools, hospitals and infrastructural facilities. According to CIA (2011) estimate, the youth

population constitute over half of the total population. Despite this pool of active and vibrant human resources, crafts skills shortage persists in the construction sector and much has not been accomplished in the area of channelling the useful resource to contributing to overall economic development of the nation.

This paper sets out to identify the factors militating against the interests of the Nigerian youth population in acquiring construction related crafts skills, with the view to determining the strategies for effectively securing and sustaining their interests in choosing and getting trained to acquire employable skills in construction crafts. The ultimate goal of the study is reducing the crafts skills shortage and improving the sector's chances to favourably perform in PPP contracts.

The study emanates from ongoing PhD Research work which aims at formulating a framework targeted at improving the strategies for the training and development of construction related craftsmen in the Nigerian construction sector.

## **THE NEED FOR SUFFICIENT NUMBER OF COMPETENT SKILLED CRAFT WORKFORCE IN SUCCESSFUL IMPLEMENTATION OF PPP PROJECTS**

Construction related craftspeople play primary and prominent roles both in new builds and in the running and maintenance operations throughout the life cycle of the construction industry's products. Since this is the crux of PPP ventures, then, for a successful implementation of PPP related projects in any nation and in Nigeria in particular, there is need for the training of creams of competent crafts workforce with the view to raising sufficient numbers to meet the skilled crafts manpower need and improve the prospects of PPP projects approach. Insufficient number as well as incompetence of the available crafts workforce in the sector will hinder the delivery of 'value for money' (VFM) which is a major goal of any PPP initiative (Cheung *et al* 2009; Li *et al* 2005).

The skills of all the role-players in an industry determine the quality of its products. In the building and construction industry, semi-skilled and unskilled workers form a large part of the labour supply and they perform various tasks, which eventually determine the quality of products (Awe *et al* 2011).

The development of a skilled labour force in a nation makes for important contribution to national development; such competent skilled workforce would be able to apply science and technology in the transformation of raw materials into goods and services. Oyegoke *et al* (2009) argues that skills have been one

of the most important issues in the construction sector because construction methods are largely traditional and primitive; consequently labour intensive. A well trained, capable, seasoned and knowledgeable skilled workforce is therefore the secret to national development, successful implementation of PPP projects and overall economic progress of any nation.

Skilled workers and technicians enhance the quality and efficiency of product development, usage, production and maintenance and they supervise, train and develop new hands and workers with lesser skills. Gann and Senker (1998) noted that high quality skills are essential for achieving performance improvements, and this has implication for PPP projects delivery. A nation's commitment to technical and vocational training is a decisive factor determining the competitive strength and level of development of its economy (Lugujjo and Manyindo 1993).

## **CONSTRUCTION SECTOR'S SKILLED CRAFTS LABOUR NEED**

There has never been such a period in history when the diversification of craft occupations has increased the challenges of skilled workforce need of building and construction sector; because as self employment continues to rise, competition is becoming tougher, contract times are shorter, profit margins are smaller and specialization and fragmentation of various trades is increasing; and right now, it is very difficult to find key skilled people such as bricklayers, carpenters, plasterers and electricians etc (Dennis 2007; CPA 2004; TCE 2007). The challenge of skills shortages is not limited to the Nigeria construction industry but is been experienced in other nations around the globe (Mackenzie *et al*, 2000; Dainty *et al*, 2005). The Construction sector, like any other aspect of industrial development, is experiencing severe and prolonged shortages of 'human power', particularly in the crafts categories, not just in terms of quantity of workers but the quality of workforce is also a noticeable factor (COOA 2005; Connor 2006; McCausland 2006). The CIOB (2008) observed that every sector of the construction industry is experiencing some labour shortage. Skills shortages problem is one of the most serious threats to the economic health of many nations around the globe and can derail the prospects of PPP projects if not properly addressed. Shortage of skilled labour affects schedules and costs, this consequently derail or critically delay important projects (COAA, 2005; Ireland 2007); and can put at risk the economic benefits that PPP projects are designed to generate. The shortage of skilled labour is one of the most pressing issues today and is already having serious implications for both business and the economy. (Connor, 2006; McCausland 2006).

Since the successful performance of the industry is dependent on the availability of competent skilled trades' people, it is very necessary to identify and adequately address reasons militating against the interests of new entrants especially the youth population into the various crafts trades in the industry. This is imperative because Nigeria as a developing nation needs a lot of PPP approach for the procurement the needed infrastructural facilities and have to device means of recruiting new entrants from among the youth population for training. This will enhance the sector's performance and put the industry on a good pedestal to deliver as expected under the PPP contractual arrangements.

## **FACTORS MILITATING AGAINST YOUTHS' INTEREST IN ACQUIRING CONSTRUCTION RELATED SKILLS**

The lack of interest in acquisition of construction related crafts skills among the Nigerian youths is evidently contributing to crafts skills shortages in the construction sector both in terms of quality and quantity. Some of the relevant factors working against the interest of new entrants into construction crafts careers and which consequently aggravates crafts skills shortages in the sector have been found amongst others to include: lack of effective career guidance and counselling services (Durosaro and Adeoye, 2007; Durosaro *et al*, 2009); which evidently hinders Nigerian youths from considering crafts skills acquisition as viable and profitable careers, too much emphasis on secular education at the expense of vocational education (VE), low wages (Salami, 2011; Awe *et al*, 2010), poor image of construction related crafts career (Green *et al*, 2004; Dainty *et al*, 2007; Ness, 2009; Salami, 2011), absence of a clear career path (Salami 2011; Awe *et al* 2009), poor funding of the practical aspects of vocational education resulting in poorly equipped training workshops (Umar, 2005; Ugwuja, 2010; Odusami and Ene 2011), lack of encouragement and motivation from the political class and government hierarchy for the youth to take to crafts as careers (Salami, 2011; Awe *et al*, 2010).

## **METHODS**

The methods adopted for the study include both primary and secondary research. The primary research adopted the quantitative and the qualitative approach, while the secondary reviewed relevant literature. Data collection for the study took the form of questionnaires survey and qualitative interview enquiries. For the purpose of exploring respondents' perception with regards to a wide range of relevant issues on the research focus; semi structured questionnaire with Likert scale format, designed around opinion statements, with propositions based on relevant issues emanating from literature and the preliminary (pilot) survey was adopted. It comprises a series of statements or items focusing on certain issues or themes to which the respondents were asked to indicate level of agreement to

the various propositions, scales 1-5 was used for all the variables in the questionnaire. 500 questionnaires were administered among the various groups targeted for the study, a total of 282 (56.4%) 'valid' questionnaires returned by the respondents were used for data analysis. Statistical analysis was performed using the Predictive Analysis Software (PASW Statistics) version 18.0.

The 7 participants for the qualitative interview research were purposively selected to cut across various strata of stakeholders who could volunteer information on relevant issues and problems militating against youths interests in construction related skills acquisition. The interviews were also aimed at corroborating the data elicited through the quantitative survey. Other considerations for interview participants' selection include: scope of professional practice, years of experience, youth and training institutions' representations. Detailed analysis was carried out using the qualitative data analysis software NVivo version 8, the software assisted in the data coding process and facilitated the identification of patterns and comprehensive exploration during the data analysis process.

## RESULTS AND DISCUSSION OF FINDINGS

### Reasons why Nigerian youths are not showing interest in acquiring construction related skills

Table 1 shows the submission of the survey participants on reasons why most Nigerian youths are not showing interest in acquiring construction related skills. Top on the list of apparent reasons why the youth generation are not considering acquisition of skills was due to *lack of adequate guidance and counselling as to the importance and relevance of skills as a career*. 84.8% of the respondents (strongly Agreed 36.2%, Agreed 48.6%, mean **4.1889**, and median score 4\*; V=.22) supported the point. Similar to the above mentioned and second on the list was the *lack of adequate forum for mobilising youth for skills acquisition* with 79.8% agreement (strongly Agreed 36.5%, Agreed 43.6%, mean score **4.1185**, median 4\*; V=.17). 78.7% of the survey participants (strongly Agreed 34.0%, Agreed 44.7%, mean **4.0517**, with a median score of 4\*; V=.24) viewed *poor rate of pay for construction site workers* as one of the major reasons why Nigerian youths are indifferent towards acquiring construction related skills. A good percentage of the respondents (70.4%) also pin-pointed the social problem *of the get rich quick orientation in the nation* as another relevant reason why youths are showing apathy towards acquiring construction related skills (strongly Agreed 39.4%, Agreed 31.6%, mean **4.0111**, median score 4\*; V=.19). 75.5% (strongly Agreed 35.1%, Agreed 40.4%, mean score **3.9779**, median 4\*; V=.22) were of the opinion that the reason the youth are not attracted to acquisition of construction related skills is because *the Nigerian government do not encourage skills acquisition*. 74.1% of the responses (strongly Agreed 27.3%, Agreed

46.8%, mean score **3.9366**; median 4\*; V=.16) favoured the problem of *lack of clear-cut career path for craftsmen* as a reason youths are not showing interest in skills acquisition. Other propositions with significant mean scores in this scale include the *lack of job security in the construction industry* 73.8% agreement (strongly Agreed 31.2%, Agreed 42.6%, mean **3.9041**; median 4\*; V=.21), *lack of respect or dignity for Artisans* 73.0% agreement (strongly Agreed 31.9%, Agreed 41.1%, mean **3.9037**; median 4\*; V=.22), *too much emphasis on general/secular education* (mean score **3.8852**; median 4\*; V=.22), and *lack of recognition for Artisans* (mean 3.8118; median score 4\*; V=.23). All other propositions had a median score of 4\* except for the problem of *excessive cost of vocational training* which had a median score of 3\* and V=.22. The lowest value of .15 and highest value of .24 for the Crammer's V test indicated that there is a weak association between the opinions of the respondents and their age-group; it also shows that they are united in their perception of the reasons why the youth generation seem not showing interest in skills acquisition and implied the validity of the scale. The Cronbach's alpha value for the scale's reliability was 0.788. The analysis in this section will assist immensely in achieving the research objective to unravel the reasons the younger generation in Nigeria seems not showing interest in acquiring construction related skills.

Findings from the interview enquiry corroborated the questionnaire survey findings with not less than 5 of the 7 participants highlighting poor remuneration, lack of respect for crafts people and the relegation of craftsmanship to the domain of the drop-outs from secular education; as been responsible for the lack of interest of the youths in considering the acquisition of construction related crafts as lucrative career options.

## **DISCUSSION**

### **Reasons Nigerian youths are not showing interest in skills acquisition**

The objective of this study is to investigate reason(s) why the younger generation in Nigeria is not showing interest in Construction related Vocational Training/Skill acquisition and propose strategies for motivating and mobilizing them. The reasons why the majority of the younger generation seems not showing interest in acquiring construction related skills; as identified by the quantitative and qualitative data analyses include:

Lack of adequate guidance and counselling as to the importance, prospects and relevance of skills as a viable career, lack of adequate forum for mobilising youth for skills acquisition, poor remuneration or rate of pay for construction site workers, the social vice of 'get rich quick' syndrome or orientation prevalent in the nation and lack of encouragement and motivation from the political class and government hierarchy for the youth to take to crafts as careers. Other factors

identified include the lack of a clear-cut career path for craftsmen, problem of lack of job security and employment continuity in the Nigerian construction

Table 1: % Scores, Mean, Median, Cramer's V test value and Cronbach's reliability rating for variables on the assessment of reasons why Nigerian youths are not showing interest in acquiring construction related skills

Propositions	Response Scores %					Mean	Median	Cramer's V	Cronbach's Alpha
	SA	A	DN	D	SD				
hazardous nature of construction site works	19.9	29.1	12.1	21.6	13.5	3.2103	4.00	.229	<b>0.788</b>
poor rate of pay for site workers	34.0	44.7	6.7	9.6	1.1	4.0517	4.00	.238	
lack of recognition for Artisans	29.8	41.1	7.8	12.1	5.3	3.8118	4.00	.232	
lack of respect/dignity for Artisans	31.9	41.1	6.0	14.9	1.8	3.9037	4.00	.218	
government do not encourage skills acquisition	35.1	40.4	7.1	11.3	2.5	3.9779	4.00	.221	
no clear-cut career path for craftsmen	27.3	46.8	9.2	11.0	0.7	3.9366	4.00	.153	
the youth lack adequate guidance and counselling to take to skills acquisition	36.2	48.6	5.3	4.3	1.4	4.1889	4.00	.224	
there is no adequate forum for mobilising youth for skills acquisition	36.5	43.6	7.8	6.0	1.8	4.1185	4.00	.171	
construction site work is viewed by the youth as too difficult a task	26.6	36.5	12.8	12.1	7.1	3.6679	4.00	.192	
construction site work is viewed by the youth as too degrading	26.2	40.4	7.8	17.4	3.5	3.7222	4.00	.193	
the youth generation are lazy and hence unwilling to acquire skills	24.5	29.8	13.8	19.9	7.8	3.4519	4.00	.191	
too much emphasis on general/secular education	36.5	31.6	11.0	13.5	3.2	3.8852	4.00	.221	
it is too expensive to receive vocational training	12.8	32.3	12.1	28.0	10.3	3.0967	3.00	.221	
the get rich quick orientation in the nation	39.4	31.6	13.1	9.9	1.8	4.0111	4.00	.185	
lack of adequate provision for protection and safety of site workers	26.6	34.8	14.5	17.4	2.8	3.6753	4.00	.182	
lack of encouragement or incentive from political leaders	37.6	34.8	8.9	10.3	2.8	3.6692	4.00	.239	
absence of health and safety training from the vocational education curriculum	23.8	35.5	17.0	16.7	3.2	3.6236	4.00	.156	

lack of job security in the construction industry	31.2	42.6	8.2	10.3	3.9	3.9041	4.00	.211
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sector, lack of adequate provision for the protection and safety of construction site workers, lack of respect, recognition and dignity for Artisans; too much emphasis on secular/general education. The views by the youth the construction crafts career is too degrading and the belief that construction site work is too difficult.

Some of the highlighted reasons as indicated above are focused for further discussion under the following captions.

### **Lack of adequate guidance and counselling as to the importance, prospects and relevance of skills as a viable career**

The absence of appropriate career guidance and counselling for the youth to consider construction related skills acquisition ranked first from the quantitative analysis as one of the major reasons why the younger generation in Nigeria are not showing interest in choosing craftsmanship as a career, findings from the qualitative enquiry also corroborated this opinion. The greater percentage of the youth population are ignorance and un-informed about the relevance, economic prospects, and importance of acquiring a skill. Durosaro and Adeoye (2007) has decried the neglect of effective guidance and counselling in Nigerian schools, pointing out the commitment to guidance and counselling as indicated in the NPE is not receiving adequate attention. There is also lack of adequate formal forum for effective motivation and mobilization of youth for crafts-skills training.

### **Poor Image of Construction site Craft Workers**

The problem of negative or poor image of construction site work featured in both the quantitative and qualitative analysis as one of the factors deterring the Nigerian youths from acquiring construction related crafts skills. The widespread erroneous notion that VET is only for those who cannot do well in secular education discourages many who would have consider skills as a career. Those undergoing secular education are seen as superior and clever in comparison to those in VE, artisans are viewed as second rated citizens and construction site works viewed by the public as dirty jobs. Various past studies have identified the poor image of the industry as an issue which adversely affects the popularity of construction related crafts as a career choice (Green *et al*, 2004; Dainty *et al*, 2005; Dainty *et al*, 2007; Ness, 2009). Salami (2011) described this malaise more vividly by saying that ‘there is the general perception that artisans and technicians are “never-do-wells”, dropouts, societal rejects or even failures who should perpetually remain at the bottom of the socio-economic ladder’. A corollary of image problem is the view by most youths that construction craft



careers are downgrading and demeaning. The poor remuneration of the construction craft workers even aggravates and further tightens the ability of the sector to attract the youth into its crafts categories. The poor image syndrome is a malaise that the construction industry and other stakeholders need to adequately address in order to attract and sustain the interests of new entrants into the industry; especially at the crafts level.

### **Lack of encouragement and motivation from the political class and government hierarchy for the youth to take to crafts as careers.**

The necessary good leadership example from many in the political circle seems to leave much to be desired, crave for quick-wealth at the expense of hard work is another social menace pointing the youth in the wrong direction. The social vice of 'get rich quick' syndrome or orientation prevalent in the nation seems not to be pointing the youth generation in the right direction. Salami (2011) ascribed the trend to two cultural related factors of societal misconception about the economic and social status of artisanship and secondly to the fast eroding value system. Instead of signing-up for an apprenticeship to acquire a profitable skill, myriads of Nigerian youths jettisoned skills acquisition and opt for motor-bike transportation business (nick-named Okada or keke NAPEP); with the view to making 'quick cash'. Awe *et al* (2010) in a previous study has also identified lack of encouragement or incentive for youth to acquire technical skill as an issue for the evident lack of interest of the youth population in Nigeria.

### **Too much emphasis on secular/general education.**

The current preoccupation with university education in Nigerian reduces economic opportunities of those who are more oriented toward work than academia. Not everyone needs a university education, but everyone needs a vocation at least for self sustenance. A relevant question is; if everyone became a university graduate, who will do the manual operation for the actualisation of the construction industry's products? Vocational education surely produces graduates who are highly skilled entrepreneurs; VE leads to the acquisition of practical and applied skills as well as basic scientific knowledge. The policy makers seem to have endorsed the crave for further education and acquisition of paper qualifications without the corresponding employable skills; this is evident in a change of policy converting the old TCs to STCs and equating NABTEB certificate with those of WAEC and NECO to compete for FHE. Awe *et al* (2009) had earlier posited that if the orientation for the pursuit of paper qualification at the expense of practical skills acquisition is left unchecked, the Nigeria construction industry will be moving towards a situation where it will have many graduates of construction related fields; but insufficient number of

skilled craftspeople who can effectively and efficiently deliver the sector's products. A situation which they insist will be catastrophic for the industry and the nation's economy and development as a whole. Any phenomenon that jeopardize youth interest in acquiring construction related crafts skills will also stall successful PPP implementation in the nation.

### **Lack of a clear-cut career path for craftsmen**

Craftsmanship career as it is practised in Nigerian seems to be a dead end without adequate provision for career progression or advancement. The artisans are in most cases not educated to the point that will sustain floating a SME venture. Only few, highly skilled are in permanent employment of large multi-national or indigenous construction firms; while the majority depend on daily-paid engagement. They congregate daily at popular junctions or public areas in major cities with their working tools stacked in sacs waiting for a labour only petty contractor in their trades to come and engage them for the day; and if they are lucky enough, for few days or weeks. After which they are back at their 'junction-office' to join another long queue waiting for the next engagement. Those in regular employment in the good old days could at least advance to become General Foreman (GF) or trade supervisors in their trades, but the modern agenda in the construction industry seems to have transferred such roles to the fresh construction graduates with little or no practical knowledge in the trade. Ness (2009) noted that the construction process is now often managed by degree-trained construction managers without hands-on-experience. Even in the public sector in Nigeria, graduates of vocational related institutions are discriminated against in terms of wages and career progression (Salami 2011). Just as the highly skilled construction workers that participate in PPP projects have the privilege of career progression, the skilled construction craftsmen and women should also be able to advance in their chosen career.

## **CONCLUSIONS/RECOMMENDATIONS**

Based on the findings from the study as discussed under the various headings above; it could be concluded that there are many salient factors militating against the interests of the youth population in Nigeria to choose construction crafts as careers and this certainly has implication for PPP initiatives in Nigeria. PPP is a viable option for construction project procurement but the initiative cannot be successfully implemented without agile, competent, confident and skilled construction crafts workforce.

The study recommends that in order for successful delivery of PPP projects in Nigeria, there is need for the construction sector to address the various militating factors and device strategies for securing and sustaining youths interest, initiate

strategies for mobilising, recruiting and constantly training the youths with the view to raising sufficient numbers of skilled craftspeople to meet up with labour demand for PPP initiatives.

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# **PUBLIC-PRIVATE PARTNERSHIPS APPROACH: A PANACEA TO URBAN HOUSING INEQUALITIES IN DEVELOPING COUNTRIES- A CASE STUDY OF NIGERIA**

**Akanbi Olusayo Oyeibanji, Akintola Akintoye and Champika L. Liyanage**

*School of Built and Natural Environment,  
University of Central Lancashire, Preston, UK*

*Email: AOOyeibanji@uclan.ac.uk*

There are perceived housing inequalities in the urban centres of Nigeria like any developing countries due to social, political and economic reasons. The features of such urban neighbourhoods are deprivation and segregation which gives a feeling of the need for intervention. This paper seeks to examine the application of PPPs approach as an involvement of different actors in eliminating urban housing inequalities. Four sets of argument in favour of PPPs – synergy, transformation, budget enlargement and capacity enlargement are employed for the examination of its performance in Nigeria as a less-developed state. The approach has capacity for the provision of quantity and quality housing at affordable costs and ensures equitable distribution of infrastructural facilities within residential neighbourhoods. Consequently, the approach is beneficial to the bodies of public and private actors as well as making the urban dwellers enjoy dynamic urban governance.

Keywords: housing inequalities, public-private partnerships, urban housing.

## **INTRODUCTION**

Housing is an elemental condition for basic human functioning and flourishing which can be described as shelter (physical structure) together with all social services and utilities such as road, drainage, electricity, health, clean water, sewerage, and waste management and security services among others that make a locality live-able (Quigley, 1999; King, 2003; Coolen, 2006; Powel 2010, p. 9). Housing acts as a focus of economic activity, a

symbol of achievement, social acceptance and an element of urban growth (Bujang et al 2010). Idrus and Siong (2008, p. 1) opine that housing is a major concern for all people in every corner of the world as the well-being of a country is reflected in its people enjoying a certain standard of living.

Despite the importance of housing, there are perceived housing inequalities in the urban centres of Nigeria like any developing countries due to social, political and economic reasons. The features of such urban neighbourhoods are deprivation and segregation which gives a feeling of the need for intervention.

Public-private partnership gives equal access to decent and affordable housing to the less-privileged in urban centres especially in developing countries through qualitative and qualitative provision (Boxmeer and Beckhoven 2006). PPP in housing also helps in the provision of basic services, lower cost through mass production, access to mortgage finance, faster delivery times, mobilisation of resources, incentives participating members, etc (Shelter-Afrique, 2010) .

This paper therefore seeks to examine the application of PPP as an involvement of different actors in urban housing provision. It also aims to provide insight into how the public-private partnership (PPP) initiative can help promote sustainable housing and eliminate urban housing inequalities in Nigeria. Four sets of argument in support of PPP - synergy, transformation, budget enlargement and capacity enlargement are used to examine its performance and make suggestions for improvement. This study uses an in-depth literature review as part of an on-going PhD research in its early stage on “A Public-Private Partnerships Agenda for Sustainable Social Housing Provision in Developing Countries: Nigeria as Case Study”. The core areas of this paper – PPPs approach as a panacea to urban housing inequalities happen to form some major aspects of the on-going PhD research. This paper, the on-going PhD research and the theme of the Doctoral Workshop are in consonance.

## **URBAN HOUSING IN NIGERIA**

Nigeria has a land area of about 930,000 square kilometres or 359,073 square miles with a population of about 151 million (World Bank, 2010 in Abdullahi and Aziz, 2010, p. 3). Some major cities in Nigeria are Abuja (Capital City) with a population of about 6 million, Lagos (8 million people), Kano, Ibadan, Port Harcourt and about six other cities with a population of over 1 million each. Since becoming an independent nation in October 1<sup>st</sup>, 1960, there has been political instability, lack of the rule of law, high crime rate, violence,



inequalities, poor economy and corruption among others in the country (Kadiri, 2006; Abdullahi and Aziz, 2010; Ibem, 2011).

Evidences of segregation and deprivation depicting urban housing inequalities in Nigeria can be summarised as follows (Beng-Huat 1996, p. 1; UN, 2001; Kadiri, 2006; Abdullahi & Aziz, 2010; Ibem, 2011):

- Geographical separation of housing into class structure;
- Uneven distribution of basic amenities in favour of some preferred areas;
- Poor housing quality in terms of environmental condition, design, size and finishing adorning a larger portion of the urban centres; and
- Inability of the larger populace to contribute to the development of their areas and non-benefiting from the gains therein.

In relation to the above, four main factors are responsible for urban housing inequalities in Nigeria. These are (i) activities of the past colonial masters and (ii) urbanisation growth (Renaud, 1999; Nwaka, 2005; Olotuah and Adesiji, 2005, pp.2-3), (iii) lack of proper economic and physical planning (Aribigbola, 2008) and (iv) poverty (Lawanson, 2006, p. 5; Abdullahi and Aziz, 2010, p. 3).

### **Activities of the Past Colonial Masters**

According to Nwaka (2005) a large number of Nigerian cities – Lagos, Sokoto, Ibadan, Zaria, Abeokuta etc pre-date British colonial rule. These were native towns, with large indigenous populations, which subsequently had European reservation areas and migrant quarters grafted onto them during the period. Those native towns were made to retain their traditional characteristics — like traditional compound houses; customary attitudes and practices regarding food handling, waste disposal, and personal hygiene; urban agriculture; and livestock keeping (Nwaka, 2005).

In the contrary, the European quarters known as Government Reservation Areas (GRAs) were mainly for the colonial masters (District Officers) and members of their work-force with provision made for electricity, good road network, pipe-borne water supply and security. The houses were better designed similar with housing quality in their home country. This marked the beginning of housing inequalities as two distinct residential neighbourhoods were created within each of the existing towns. The development created a breathing ground for inequality, injustice, lack of equity, and above all, residential segregation and deprivation. According to Lawrence (2002), equity implies fairness in the relationship between individual and the state,

including a just distribution of benefits and services in a society while equality means equal circumstances, treatment and outcomes for all.

### **Urbanisation**

Nigeria is the largest country in Africa, and the largest concentration of black people in the world. Estimates at the turn of the 21st century suggest that 43.5% of the population were living in urban areas, up from 39% in 1985, with projections that the urban population will reach 50% by the year 2010, and 65% by 2020. The rate of urban population growth is thought to be 5.5% annually, roughly twice the national population growth rate of 2.9%. Increase in the urban population in Nigeria can be attributed to rural-urban migration, high birth rate, low death rate and relative peace due to non inter-tribal wars (Nwaka, 2005).

High urban population has therefore resulted in the proliferation of slums and informal sub-urban settlements otherwise known as shanty towns (Lawanson, 2006, p.5). The shantytowns are deprived settlements characterised by excessive residential densities, largely uninhabitable housing and the absence of sanitation, basic infrastructure and social services (Aina, 1990 in Lawanson, 2006, p. 5). Despite the intentions of many policies and programmes in recent decades, there is a growing amount of evidence showing that inequalities in the cities of many developing countries have increased in tandem with a growing incidence of homelessness, unemployment, social deprivation and health problems (Lawrence, 2002).

### **Lack of Proper Economic and Physical Planning**

Using criteria such as income, economic, social structure, physical quality of life and freedom (economic and political freedom) as determining factors Nigeria is categorised as developing country (Abdullahi and Aziz, 2010). Again, Nigeria is classified as low-middle income country with a gross national income (GNI) of US\$175.6 billions, GDP growth rate of 3.0 %, per capital income of US\$1,160 and about 84% of the population earning below US\$2 a day (World Bank, 2008 in Abdullahi and Aziz, 2010).

Lack of economic planning dated back to the era of colonial rule in Nigeria, (Nwaka, 2005) when cities and towns were not conceived or promoted as centres of industrial production for job creation and self-sustaining growth, rather as small enclaves for administration, colonial trade, and transportation. In addition, informal financing is common with urban housing development in Nigeria and explains why housing neighbourhoods look like endless, almost permanent, construction sites and housing construction sometimes

spanning well over 15 years, creating substandard homes and slum settlements (Renaud, 1999; Nubi, 2006, in Nubi, 2010, p. 22; Omirin, 2007) in Nubi, (2010, p. 22).

Nwaka (2005) argues that the policies and institutions for urban development, where they existed, were very restrictive and myopic, especially in the critical areas of land-use control, planning, and the provision of infrastructure and services. The laws, codes, regulations, and institutions designed for the small populations envisaged in colonial cities with consequential segregation and deprivation were inherited with little rethinking by post-colonial administrations, and have been quickly overtaken and overwhelmed by the process of rapid urban growth and post-colonial transformation (Nwaka, 2005).

Similar to the argument of Burningham and Thrush (2003) the post-colonial administrations engaged in a rather different aspect of housing neighbourhood inequality in the way the environmental and social policies were pursued without social and economic considerations by the colonial masters which exacerbate the hardship been faced by the poor.

Formal land use planning and management in Nigeria began in 1863 with the enactment of the Town Improvement Ordinance by the colonial government (Aribigbola, 2008). Subsequent notable planning laws are the Land Use Decree of 1978, Urban Development Policy of 1992, Urban and Regional Planning Act 1992, the Housing and Urban Development Policy of 2002, etc. Despite the existence of these laws and policies, urban land use management problems (Aribigbola, 2008) which further propagate urban housing inequalities, segregation and deprivation still persist.

A number of factors (Kadiri, 2006) can be advanced for this such as: (i) Lack of long term vision to guide the development of planning objectives; (ii) conflicts between short and long term economic objectives; (iii) geographical and functional fragmentation in many institutions; (iv) legal and technical frameworks that limit the harmonisation of planning activities; and (v) a mismatch between the political and planning framework. Other constraints according to Aribigbola (2008) are (i) use of outdated and outmoded land use Planning Policies, Laws and Regulations; (ii) inadequate manpower; and (iii) poor and inadequate funding.

## **Poverty**

This is the state of being poor; want of the necessities of life, scarcity or lack and inferiority (Advanced Learner Dictionary). The poverty level of most

Nigerians living in urban centres made it difficult for them to own houses as most of them with lowest incomes do not have sufficient funds to exercise an effective demand in the formal housing market (Daramola et al, 2004, p. 3). It has been observed that 8 out of every 10 urban households are poor with this constituting a major factor in urban congestion and environmental degradation (Jimoh, 19997) in Lawanson (2006, p.5). Poverty in Nigerian cities is endemic, according to The Human Development Report (2004) in Lawanson (2006, p. 5), 70.2% Nigerians survive on less than US\$1 daily, while about 84% of the population lives on less than US\$2 daily. Over 100 slum areas of poor housing and living conditions have emerged in Lagos between 1985 and 2006 the residents of which are low-income people (Akinmoladun and Oluwoye, 2007, p. 10) in Ibem (2011).

## **ISSUES IN URBAN HOUSING PROVISION IN NIGERIA**

Issues requiring attention in urban housing provision in Nigeria can be described in the following areas (Adamchak, et al., 1999; Wei and Wu, 2001; Fan and Grossman, 2001; Johnson, 2001) in Gong and Bingqin (2003):

- Failure of the market economy
- Deprivation, segregation and discrimination
- Inequality in neighbourhood amenities and
- Affordability

### **Failure of the market economy**

Housing is one of the basic social needs of man, but is mostly “unaffordable” for low-income earners (Franz 2009, p.12; Rizvi 2010). This is because market economy usually fails to provide adequate housing to the masses as inequalities in affordability, distribution and consumption of housing are intrinsic therein which give rise to the class structure in the urban centres (Beng-Huat 1996, p. 1). In Nigeria, market has created class structure in terms of different qualities of housing environment – low, medium, high density areas for high, medium and low income earners respectively and government reservation area for top government officials and successful business people with varying housing standard and amenities based on demand and supply forces.

### **Deprivation, segregation and discrimination**

Housing inequality within urban neighbourhoods refers to the differences in the quality of housing the results of which are deprivation and segregation. According to Pryce and Sprigings (2009) housing inequality is directly

related to concepts of racial, social, income and wealth inequalities aided by factors such as natural market forces, housing discrimination and housing segregation. Housing inequality can be viewed or conceptualised as the dispersion of a distribution in terms of location, ownership, consumption or any other quality or attribute that shows or tells the welfare status of a residential neighbourhood (Oluwatayo, 2008).

### **Inequality in neighbourhood amenities**

The most direct effect of residential inequality is an inequality of neighbourhood amenities in terms of the conditions of surrounding houses, the availability of social networks, the amount of air pollution, the crime rate, and the quality of local schools (Yinger, 2001, p. 362). In fact, there has been a long established link between poor housing and poor health dating back to Edwin Chadwick's 'Report into the Sanitary Conditions of the Labouring Population of Great Britain' in 1842 (Pevalin, et al., 2008).

### **Affordability**

There exist wide wealth gaps between the rich and poor in Nigeria. Non-affordability of good housing by the poor promotes the negative effects of housing inequality by restricting access to household wealth and greatly affect the freedoms available to an individual (Krivo and Kaufman, 2004). Apart from the intrinsic value of neighbourhood amenities like the satisfaction derived from living in a nice area which the poor is deprived of due to lack of affordability, many studies reveal that growing up in a high poverty neighbourhood may have adverse social and economic outcomes later in life (Yinger, 2001, p. 368).

## **THE NEED FOR PPPs IN URBAN HOUSING**

Over the years in developing countries, the government play the sole or dominant role in all spheres of economy including housing provision and public service delivery (Njoh, 2006) in Abdullahi and Aziz (2010, p.4). The effect has been that at all levels of economic development, there is a far greater financial need for urban development projects than can be provided by the traditional public purse alone. Problems of deprivation and segregation are arising making housing inequalities a known feature of many urban neighbourhoods especially in developing countries. Boxmeer and Beckhoven (2005) therefore, argue that these neighbourhoods are in need of intervention through a proactive measure of urban regeneration projects aiming at decreasing social, economic and/or physical problems.

PPP approach has been a trend fast developing in a number of developed countries such as UK and United States as an avenue towards increasing involvement of the private sector in the provision of goods and services traditionally provided by, and earlier seen as a function of, the public sector (Webb and Pulle, 2002; Ching ONG and Lenard, 2002). Specifically, since 1990s the establishment of public-private partnerships have become a key tool of public policy in many developed countries (Osborne, 2000, p. 20; Boxmeer and Beckhoven, 2005). Li and Akinyoye (2003) argue that one of the common approaches that have emerged over the past three decades is the use of the public-private partnership in the provision of public goods and services.

## **PPPs IMPLEMENTATION IN HOUSING PROVISION IN NIGERIA**

In response to the wave of development across the world, and convinced by the apparent benefits, the government of Nigeria notably adopted PPP around 2000 in a bid to increase housing and reduce housing inequalities to a manageable proportion (Gana, 2002, in Ibem, 2011). PPP in housing provision thereby becomes prominent in Lagos and Abuja, the Federal Capital Territory of Nigeria. Public-Private Partnerships housing schemes in Abuja are for the development of the capital city while the ones in the Mega City of Lagos, notably the Lekki scheme, Ikeja GRA scheme and OGD - Sparklight Housing Estate, Ibafo, Ogun State are for mass housing provision in the area.

Public-Private Partnerships in housing provision in Nigeria comprises mostly multi-national housing finance institutions, Federal and State government housing agencies and finance institutions, private commercial housing developers, and commercial banks as well as primary mortgage institutions (PMIs) (Daramola et al, 2004; Ibem, 2011). The attractive package attached to the scheme by the government, led to tremendous responses of the Organised Private Sector (OPS). (Abdullahi and Aziz, 2010, p. 11) as shown in Table 1

Table 1: Distribution of Participating Developers in PPP Housing in Abuja

S/N	Developer	Number	%
1	Organised Private Sector (OPS)	122	93.1
2	Public Corporation	6	4.6
3	Staff Cooperatives	3	1.5
4	International Company	1	0.8
	Total	131	100

Source: FCTA (2007, 2008) in Abdullahi and Aziz (2010, p. 11).

The roles of the participants of PPP in housing are shown in Table 2.

**Table 2:** Roles of the Participants of PPP in Housing Provision in Abuja

Government	Organised Private Sector (OPS)
1. Gives land at no cost to OPS	1. Gets land at no cost except meagre processing fee
2. To provide primary infrastructure	2. Given 3 years and 18 months to complete development
3. Set the goals	3. Comply with city regulations, standards and speculations in the construction
4. Supervision and monitoring	4. Physical construction of houses
5. Determine the standard and ensure compliance	5. Funding of the housing projects
6. Provision of legal, institutional and economic policy frameworks	6. Management of the disposal (in some cases)

Source: Adapted from Abdullahi and Aziz (2010, pp.14-15).

The general arrangement for the PPP in housing provision in Lagos (Megacity) simply involves the signing of a memorandum of understanding (MOU) and development lease agreement (DLA) between government agencies and private sector housing developers for the purpose (Ibem, 2011).

## SUGGESTIONS FOR IMPROVEMENT

It is hereby suggested that the use of PPPs in housing provision in Nigeria be adopted as in developed countries such as UK. In making this suggestion, four sets of argument are used in support – synergy, transformation, budget enlargement and capacity enlargement. These sets of argument are the ingredients embedded in PPP initiative that makes it a useful tool to address the issues earlier raised in urban housing provision in Nigeria as follows:

### Synergy

In PPP, the coming together of the public and private sectors in housing provision will make them produce a greater effect than the sum of their individual effort. There will be an improvement in the housing sector in terms of quality and quantity production at affordable prices. Where supply of housing equals of more than demand, prices will stabilised. Affordability will not only be enhanced, deprivation and housing inequalities as issues are going to be addressed. Hastings (1996) in Boxmeer and Beckhoven (2006), sees PPP arrangement as a policy synergy; a process by which new insights or solutions are produced out of the differences between the partners, thereby advancing the social goals of the public sector.

However, the PPPs in housing provision as presently structured in Nigeria could not advance the social goals of the public sector because according to

Abdullahi and Aziz (2010), the participating organised private sector (OPS) are mostly “land grabbing merchants” or “brief case companies/firms” owned by politicians, proxy civil servants and dubious business men. The interest of the masses and low-income earners are not protected considering the total housing units completed (1, 267 units) under the scheme in Lagos Megacity between 2002 and 2009 – low-income, 200 units or 16%; middle-income, 379 units or 30% and high-income, 688 units or 54% (Table 3). Comparing this with the estimate of 40,000 housing units required annually in the city, one can conclude that PPP housing schemes have contributed less than 1% of the yearly housing need in the city (Ibem, 2011).

Table 3: PPP Turnkey Housing Estates Identified In the Lagos Megacity Region (2002 – 2009).

Housing Estates	Location	Govt agencies involved	Housing units per income group		
			Low	Middle	High
Lekki Apartment	Victoria Island	Shelter Afrique	-	-	126
Havilah Villas	Isheri	GCDCL*	-	60	100
OGD – Sparklight	Ibafo	GCDCL*	50	100	150
Paradise City	Mowe	GCDCL *	-	100	200
Ewu Elepe Estate	Lagos	LSDPC*	50	119	50
Ikeja GRA	Ikeja	LSDPC*	-	-	36
Ilupeju Estate	Ilupeju	LSDPC*	-	-	26
Total			200	379	688
Percentages			16	30	54

\***GCDCL** –Gateway City Development Company Limited

\***LSDPC** – Lagos State Development and Property Corporation

Source: Ibem (2011)

## Transformation

This argument, according to Boxmeer and Beckhoven (2006) is formed by Mackintosh’s model of transformation expecting the public-private partnerships to be seen as vehicles through which participants can ‘shake up’ each other for a more entrepreneurial way of working. PPP is capable of transforming the housing sector as it is a result oriented mechanism through which the public sector can challenge the private sector to adopt more ‘social’ objectives, less driven by short-term gains. Transformation entrenched in PPP makes it a right approach for addressing issues in urban housing such as segregation, deprivation, inequalities and affordability.

However, housing prices shown in Table 4 provide support for the argument that PPP in housing provision in Lagos for instance has not shown any transformation nor provided equal opportunity to all categories of income earners to gain access to decent housing as expected (Ibem, 2011),



Table 4: Cost of Housing Provided in the OGD-Sarklight Housing Estate, Ibafo

Housing Typology	Unit Cost (Million Naira)
2-bedroom terrace bungalow	3.450 (US\$23, 000)
Semi-detached 2-bedroom bungalow	3.191(US\$21, 273)
Detached 2-bedroom bungalow	4.380 (US\$29,200)
Semi-detached 3-bedroom bungalow	5.520 (US\$36, 800)
Detached 3-bedroom bungalow	6.500 (US\$43, 333)

Source: Ibem (2011)

## **Budget Enlargement**

PPP will enable the public and private sectors collaborating and to co-operate with the objective of executing mass housing for the masses with an enlarged budget unlike a situation where each of them would have acted in isolation (Mackintosh, 1992) in Boxmeer and Beckhoven (2006). . They can in the process gain additional financial support from a third party like international financial organisations or foreign governments (Elander, 2002) in Boxmeer and Beckhoven (2006). It is a means of pulling resources together with a view to adequately address societal issues and in this regard they are housing related issues.

## **Capacity Enlargement**

In a developing country like Nigeria, Government has more responsibilities but little financial and political capacities to cope. Government capacities will be enhanced if it forms partnership with other bodies for the purpose of housing provision. Public-private partnership makes every responsibility to be spread among various intergovernmental, voluntary and private sectors thereby making major development projects such as mass affordable housing provision a reality (Friedrichs and Vranken, 2001) in Boxmeer and Beckhoven (2006).

## **CONCLUSION**

This paper focused on public-private partnerships approach as a panacea to urban housing inequalities in developing countries with Nigeria as case study. Though, findings reveal that PPPs in housing provision in Nigeria is poorly structured and without defined policy guidelines, it remains a scheme that can be employed to address urban housing inequalities in the country. The four sets of arguments – synergy, transformation, budget enlargement and capacity enlargement in support of PPPs approach are capable of generating enough resources – financial, technical, materials etc for adequate housing provision (quantitative and qualitative) for people at all income

levels. It is the right channel through which urban housing inequality eradication objectives can be achieved.

In conclusion, PPP in urban housing provision in Nigeria needs proper restructuring and should comprise not-for-profit private sector to collaborate with the public sector for the desired goal.

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# **A CRITICAL APPRAISAL OF ROAD TRANSPORT INFRASTRUCTURE MANAGEMENT IN NIGERIA**

**Alaba Adetola; Jack Goulding and Champika Liyanage**

*School of Built and Natural Environment, University of Central Lancashire, Preston, PR1 2HE, UK*

*E-mail: aeadetola@uclan.ac.uk*

In contemporary human society, transportation is crucial to the economic life of every nation. Road transport happens to be the most common mode of transportation in Nigeria, and accounts for about 90% of the movement of persons, farm produce, merchandise, animals and mobile services such as clinics, libraries and banks. Most of the federal highways in Nigeria were procured decades ago by the traditional contracting system. A good number of the road-networks in many Nigerian cities are unpaved, poorly maintained, overused and impassable, thereby cutting off many rural areas from larger settlements during the rainy season, which has a corresponding negative impact on the cost of production. This paper critically reviews the management of road transport infrastructure in Nigeria, a nation with about 140 million people. It identifies six key issues that hinder or do not allow the active involvement of the private sector in road transport infrastructure delivery. These issues include: inadequate maintenance, misuse of roads, over dependence on roads, poor inter-modal transport systems, institutional issues, and inadequate funding. It is therefore positioned that, in order to provide high quality, cost-effective, all-weather, safe, reliable and environmentally sensitive road transport infrastructure of world-class status (underpinned by 'value for money' drivers), there is a need for an adequate, enforceable and enabling legal/ regulatory collaborative engagement framework for road transport infrastructure management in Nigeria.

Keywords: highway, infrastructure, maintenance, public-private partnerships, road transport.

## **INTRODUCTION**

Transport is often a means of conveying people, goods and services from one place to another, and across several communities through road, rail, air, water, tunnel and pipeline. Transportation plays a crucial role in shaping the destiny of many nations because modern industry and commercial activities seem to rest on appropriate, well developed and efficient transport system. It

performs a critical role by allowing raw materials to be moved from farm to factory, and finished goods from factory to market, thereby enabling products to be made available at locations desired by the consumers (Potter and Lalwani, 2008). Other activities which require the movement of people include farming, agriculture, education, recreation and social contacts, employment opportunities, health services, economic activities, general development of the community, and maintenance of law and order. Emergency services rendered by most agencies also depend on street and highway system for optimal efficiency (Brockenbrough and Boedecker, 2009). Thus, the extent to which a nation's land mass is covered by road network is often an index of the degree of mobility of people, goods and services within the country, and the quality of the network measures the ease and cost of that mobility (Adesanya, 1998).

A road can be described as a thoroughfare, route, or way between two places, which typically has been improved to allow travel by some conveyance, including a horse, cart or motorised vehicle. Traditional roads were simply recognisable routes without any formal construction or maintenance while modern roads are normally smoothed, paved, or otherwise prepared to allow easy travel on land via carriageway. Road transport has trip origin and destination through terminals where passengers can embark, or where goods and services can be loaded or off-loaded in urban areas (Kendrick et al, 2004).

Road transportation has been the most popular means of movement in Nigeria, a country with an area of 923,768.64 km<sup>2</sup>, population of about 140 million comprising 11 cities with population above one million and 23 cities with population of over 200,000 (Federal Government of Nigeria, FGN 2010). It accounts for about 90% of all inter and intra city movements of persons, farm produce, merchandise, animals and mobile services such as clinics, libraries and banks across the country (Akpogomeh, 2002). The optional use of motor cars for pleasure tend to contribute tremendously to the importance of road transport in Nigeria given the deteriorated state of alternative modes of transportation (rail system, inland waterways) and also the psychological satisfaction offered by the possession of a car (Adesanya, 1998). The major cities, including the 36 state capitals and the Federal capital are connected to each other by a network of highways. The road network in the South-Western and South-Eastern Nigeria seem to be much denser than others in the rest of the country due to higher population densities (Ubogu et al, 2011).

Nigeria appears to have the largest road network in West Africa and the second largest South of Sahara. The current national network of roads is



estimated at about 196,000 kilometres with the Federal roads network carrying about 70% of freight in Nigeria (Oni and Okanlawon, 2006). Details of the distribution are given in Table 1.

Table 1 Distribution of the National Road Network in Nigeria

Type of Pavement	Federal (Km)	State (Km)	Local Government (Km)	Total (Km)	Percentage
Paved Trunk Roads.	28,741	10,400	_____	39,141	20%
Unpaved Trunk Roads.	05,600	20,100	_____	25,700	13%
Urban Roads.	_____	_____	21,900	21,900	11%
Main Rural Roads.	_____	_____	72,800	72,800	37%
Village Access Roads.	_____	_____	35,900	35,900	19%
Total (Km).	34,341	30,500	130,600	195,441	100%
Percentage.	17%	16%	67%	100%	

Source: Oni and Okanlawon, 92006

Reports have it that the present condition of some of these roads require urgent attention in most parts of the country, thereby impacting negatively on the cost of production and representing a major trigger of cost-push inflation in Nigeria (Ubogu et al, 2011; Oni, 2008; Oni and Okanlawon, 2006). Transport appears critical to economic development, both in low volume/rural roads and major arterials, since there seems to be a direct relationship between a country's economic prosperity and the length (kilometres) of paved roads (Queiroz and Gautam, 1992). This paper articulates the economic importance of road infrastructure, road classification in Nigeria, and the roles of various agencies responsible for road infrastructure management in Nigeria. Furthermore, it identifies a series of cogent problems and challenges that hinder the effective management of roads in Nigeria; and presents a number of initiatives as a potential way forward.

## **ECONOMIC IMPORTANCE OF ROAD INFRASTRUCTURE**

Transport often plays a key role in the economic and social development of every nation. Land transport involves movement of people and goods on land from one location to another. In this respect, it appears to be the dominant form of transportation in the world and includes road, rail and pipeline. Heggie and Vickers (1998) described public road network as the largest public infrastructure asset. The predominance of road transport as the means of passenger and freight movements further underlines the economic

importance of roads. The value of road asset and cost implications of delayed maintenance to a nation's economy and the road user often underscore the invaluable role of maintenance. For example, in Sub-Saharan African countries, the costs of degraded road network to road users are often very high and consequently hinder national economic development potential. In other words, poor road condition often translates into higher vehicle operating costs and lengthier travel times (Brushett, 2005). In this regard, road network may be considered as an asset which often needs to be maintained and improved in order to ensure the best performance, value-for-money and the maximum service-life. Effective management enables the road network to withstand the damage caused by wear and tear, prevents substandard conditions from developing, and ensures the flow of traffic in a safe, efficient and reliable manner with little or no damage to the environment. Thus, well maintained road networks that provide the level of service needed by road users are often critical and important element of development (Transport Research Laboratory, 1998).

The users of effective highway facilities tend to benefit from enhanced ease of travel, safety and economy of time. The owners of abutting property also benefit from better access and increased property value. Good highway system often makes for effective emergency service and better street parking. Concentration of people in urban areas might be greatly reduced, as an efficient transportation encourages the people to live in places away from their work centres. Thus, it may help in decreasing the growth of slums in urban area. Highway system may also have impact on the overall economy by lowering the cost of producing and distributing products which make up the economy and directly feeds the Gross National Product (GNP). Furthermore, it tends to generate employment since a considerable number of jobs may be highway related and expenditure on highway seems to form a big portion of the GNP (Queiroz and Gautam, 1992). The provision of highway probably makes easier the defence of a territory against aggression and the task of guarding the borders.

## **ROAD CLASSIFICATION IN NIGERIA**

The important factors often considered in classification of roads seem to be the authority responsible for the roads, accessibility to the abutting property, location and functions of the road. In this respect, the Nigerian road system is classified into three broad categories.

## **Trunk ‘A’ Road**

The trunk ‘A’ roads form the major network around which other categories of roads are built. They run through the length and breadth of the country, connect ports, capitals of various states and also provide international links with neighbouring countries. Notable examples are Lagos-Ibadan Expressway, Sagamu-Ijebu Ode-Benin Expressway, Abuja-Kaduna Expressway, Akure-Ilesa road, Lagos-Badagry-Republic of Benin road etc. This category of roads are constructed, managed and owned by the Federal Government. The distribution and length of the federal highway network in the six geo-political zones of Nigeria is shown in Table 2.

## **Trunk ‘B’ Road**

The trunk ‘B’ roads are the highways within the states which connect important towns and cities of the states, connect the cities of the states to federal highways and serve as the main arteries of traffic to and fro the district roads. This category of roads are developed, maintained and owned by the component states.

## **Trunk ‘C’ Road**

The trunk ‘C’ roads serve the interior rural population of the district and connect areas of production and market with state highways, major district roads and railways. This category of roads are under the ownership and management of the local government, hence they are commonly referred to as local government roads.

Table 2 Federal Highway Network in the Six Geo-Political Zones of Nigeria

Zone	States	Road Network (Km)
South-East	Anambra, Enugu, Imo, Ebonyi, Abia	3,121.70km
South-West	Lagos, Oyo, Osun, Ondo, Ekiti, Ogun	4,161.06km
South-South	Akwa Ibom, Delta, Cross River, Bayelsa, Rivers, Edo	4,150.89km
North-East	Adamawa, Bauchi, Borno, Gombe, Taraba, Yobe	6,787.90km
North-West	Kaduna, Jigawa, Kano, Katsina, Kebbi, Sokoto, Zamfara	6,363.40km
North-Central	Niger, Kwara, Plateau, Benue, Nasarawa, Kogi, Federal Capital Territory Abuja	9,756.00km
Total		34,340.95km

Source: Authors’ Fieldwork, 2011

Each tier of government has the responsibility for planning, designing, construction, rehabilitation, operation and maintenance of the network of roads under its jurisdiction (Ubogu et al, 2011). In other words, federal roads are managed by the Federal Ministry of Works, state roads are managed by

the State Ministries of Works, while the local roads are managed by the Works Department of local government authorities (774) in Nigeria.

## **ROAD INFRASTRUCTURE MANAGEMENT IN NIGERIA**

Road infrastructure management often covers the use, operation, maintenance and development through improvement or construction of new roads. It has been defined as the process of maintaining, improving and optimising the overall performance of the road network and all its elements (pavement, bridges, street lights, signs, drains, lines, street furniture, verges etc.) over time (Transport Research Laboratory, 1998). A highway is a general term which defines a conduit or public way provided for use of vehicular traffic including the entire area within the strip of land reserved by mutual consent or acquired by statutory regulations. A typical highway is constructed in such a way that will enable the operators of vehicles to have a clear view ahead of lines, curves, horizontal and vertical alignment that merged (O'Flaherty, 2007). Well-maintained roads are expected to be well lit especially to aid night-travel, hence, road lighting is put in place on roads to ensure the safe movements of both vehicles and pedestrians at all times (Slinn et al, 2005). Similarly, road surface often affects the stability of vehicles by the nature of the contact between the wheels and surface, and it further affects the driver in controlling his vehicle by the amount of irregularities present. Sudden bumps are known to cause loss of control if speeds are not adjusted to the road conditions (Kendrick et al, 2004). The quality of any work is often a factor of material, methodology used and competence of personnel or supervisor. In this regard, Arumala (1987) and Akpododje (1986) discovered little or no adherence to highway design standards, poor supervision by government officials, and lowering of the design specifications during construction as major factors responsible for road failure in Nigeria. Similarly, Ibrahim (1980) and Ola (1978) attributed road failure mainly to overloading, use of sub-standard construction materials, and inadequate knowledge of the geotechnical properties of the soils over which roads are built.

The administration of highway in Nigeria does not differ considerably from the standard practice. The Federal Ministry of Works, an agency designated to administer the highway programme of the Federal Government of Nigeria is responsible for managing all the road system that form the core of the national grid.

### **Federal Ministry of Works**

The Federal Ministry of Works, (FMW) is charged with several statutory responsibilities among which are federal highways and bridges (planning,

design, construction and rehabilitation); supervision of the monitoring and maintenance of federal roads nationwide; provision of highway engineering infrastructure; and surveying and mapping of Nigeria's internal and international boundaries. The agency is presently structured into four operational departments namely: Highways (Planning and Design); Highways (Construction and Rehabilitation); Engineering Services; and Federal Surveys. Other service departments include Public Procurement; Human Resources; Planning, Research and Statistics; Legal Services; and Finance and Accounts.

The ministry also supervises the activities of the Federal Roads Maintenance Agency (FERMA); Federal School of Surveys, Oyo; and Regional Centre for Training in Aerospace Surveys, Ile-Ife. The ministry operates through its field headquarters located in the 36 states of Nigeria and the Federal Capital Territory, Abuja. The vision of the ministry is to elevate Nigerian roads to a standard where they become national economic and socio-political assets, contributing to her rapid growth and development. The agency intends to make federal roads functional, pleasurable and an avenue of re-inventing Nigerians' trust and confidence in government.

### **Federal Roads Maintenance Agency**

Highway maintenance often has to do with preserving and keeping road structures as near as possible in their original state. It consists of correcting deficiencies that have developed as a result of age, use and the effects of the elements, and taking steps to prevent or delay the development of other deficiencies. Road maintenance is vital in order to prolong its life, just as well-maintained roads often reduce the cost of operating vehicles by providing good running surface. Proper maintenance also keeps the roads open and ensures greater regularity, punctuality and safety of transport services (Central Bank of Nigeria, 2003).

In 1995, Civil Engineering experts and concerned stakeholders including the Nigerian Society of Engineers (NSE), Council for the Regulation of Engineering in Nigeria (COREN), the organised private sector, experts from the Central Bank of Nigeria (CBN), experts from the World Bank and the International Road Federation, Nigerian Association of Road Transport Owners (NARTO) and the National Union of Road Transport Workers (NURTW), after hectic brainstorming sessions, came up with what is now known as the Road Vision 2020. The Vision advised government to de-link road-maintenance from planning, design, construction and rehabilitation, which are the traditional Federal Highways Department's role domiciled in the Federal Ministry of Works. Thus, the Federal Roads Maintenance

Agency, (FERMA) was established on 20<sup>th</sup> November 2002, with the enactment of the Establishment Act 2002 to monitor and maintain all federal roads in Nigeria. FERMA is an agency under the Federal Ministry of Transport, Nigeria, whose principal role is to carry out regular routine maintenance on the federal road network. The agency came into being as a 10-13 year stop gap pending the time a full-fledged reform is put in place to incorporate the Nigerian roads with a comprehensive infrastructure management system.

FERMA, along with the Highways Department of the Federal Ministry of Works are responsible for looking after the federal roads network. The Highway Department is charged with the construction of new highways, and the reconstruction and rehabilitation of badly damaged highways, while FERMA is responsible for maintaining the highways at acceptable levels of usability.

### **Road Traffic Administration and Safety Management**

In 1976, there were 53,897 road traffic accidents resulting in 7,717 deaths in Nigeria. In the year 1981, the number of accident reduced to 35,114, but the fatality increased to 10,236. On the average, there were 96 accidents and 28 deaths every day of that year. The situation in subsequent years was not significantly different, although fatality rate reduced to 9,707 in the year 1993 and 6,521 in the year 2000 (FGN 2010). Road safety engineering according to Akinyemi, (1986), is often a set of activities designed to reduce the number and / or severity of accidents on specific road sections by exchanging or modifying some road environment characteristics. Such activities generally consist of planning (identification of safety problems, road locations and feasible road counter measures); implementation (installation or construction of the counter measures); and evaluation (the determination of the degree of effectiveness of the counter measures). In this respect, Odeleye, (2000) reported that the road traffic environment in Nigeria is characterised by over-speeding, blocked drains, narrow pedestrian walkways, bushy road environment, rough and undulating surfaces, black spots (accident prone locations), unfit road intersections, narrow bridges, defaced signs, non-functional traffic lights, irregular road marking, road median not crash worthy (concrete), poor guard railing arrangement, high disregard for traffic law and regulations, and flooded road surfaces.

This description suggests a system that is devoid of modern technology. As a key tool which can be used to improve the movement of people and goods in order to meet the evolving needs of modern economy and society, Intelligent Transport Systems (ITS), a technology toolkit involving a systems approach

to transport often facilitates effective infrastructure management encompassing improved road safety (European Transport Safety Council 1999).

### **The Federal Road Safety Commission**

The Federal Road Safety Commission (FRSC), a government agency with statutory responsibilities for policy making, organisation and administration of road safety in Nigeria was established in February 1988, through Decree No. 45 of 1988 as amended by Decree 35 of 1992 referred to in the statute books as the FRSC Act cap 141 Laws of the Federation of Nigeria, passed by the National Assembly as Federal Road Safety Commission (Establishment) Act 2007.

The functions of the Commission generally relate to:

1. Making the highway safe for motorists and other road users.
2. Recommending works and devices designed to eliminate or minimise accidents on the highways and advising the Federal and State Governments including the Federal Capital Territory Administration and relevant governmental agencies on the localities where such works and devices are required, and
3. Educating motorists and members of the public on the importance of discipline on the highway.

## **CHALLENGES TO PRIVATE SECTOR PARTICIPATION IN ROAD TRANSPORT INFRASTRUCTURE MANAGEMENT IN NIGERIA**

From the foregoing, the key issues which seem to hinder private sector participation in road transport infrastructure management in Nigeria may include:

### **Inadequate maintenance**

In 1985, about 23% of national roads were in a bad state in Nigeria. This situation rose to 30% in 1991, 50% in 2001 and about 60% in 2010 (FGN 2010). The findings of a survey conducted by the Central Bank of Nigeria (2003) revealed that some roads which were constructed over 30 years ago have not had any rehabilitation interventions, thereby resulting in major longitudinal and transverse cracking, depressions, broken bridges and numerous potholes that make road transport both very slow, costly and

unsafe. The survey reported that most of the roads in the Southern and Northern Nigeria were in very poor conditions, and therefore require complete/ total rehabilitation and asphalt overlay, re-installment of the shoulders, filling of potholes and re-building of collapsed bridges. This implies that road infrastructure in Nigeria probably suffers from inadequate routine maintenance, neglect of periodic maintenance and the absence of emergency maintenance in areas affected by flood, storms and other natural calamities. Absence of adequate road maintenance often reduces the useful life of the roads, thus, resulting in premature and costly road reconstruction, while poor surface increases the operating cost of vehicles and has significant effects on road safety (Campbell, 2009). Furthermore, decisions regarding which roads to improve may depend more upon political factors rather than the economic potential of the proposed route (Porter, 2007).

### **Misuse of roads**

Nigerian roads appear to be heavily motorised. Goods that ought to have passed through the railways and waterways seem to be moved through the road network. The Nigerian road traffic environment is apparently composed of heavy-duty trucks, lorries, trailers, tankers, cars, motorcycles/ tricycles, pedestrians, and cart pushers. Though almost all roads in the federal road network were designed to carry a maximum axle load of about 30 tonnes, many trucks seem to carry up to about 50 tonnes axle loading (Akpokodje 1986). The result of this excess axle loading “overloading” of articulated vehicles is probably the visible ruts and cracks that cause failures and damage to Nigerian roads. Furthermore, the federal roads in Nigeria appear to lack adequate transit park and rest areas, hence, heavy-duty trucks are often parked on highways. Excessively-high axle loads on paved and gravel roads especially during the raining season often contribute substantially to reducing the life expectancy of roads. Thus, a major cause of the declining roads infrastructure might be the misuse of roads due to overloaded trucks (Arumala and Akpokodje 1987).

### **Over dependence on roads**

The dependence on roads in Nigeria presently is almost total simply because the Nigerian railway is almost grounded and air traffic appears low in the country. It is estimated that between 90-95% of the total transport movements is on the road network. Thus, the transport of goods seems not optimised towards the most appropriate mode as the railway and inland waterways modes appear neglected. In this respect, freight and bulk goods are carried over long distances by heavy-duty trucks and tractor-trailers, whose activities are probably responsible for some of the fatal accidents on Nigerian roads.



For example, they are known for overloading, over-speeding and flagrant disregard for traffic laws (Odeleye, 2000).

### **Poor inter-modal transport system**

An integrated transport system often has to do with effective connectivity between ports, rail, road, inland waterways and air, thereby making use of the advantages of different modes to ensure seamless movement of goods and people and better utilisation of resources. For instance, goods arriving by sea appear best transported from the port by rail or inland waterways. However, Nigerian ports, except Port Harcourt and Apapa are not connected by rail and the waterways (FGN 2010). This implies that a comprehensive transportation system which interconnects the various transport modes to make the most use of their individual advantages does not seem to exist at present in Nigeria. Hence, freight transports are probably not carried by the most appropriate transport mode. Bulk cargoes/ goods are carried over long distances by trucks and tractor-trailers.

### **Institutional issues**

Road transport infrastructure management appears to be a complex issue in Nigeria. This is so, because the supply of road facilities cuts across various categories of public agencies. For example, the Federal Ministry of Works constructs and rehabilitates the federal road, the state ministries of works build and maintain state road, while the remaining roads are under the jurisdiction of the local government authorities. FERMA is expected to undertake regular routine maintenance, while the FRSC is responsible for road traffic administration and safety management. Furthermore, the Vehicle Inspection Officers ascertain the roadworthiness of vehicles, the Traffic Police/ Warden controls road traffic, while the Traffic Department of the Nigerian Police Force prosecutes erring road users. Some State Governments also have their own state transport maintenance agencies. Aside from the problem of overlapping objectives and responsibility, there seems to be no attempt to coordinate the activities/ effort of these agencies. In this respect, Malmberg-Calvo (1998) emphasised the need to develop an institutional framework for managing and financing road infrastructure.

### **Inadequate Funding**

Project financing can be described as a business plan for a profitable investment, with a long-term view, and the combination of time and money put together in a dynamic contract with a delegation of responsibility over time (Heather, 2000). The highways and streets on which motor vehicles

travel are often provided, maintained and operated by government as one of its primary function. Highway financing may have to do with sourcing and the usage of capital for the construction and improvement of highways. According to Mabogunje (1998), there are few available avenues in most African countries for raising sufficient revenue to fund urban infrastructure. Moreover, these countries are often restricted by their national governments to a narrow range of revenue. This may be the true state of road development funding in Nigeria, where government solitarily finances all road development projects. In this regard, The Central Bank of Nigeria (2003) reported that since the economic reform in 1999, less than 10% of the funding request made by the Federal Ministry of Works was appropriated, while only about 54% of the appropriation was released. This suggests the fact that funding of road infrastructure projects in Nigeria might have been grossly inadequate. FERMA appears to have an enormous task of maintaining nearly 35,000 kilometres of road network (see table 2), with about 60% of the roads in very serious state of disrepair. Therefore, there seems to be an urgent need for alternative source(s) of finance other than government for road improvement programmes, so as to make the national gridlock more safe, vibrant and viable.

## **PUBLIC-PRIVATE PARTNERSHIPS: THE WAY FORWARD**

Throughout the world, Public-Private Partnerships (PPP) have become increasingly popular as a vehicle to deliver large transportation projects, such as roads, bridges, tunnels, railways, seaports, and airports. The National Council for Public Private Partnership, USA (2009) defined PPP as a contractual agreement between a public sector agency (government) and a private sector entity, through which the skills and assets of each sector are shared in delivering a service or facility for the use of the general public. Globally between 1985 and 2009, more than 950 transportation facilities worth over US\$550 billion were newly built, upgraded, or operated through PPP (Public Works Financing 2009). The UK has been widely recognised as the pioneer and leading nation in delivering transportation through PPP, alongside such countries as Australia, Spain, South Korea, Canada, Ireland, France, China and Brazil (Deloitte 2007). The various forms of Public-Private Collaboration include Private Finance Initiative (PFI), Build-Operate-Transfer, Build-Own-Operate-Transfer, Build-Own-Operate, and Design-Build-Finance-Operate/ Maintain. Since 1992 to date, over 67 transportation projects costing more than US\$42 billion have been delivered through PFIs, and an additional 12 projects are in the planning pipeline in UK (Her Majesty Treasury 2009). The merits of Public-Private Collaboration are summarised by Li and Akintoye (2003) as: enhancing the government's capacity to

develop integrated solutions; facilitating creative and innovative approaches; reducing the cost to implement the project; reducing the time to implement the project; transferring certain risks to the private sector partner; attracting larger, potentially more sophisticated bidders to the project; and providing avenue to access skills, experience and technology.

## **DISCUSSION**

An effective network of roads and highways often fosters safe, efficient movement of people, goods and services, and contributes to economic growth. Roads and highways directly connect to other transportation modes, hence, are vital to moving raw materials to factories and finished products to markets.

The road network in Nigeria is currently estimated at about 196000 kilometres, with the Federal Government being responsible for managing about 17%, State Governments 16% and Local Governments 67%. However, these roads appear to have been plagued by a number of problems, the major ones being faulty designs, poor drainage system; excess axle loading of articulated vehicles; dumping of refuse on the shoulders, drains and manholes; wrong and harmful parking on the highways; and poor maintenance. Given the long years of neglect of maintenance and severe pressures being exerted on them, many of these roads seem to have deteriorated beyond maintenance and consequently require complete rehabilitation and reconstruction. These problems might have significantly reduced the utility of the roads, negatively impacted on the cost of production and represent a major trigger of cost-push inflation.

In the past, the government had concentrated effort on road construction, but probably much has not been done in the areas of establishing a regulatory framework and introducing measures that would promote effective road transport infrastructure management in Nigeria. The Federal Government had set up some Commissions in the past to address the problem of road maintenance. For instance, The Wey Commission of 1971 examined the organisational structure of highway development and management in five selected countries, and therefore recommended the formation of a Federal Highway Authority for the administration of all federal roads in Nigeria. The 1979 Panel also recommended the setting-up of a parastatal (The Federal Highway Authority) under the then Federal Minister of Works and Housing, for planning, designing, constructing, maintenance and surveillance of federal highways. Similarly, the 1996 workshop launched the 'Road Vision' 2000 and recommended the establishment of an autonomous road agency that would be responsible for road maintenance. Furthermore, the 1999

Presidential Policy Advisory Committee recommended the establishment of a central body to ensure high standards in highways development and maintenance. This Committee also recommended that funding of highways maintenance should be improved by establishing a 'Road Fund', which would derive its funds from highway tolls, vehicle taxes, trucks, petroleum taxes, weigh bridges and parking fees.

In recognition of the challenges of infrastructure development, the Federal Government of Nigeria set up the Infrastructure Concession Regulatory Commission (ICRC, Establishment) Act, 2005. This Act provides for the participation of the private sector in financing, construction, development, operation or maintenance of public infrastructure or development projects of the Federal Government through concessions or other contractual arrangements. The ICRC 2005 is expected to regulate, monitor and supervise the contracts on infrastructure or development projects. The Board of the ICRC was inaugurated in November 2008. However, since its establishment and inauguration, it appears not much has been done to implement the policies contained in the Act.

The problems associated with poor road maintenance policies may therefore have to do with weak or unstable institutional arrangements for managing and financing roads. Fund for road infrastructure projects has been from the Federal Government allocation to the FMW, as well as state and local government allocations for maintenance purposes. The proliferation of agencies appears to have created problems of overlapping objectives, responsibility, conflicts in the provision and management of road transport infrastructure and services, and in the enforcement of traffic laws and regulations. Considering the impact of effective road transport infrastructure services on the economy/ welfare of the society, and the huge amount of money required for its development, it behoves on Nigerian Government to partner with the private sector in order to achieve the desired efficiency and effectiveness in road transport infrastructure services. This is supported by Akintoye and Beck (2009) who identified transportation as one of the major physical infrastructure mainly needed by developing countries to support economic activities, but noted that many developing countries cannot afford this facility without affecting other economic activities because of the cost considerations (initial capital outlay and cost of operation/ maintenance) and lack of appropriate technology.

## **CONCLUSION**

The movement of passengers' and freight has been an integral part of everyday activities, an engine of economic growth, and an important

component of the well-being of the society. Over the years, investment in public infrastructure has been the exclusive responsibility of government. But now, there is an increased trend world-wide, where government collaborates with the private sector in order to bridge the country's infrastructure gap. Nigeria has become increasingly dependent on the road system to meet virtually all its inland transport needs as the rail, pipeline and inland waterway systems have deteriorated. At the same time, the road network itself has suffered from continuing lack of maintenance and investment by the three levels of government, federal, state and local. Thus, this study carefully identifies inadequate maintenance, misuse of roads, over dependence on roads, poor inter-modal transport system, institutional issues, and inadequate funding as key issues which do not allow the active involvement of the private sector in road transport infrastructure delivery in Nigeria.

Therefore, in order to provide high quality, cost effective, all-weather, safe, reliable and environmentally sensitive road infrastructure of world-class status that guarantees 'value for money' benefit to all road users, this study strongly recognises the need for an adequate, enforceable and enabling legal/regulatory collaborative engagement framework for road transport infrastructure management in Nigeria. The framework would encourage and remove all barriers towards the private sector participation in the development, provision, maintenance, operation, and upgrading of road transport infrastructure and services. This would guarantee regular attention as well as adequate finances for construction, rehabilitation, routine repairs, and integration through which the road traffic environment will enjoy the benefits of modern technology like Intelligent Transport System/ telematics component installation along Nigerian road network. Furthermore, it would also integrate modes of transport infrastructure services for convenient and seamless travel, using modern systems like electronic ticketing and payment.

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# CHANGING IN REFORM AGENDAS AND PUBLIC PRIVATE PARTNERSHIPS (PPP)

**Santi Jintamanaskoon and Paul W Chan**

*School of Mechanical, Aerospace and Civil Engineering. The University of Manchester, Sackville Street, UK, Postcode M13 9PL.*

*Email: santi.jintamanaskoon@postgrad.manchester.ac.uk*

Ever since it was first conceptualised in late 1970s and early 1980s, Public Private Partnerships (PPP) has recently become a cutting-edge tool in delivering infrastructures and public services. This is largely because its promises for a better level of services delivery and better value for money (VFM). As such the previous researches have focused their attentions on how Public Private Partnerships can be better governed in order to achieve the inspiration of VFM. Thus technical and managerial issues such as; management of risks and finance, structuring an arrangement, performance management and measurement have been put forward with the attempts to advance this field of study. Nevertheless this seems to be a lopsided of research into Public Private Partnerships, given the fact that it is a measure for government to implement their public services policy. That means the existing literatures are very much concerned with inter-organizational relationships between the two settings in relations to the above aspirations. But they appear to take a wider surrounding context Public Private Partnerships operate in for granted. With this in mind the paper is intended to broaden the current focus of the research to include that oblivion context of the study. Public services reform agenda as an important element in deciding: which areas, what extent and how the services should be delivered, is therefore proposed to complement the current stage of Public Private Partnerships study. Their natures and roles in influencing collaboration between public and private sector are investigated with the aim for a better understanding of Public Private Partnerships in a more practical and real context.

Key words: public private partnerships (PPP), collaboration, public services reform, reform agendas.

## INTRODUCTION

Over the last two decades Public Private Partnerships, as a cross economic sector collaboration, has been widely used across the continents for delivering public infrastructures and public services. This is because first of

all its ability in helping the governments to reduce public spending during the period of budget constraints. Secondly by bringing in private sector into the public works, it is argued by the proponents as a way of revitalising sluggish areas in public sectors (Robinson *et al.*, 2010). This point is often considered as a complementary of skills set across boundaries where the public sector leaning towards, for instance, responsible and accountable to society, whilst the private sector is likely to be more competitive and efficient in economic term (Jamali, 2004). In other words that means by coming to the term partnerships, it provides an opportunity for resources and skills to be more effectively utilised for delivering a better services. However, the problem is that how to capitalise on this opportunity and how strengths from both sides can be properly leveraged.

Developing upon these fundamental reasons the existing researches into Public Private Partnerships therefore have been central in managerial and operational aspects for enhancing collaboration between two sectors. For example Jones and Noble (2005) in sustainability in inter-organizational collaboration; Robinson and Scott (2009) in services delivery and performance monitoring in PFI/PPP; Sobhiyah *et al.* (2009) in increasing VFM in power station project; Li et al (2005) appropriate risk allocation model and Appuhami *et al.* (2011) risk management in inter-organizational level of PPP. This streamline of research is observed by Tang *et al.* (2010). They review the literatures in Public Private Partnerships in the construction industry over the last ten years and point out that the past research appears to be focused on very limited areas: risks, financing, relationships, development of partnerships model, project success factors and concession period. To this end it could be argued that the key concern in this field of study is tended towards overcoming any technical and managerial obstacles in implementing Public Private Partnerships so that its expected advantages and promises could be demonstrated.

However as noticed by Phillips *et al.* (2000) in the study of inter-organizational collaboration and the dynamics of institutional fields that collaboration does not occur in a vacuum or external to surrounding context. In fact there is the connection between collaborations and institutional field that they operate in the sense that it provides a backdrop of resources and practice that are crucial in collaboration process. This implies that Public Private Partnerships is not only a matter of collaboration between the two settings. In fact it can be enhanced or disrupted by a wider institutional context they operate in (Marchington and Vincent, 2004). In order to have a more understanding in Public Private Partnerships in a real and practical context, this dimension should not be ignored, as though the partnerships are isolated and would never been influenced by the institutional dimension.

The aim of this paper is to inject a fresh perspective into Public Private Partnership research by calling for an investigation into changes in reform agenda over collaboration between public and private sector in delivery of public services. It is organised in three main sections. Firstly a brief overview of current stage of knowledge in Public Private Partnerships research is presented. By doing this it helps us to think and rethink through the present territory of the research and crucially what appears to be a missing context for advancing this field of study. Second of all a proposed methodology for conducting research in a specific direction is subsequently discussed. Due to the study investigates past and present phenomenon (changing of reform agenda over collaboration between public and private since 1980s), a multi-qualitative strategy is developed to get access to the past events and their changes (an archival strategy) as well as deeply investigate recent and current phenomenon (a case study strategy). Lastly as this paper is produced on the ground of preliminary step in Ph.D study therefore it is unable to draw up the research findings. Notwithstanding its early stage and findings yet to be found, the expected practical implication on Public Private Partnerships and its value are discussed as a conclusion in this paper.

## **CURRENT STAGE OF KNOWLEDGE AND MISSING DIMENSION**

Unlike the conventional way of working which is almost all activities in delivering public services fall into the public sector's hands, Public Private Partnerships helps to relieve those overwhelmed tasks through an involvement from private sector. Basically it spans from involving in decision-making to delivering process of infrastructures and services (Hodge and Greve, 2007). From the view of researchers such as; Kwak *et al.* (2009) and Jamali (2004) this could be argued that Public Private Partnerships is an umbrella term encompassing a variety of arrangements between public and private sector depending upon a degree of involvement from private sector (e.g. designing, financing, operating and owning/returning the asset backs). As such Public Private Partnerships could be considered as a type of inter-organizational relationships (IOR) which is intended to increase efficiency, quality and competitiveness of public sector services (Appuhami *et al.*, 2011 and Lane, 2000).

According to Cropper *et al.* (2010) the IOR is largely concerned with forms, structures, process, management and outcomes of relationships between two organizations. These characteristics of IOR study have obviously presented in many researches into Public Private Partnerships. For example Gross and

Gavin (2011) in structuring PPP toll-road that has to deliver “public objective” (e.g. affordable rate, managing congestion and minimising state subsidizing) and able to provide a vital financial return to make the project approval. Or relationships management in PFI/PPP projects by (Smyth and Edkins, 2007) and stakeholder management for Public Private Partnerships (El-Gohary *et al.*, 2006). This trend of researches is certainly central in how to enhancing the use of public private arrangement. That means it attempts to capitalise on opportunities provided by the partnerships and wherever the problems are or the obstacles arise, then the research would be placed to tackle. Developing upon this argument the key issues in Public Private Partnerships seem to be broadly investigated in two main concerns. Firstly it is about gaining more benefits from committing to partnerships or advantages focus, while another concern attempts to overcome obstacles in using this partnerships. Table 1 shows example of issues in two concerns of Public Private Partnerships research.

**Table 1:** The two concerns in conducting Public Private Partnerships research

<b>Advantages focus</b>		<b>Overcoming obstacles</b>	
<i>Author(s)</i>	<i>Research focus</i>	<i>Author(s)</i>	<i>Research focus</i>
Gibson and Davies (2008)	Investigating impact of PPP on education	Jost <i>et al.</i> (2005)	Sustainability of collaboration across economic sector
Barlow and Koberle-Gaiser (2008)	Delivering innovation and better performance in PFI/PPP hospital project	Jones and Noble (2005)	Boundary-spanner in helping to co-ordinate works across organizations
Clifton and Duffield (2006)	Improving services and outcome and performance measurement	Appuhami <i>et al.</i> (2011); Zheng <i>et al.</i> (2008)	Behavioural risks and opportunistic behaviours

<b>Advantages focus</b>		<b>Overcoming obstacles</b>	
<i>Author (s)</i>	<i>Research focus</i>	<i>Author (s)</i>	<i>Research focus</i>
Sobhiyah <i>et al.</i> (2009)	Increasing VFM for power station project	Zheng <i>et al.</i> (2008)	Dynamic of contractual and relational governance in PPP
Li <i>et al.</i> (2005)	Risk allocation model in PFI/PPP	Roehrich <i>et al.</i> (2010)	A model in complex inter-organizational system
Zhang (2005)	Financing PPP projects		

The example of existing studies seems to imply that in one hand it tends to advance the use of partnerships by working on managerial and technical aspects that are brought in by the partnerships arrangement. On the other hands the research attempts to deal with issues arising from differences in business, strategies and value driven between the two sectors (Jones and Noble, 2005). That said the current streamline of Public Private Partnerships

research is largely dealing with inter-organizational collaboration matter: leveraging strengths from both sides, capitalising on opportunities provided by partnerships and overcoming obstacles arisen from those differences, with the aim to make a better and more efficiency of public services.

In addition to a promise for better level of services delivery, Public Private Partnerships research also appears to be driven by an inspiration for a better value for money (VFM). This is because in deciding whether or not Public Private Partnerships is adopted it has to demonstrate that comparing to the traditional way of delivering, Public Private Partnerships can deliver a better value for money (Robinson *et al.*, 2010). According to HM Treasury (2004) Value for Money (VFM) is defined as an optimum combination of whole life cost (capital cost and operational cost) and quality of services delivery to meet public sector requirement. Clifton and Duffield (2006) noticed that it is featured by: risk transfer, whole life costing, innovation (e.g. financial, structure, services and technical), asset utilisation, output based specification, performance measurement and incentive. Together with the above discussion, it is not surprising why most of the research tends toward managerial and operational issues that are associated with managerial and operational aspects in using PPP.

Nevertheless by focusing up VFM inspiration and performance improvement for services delivery, it seems to be a lopsided of Public Private Partnerships research. This is because ever since it was first conceptualised in late 1970s or early 1980s, Public Private Partnerships has been used as a tool in implementing public services and public infrastructure policy. Therefore it could be said that the collaboration between public and private does not take place external to a wider surrounding context. In fact it has always been influenced by for instance direction, certain areas introduced by the government policy which is known as “public services reform agenda”.

For example comparing between the recent New Labour government (1997-2010) and the current Conservative government, there is a clear distinction between their reform agenda for better public services. In the attempts to modernizing those services in the line of users need the New Labour government were committed to “widening choice” and “personalization of services”. At this point it was implemented through the involvement from the Third Sector (TS) in many contexts: developing mainstream policy, commissioning, shaping and delivering the services for public (Kelly, 2007). However after the regime was changed in the general election 2010, the agenda in reforming public services appears to be in the different direction. As it was proposed in the Comprehensive Spending Review (CSR) in autumn 2010 as a significant part of the government plan in deficit reduction, the

reform agenda is tended towards the government's flagships "Big Society" where the emphasis is on sharing responsibility by changing the role of the state and how services are provided (HM Treasury, 2010). In a broad context while the previous government seemed to reform public services by focusing on diversity and users need, the incumbent on the other hands is committed to effectively utilise resources, localising power and decision making as well as bringing in involvement from community in shaping services.

This changing of reform agenda has continuously happened in the UK public services as Kelly (2007) pointed out "In the UK, the government continues its project to reform public services. Earlier projects have focused on the modernization of public sector organizations; in the latest round of reform, New Labour has focused on widening choice and the personalisation of services". From this perspective both of public and private sector which are they key participants in delivering the services are inevitably influenced or subjected to the matters of reform agenda. In other word the Public Private Partnerships is not only confined to a collaboration between the two settings. In fact it is also inextricably linked to institutional field, here "reform agenda" they operate in. Figure 1 below shows the key concerns brought into public services by each government reform agenda.

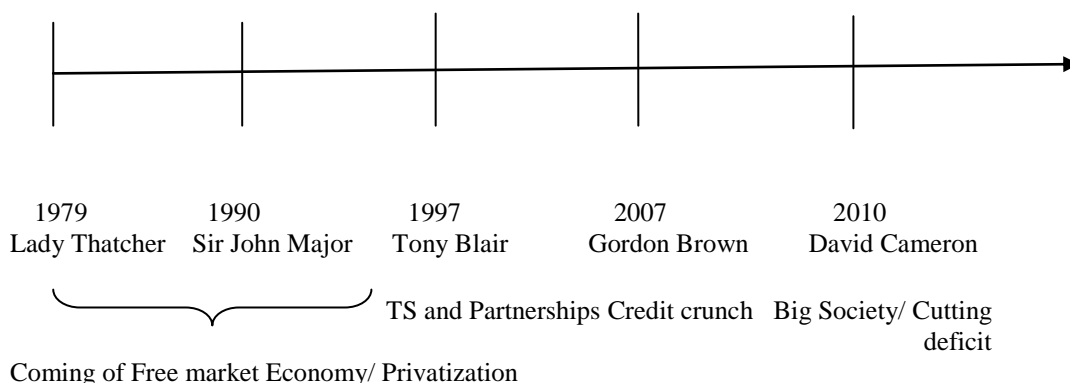


Figure 1: The emphasis and condition of each government in reforming public services

The important of a concern in connection between inter-organizational collaboration and institutional field was observed by many scholars. For example Phillips *et al.* (2000) they pointed out that collaboration does not occur in a vacuum or external to surrounding context. In fact there is the connection between collaboration and institutional field that they operate in the sense that it provides a backdrop of resources and practise that are crucial in collaboration process. However it is suspected by Marchington and Vincent (2004) that "Much of the research in inter-organizational relations assumes that firms operate as relatively autonomous and cohesive units that

are....[...] unimpeded by wider institutional context governing the industry as a whole". This seems to be relevant with the current streamline of research into Public Private Partnerships which is largely driven by VFM inspiration and performance improvement aspect.

Consequently by taking the institutional dimension for granted, research findings might have been misinterpreted in the sense that 1) excluding how institutional structures shape relation between organizations or 2) not capturing the fact that inter-organizational relations vary depending on a variety of circumstances. In the context of Public Private Partnerships as a type of inter-organizational relationships (IOR), this concern might have a significant implication on reliability of findings, for instance; whether or not they reflect the full pictures of study.

With this in mind this paper aims to inject a fresh perspective on Public Private Partnerships research by calling for research into the nature and role of public services reform on the way collaboration between public and private sector stakeholders are conceptualised, talked about and practised. To do so the research will be conducted under two primary contexts. Firstly it is concerned with tracing back changing agenda of public services reform since the conceptualisation of Public Private Partnerships in the 1980s. Secondly the paper also seek to investigate on how those reform agendas have shaped the way in which public and private working together in delivery of public services.

## **RESEARCH METHODOLOGY**

Due to the study attempts to investigate phenomenon and changes of reform agenda since Public Private Partnerships was first conceptualised in 1980s as well as at the current and present time. A multi-qualitative strategy is adopted to address the research concerns. This includes an archival strategy for dealing with the past distant phenomenon and a case study approach is targeted for current and present phenomenon. By employing both of archival and case study strategy, it will be able to facilitate a process for in-depth exploration in what had happened to collaboration between public and private sector according to public services reform. And essentially a full picture of this concern (streamline of phenomenon since the past) could be obtained. Figure 2 below illustrates on how both an archival and a case study are used to investigate influences of reform agenda over collaboration between the public and private sector.

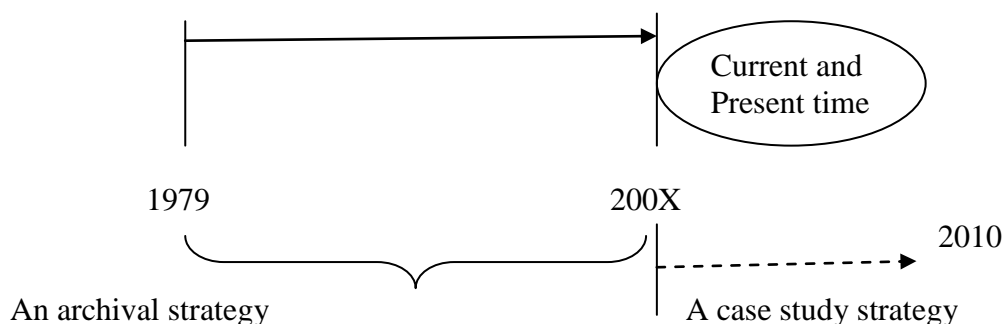


Figure 2: Multi-qualitative strategy (Archival and Case study)

According to the figure 2 an archival strategy is designed to use for accessing the past phenomenon (reforms agenda and their changing) since 1979 to the recent time , for instance, 2005 or 2007 which was the last days of the Labour government. The investigation will then be complemented by the use of a case study for a dept understanding of reform agenda in the current and recent time.

For conducting an archival research data will be collected through the National Archive material which is unpublished. In a broad context the investigation will be held for the three consecutive periods: Lady Thatcher's year (privatization), Sir John Major (Chaterism) and Mr Blair (Partnerships and Third sector). This is largely because although the public service reform agenda is continuous process from one government to another, each of them tended to carry different agenda and features in reforming. Thus it is worthwhile for getting access directly to these past events and see their changes and transition from one focused agenda to another.

In the context of case study, data will be collected through two channels. First one is documents and second one is interviews. Using of documents is mainly concerned with reviewing the independent reviews conducted by appointed committees such as; Lyon Reviews (2004) in relocation of public sectors activities and Gershon review (2004) in public services efficiency. By doing this it could enable us to understand what have happened and are likely to happen in recent and current round of reform. In addition the implications of government policy or reform agenda could be found in this sort of reviews. This series of reviews could credibly help to form the current stream of how reform agendas have been changed. And crucially it could also provide the perspective on how they influence the way in the two sectors working in a delivery of public services.



Second technique is a semi-structured interview. While reviewing documents can give the broad picture and stream line of reform agenda as well as implications, the semi-structured interview is employed with the attempts to capture a variety of views and establish insight into how PPP is perceived, talked about and practiced under a changing in reform agenda.

## **CONCLUSION**

Unlike the past research which was largely focused on VFM and performance improvement, this paper takes a different position in looking Public Private Partnerships. To do so instead of only focusing on inter-organizational relationships (IOR) aspect of the partnerships, the paper adopts institutional lens as a fundamental concern in researching into Public Private Partnerships. This is mainly seeking to investigate how changing of reform agenda influencing the collaboration between public and private sector in delivery of public services. By doing this it will benefit in two ways. First of all as mentioned earlier in injecting a fresh perspective in PPP by filling the gap left by taking for granted a reform agenda.

Second of all adding to that it will make an original contribution to this field of study by new rigorous information from an archival material. Based on the extensive literature review the past research is rarely conducted by this research strategy. That means they appear to be scant in capturing and understanding what had happened in past distant in influencing/shaping collaboration between the two sectors for delivering public services. By taking the extraordinary methodology in Public Private Partnership research, at the end of the day it is expected to reveal extraordinary findings to this field of study.

Last but not least after the study is fully conducted, it is expected to have implications for those who are involved in PPPs or those who are considering the adoption of PPP. It will raise awareness in whether they are capitalizing on reform agenda or against the direction of reform. Moreover they might have to rethink through the way in which public and private sectors have worked in the context of suitability and relevance to the reform. And essentially what they should do and could do much more according to those agendas.

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# **CONTRACT DESIGN TO PREVENT UNDERINVESTMENT IN PUBLIC-PRIVATE PARTNERSHIP**

**Robert Ågren**

*Construction management, Lund University / LTH, PO. Box 118, S-221 00, Sweden*

*Email: robert.agren@construction.lth.se*

Underinvestment happens when an investor abstain from investing in an asset, even if the investment is beneficial for the customer, because it does not perceive a profitable return on the specific investment. The risk for underinvestment is high in projects which rely on high asset specificity and towards the end of contract lifespan. This paper builds upon a qualitative analysis of documentation around a multimillion dollar construction project, where contractual mechanisms are investigated to determine if they could prevent underinvestment due to high asset specificity. The study shows that underinvestment in the project is prevented by unilateral options for the public authority to buy the property at different milestones during the contractual lifespan. In addition there are joint project groups to implement a concept of partnering to reduce asymmetric information during investment decisions. In conclusion, the contract gives the impression of dealing with underinvestment. Nevertheless, there are some draw backs due to the financial setup of the public authority and it exposes the private party to some contractual risks due to high asset specificity which could risk underinvestment.

Keywords: Procurement, Economic analysis of law, Contracting, Public-private partnership

## **INTRODUCTION**

Public-private partnership, PPP, is a term as diversified as the number of articles written about it. Within the construction industry it can include a build, operate and transfer, BOT, setup but it can also include a design, build, finance and operate, DBFO delivery method (Leiringer 2003, for an overview). One divider between different PPP projects are joint ventures made by the public authorities in order to capitalize on a public asset such as land (Kwok-Chun and Walker 2000) and PPP projects aiming to provide a public service (Arrowsmith 2000). It could be construction of hospitals (McKee, Edwards and Atun 2006), roads (De Palma and Lindsey 2000) or

railway infrastructure (Koppenjan 2005); the latter description has also been called institutionalised public-private partnerships, IPPP, (Tvarno 2009). For the purpose of this paper PPP will be defined as a project instigated to provide a public service and where a private party is responsible for the provision and operation of the project and also responsible for the initial financing of it. The cost and profit of the project is collected through the public authority (Arrowsmith 2000, Tvarno 2009). To further narrow the scope of this paper, aspects connected to construction projects only will be taken into account. Nevertheless, the reasoning in this paper would probably be applicable to other sectors.

In order to attract a private entity to commit to finance a PPP project, the private entity has to be, to a certain extent, sure of being able to get a return on its investments. At every degree of uncertainty it can be assumed that the private party will introduce different levels of risk premiums in order to compensate for uncertain outcome (Laryea and Hughes 2008). In spite of the use of risk premiums by the private party there still might be risk left not accounted for in those risk premiums. A private party could be forced to reduce their risk premium to a level which they are uncomfortable with because of high competitive pressure. It is also possible that risk is hard to estimate due to the lack of complete project definition or due to uncertainty about the future state of the world. As a project develops over time, the state of the world will become known to each party, and the expected outcome of the partnership will be more accurately estimated. If the private party, in those later stages of the contract, perceives a lack of return on its investment this might cause shading behaviour (Hart and Moore 2008). Shading behaviour may include a number of things, all which are a disadvantage for the public authority and typically includes either moral hazardous behaviour or underinvestment. Moral hazard is particular present in PPP situations where there is high asset specificity, for example where the investment goes into a project which cannot be used for any other propose than what it is provisioned for (Klein 2000). In those cases it might give one of the parties the opportunity to hold up the other party. There are two sides of this concept; either the public authority can hold up the private party by threatening to purchase the services elsewhere thus enforcing a lower than market price, or the private party can hold up the public authority by threatening to sell its service to a third party thus enforcing a higher than market price. Underinvestment (Hart 1995) is related to the investments the private party has to make in order to meet its obligations. If the private party, for some reason, do not perceive a possibility to recover its costs and profits it might resort to underinvest in the project and as a consequence lower quality. The focus of this paper is to identify contract mechanisms preventing

underinvestment in a case study of a highly complex research facility which exhibits PPP characteristics.

## **THEORIES ON THE BOUNDARIES OF THE FIRM**

Underinvestment is a phenomenon, as mentioned above, where a seller invests less than necessary to achieve the quality desired by the buyer. Quality may, in this respect, be defined not only as the quality of a product, but also including the entire process covered by the contract in question. Many causes for the occurrence of underinvestment have been put forward in the literature, some of which will be considered below. There is, however, a unifying dimension in all causes of underinvestment: the presence of unobservable quality in the project. Unobservable quality can manifest itself *ex ante*; in an innovative process, when the needs of the buyer are unpredictable or when the scope of the project is too expensive to describe exhaustively. Quality can also be unobservable *ex post* due to immeasurability or owing to high transaction costs to actually establish or measure quality (Bajari and Tadelis 2001, 2006).

A situation where quality is unobservable *ex ante* but observable *ex post* started to attract tension in the early 20th century within the context of trying to define boundaries of the firm (Coase 1937). The theory recognized that creation of a firm took place when the new firm could manufacture a product to a lower price than the cost of a firm buying the product had when manufacturing the same product itself. The theory did however get more complicated when there was a need for specialised assets, high asset specificity, to produce products to satisfy a specific buyer. Coase argued (1988) that asset specificity can be dealt with through long-term contracting. This introduced an unobservable level of quality into the contract, because the states of the world throughout the contract was unknown, thus preventing the buyer to define the specification in the contract during the entire contract lifespan. This situation can be resolved through cost-plus contracting where the buyer pays for actual incurred costs with an addition of a profit margin. By signing a cost-plus long-term contract, the seller can secure return on necessary specific investments, while still being able to make adjustments due to changes in the state of the world, as a result securing quality for the buyer. The critique of this is based upon a situation where there is a need for a large reinvestment in order to keep quality up, occurring due to changes in the state of the world. In those cases there is a possibility for the seller to refuse to make investments which would increase quality, or decrease cost, and thereby price, thus holding up the buyer with the cost-plus agreement (Klein 1988). The solution is suggested to be that it would be more feasible to use vertical integration in those circumstances, in other words, it would be

beneficial for the buyer to integrate the production in its own organisation and assume total control (Klein 1988). If the production is undertaken in-house then the risk of moral hazard would decrease significantly. It has been argued that a vertical integration would be to take the solution too far, and it would be more beneficial to renegotiate, or prolong, the contract when needs for new investments arise (Coase 2000), thus keeping the boundaries specialised. The backside of Coase's solution is that it probably would increase costs, both for the seller and the buyer, in the form of increased transactions costs due to repeated contracting (Williamson 1988).

Another objection to the long-term cost-plus contract is based upon the property rights approach (Demsetz 1967). Property rights builds upon a theory of ownership. If a contract is complete, that would say if the contract specifies exact quantity, quality and the exact price, the ownership of the assets needed to produce the product is just a form of contractual relationship between the buyer and the seller (Hart 1988). Effectively the buyer leases the assets for the production of a specific number of units, or for a definite period of time. If the contract is incomplete the ownership of the asset plays another role. Since the contract is incomplete, it would not be possible to transfer all rights exhaustively, if it were, the contract would not have been incomplete. Those rights left behind and thus not included in the contract is the residual rights of control (Hart 1995). If A rent his bike to friend B, this would probably include the right for B to install a speedometer on the bike. But if B wants to mount a hybrid electric motor on the bike, B probably would have to ask permission from A first, if this were not included in the lease agreement. A has, as the owner, the residual rights of control, and accordingly has the right to approve any changes not included in the contract. The only way to fully transfer those rights is to change the ownership of the asset. According to this view, if the contract has unverifiable quality *ex ante*, and the state of the world changes during the contract lifespan, the seller has the residual rights to the assets needed for the production. The seller can, by using those rights, hold up the buyer, by threatening not to use the residual rights in benefit of the production. The seller can also refuse to develop those residual rights in a manner that would be beneficial to the buyer. The buyer can compensate for this, by limiting the residual rights of control left to the seller. However, at some point the buyer would have assumed enough control to be able to hold up the seller. The seller no longer has enough residual control to secure a return on its investments. This will provoke shading behaviour, often in the form of underinvestment in the quality of the project. Consequently, if the buyer relies on a specific asset, in order to get a return on its investments, the buyer should own the asset (Hart 1988). The main objection to this approach is that it seems to rely on physical assets. If the assets needed for production, at least partly, are formed out of human capital, assuming



ownership would not necessarily remove risk of moral hazard or a hold up. If certain groups of employees have certain skills or know-how those employees can hold up the buyer even after the buyer purchased the selling firm simply because the employees can threaten to quit (Freeland 2000). Nonetheless it would seem that the buyer still is in a better position if it assumes ownership with regard to moral hazard (Hart and Moore 1990), due to transfer of a physical asset and because there is a probability that an employee might not gain on moral hazard in all situations.

Game theoretic modelling has shown that this view of property rights can be too simplistic. A joint-ownership contract is a contract where both parties own the property rights to the asset, and where the parties cannot use the property without the permission of the other party. If a bilateral exit clause is entered into such a contract, with addition of a tax, it would make some of the disadvantages of a joint contract to disappear. This is because of the power of a bargaining game (Nash 1950a) joined with an extra tax, or extra cost to use the exit (Maskin and Tirole 1999). The tax is presumed to be collected by the community, thus not beneficial to any party within the contract. The contract would reduce both parties profit of unilaterally using the exit strategy. It would be hard to make a theoretic judgment on which of the single- and joint-ownership contracts is most advantageous (Maskin and Tirole 1999). This inference would allow for a joint-ownership in spite of Harts conclusions.

## METHOD

Even though the theories about the boundaries of the firm, initially was based on a series of case studies (Coase 1937, 2000) the main body of work has been done through theoretical approaches (Demsetz 1968, Hart and Moore 1988, Klein 1996, Williamson 1988). This approach has, together with theories intrinsic nature of generalisation and simplification, led to an ideal discussion on the theory of contracts. In order to apply the theories transparently there was a need to study an extreme case: where the contract was very incomplete, had a high number of unobservable quality variables, relied on high asset specificity and stretched over a long period of time<sup>1</sup>. Under such circumstances the choice of boundaries within the project would be particularly distinguishable. Building upon this the choice was made to study the procurement of a highly complex research facility<sup>2</sup>. The facility is a synchrotron light facility which is used to x-ray objects in a non-destructive

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<sup>1</sup> The project also had to be procured by a public authority for reasons not discussed in this paper.

<sup>2</sup> A more complete account of the case is being prepared for publication elsewhere, thus this account is limited to the aspects needed for the purpose of this paper.

manner. It can be medical compounds in order to view the molecule shape, or archaeological artefacts trying to determine how phosphate travels through different layers in the artefact. The facility will consist of a storage ring approximately 500 meter in circumference, attached to it is a 250 m linear electron accelerator. The facility will also contain office space and areas to house research equipment. The facility will be built on land consisting of 17 m of soil of varying density before hitting the bed rock. The significant detail, making it a highly complex construction project, is that the accelerator and the storage ring are only allowed to vibrate in the magnitude of 20-30 nanometres. Those specifications were however not included into the tender notice nor into the contract, since they were not finalised. The only references to the magnitude of vibration specifications were from the media and from a conceptual report, and it was concluded that given current technology it were possible to achieve a 40-50 nm stability. The construction of the facility is expected to last for five years and the level of investment in the construction will reach over 100 million euros, with another 200 million in equipment.

In order to understand the contractual relationship between the contracting authority and the contractor all documentation and contracts included in the procurement process were collected, together with the formal communication between the authority and the tenderers during the procurement. Interviews were conducted with the responsible procurement officer. The contract signed after contract award was gathered, but later signed documentation has not yet been collected. Thus, there can be later signed documentation affecting the relationship between the parties.

All documentation were initially put through a systematic document analysis similar to what has been suggested by Corbin and Strauss (1990). The coding process will not be described exhaustively in this paper, but a rough description will be given. The first step contained a review of all shift in ownership, control and liability for a certain result were coded into concepts and the direction of the shift were also taken into account. Out of those concepts categories were created out of the effect of the specific concepts. For example, categories were created out of codes that, in some sense, left control with the contracting authority, or if a decision were to be made unilaterally as opposed to jointly. From this, three broad themes arose; issues regarding unobservable results or quality, topics concerning high asset specificity and there were areas with relationship to long contract lifespan.

The analysis of the coding results were quite extensive, and were built upon analysing relationships between categories and themes, the nature of linkages and of course entailed a broader view of external factors. One of the aspects arising out of the analysis was processes and linkages which were coupled

with the control, in a broad sense, of the facility. It is suggested that this battle of control could beneficially be analysed out of a property rights approach.

## **THE CASE**

The contracting authority decided to procure the construction project as a PPP project with contract design based upon a design-build-operate delivery method. There were several reasons for this, for example, the contracting authority is prevented, by government regulation, to own property. To submit a request for exemption would probably delay the time schedule. The lease agreement was set for 25 years, which is the longest allowed lease period in Sweden. Further, the contractor should finance the project and the contracting authority would pay annuity interest calculated on actual incurred cost during construction, the interest should also cover all running costs except for facility management (which is paid per square meter). This setup allows for the contracting authority to budget running costs, and it did not need to raise funding for a large initial investment. The interest is indexed by a specific published index every month, making the price stable over time from external financial factors. After the design is set, the contractor is obliged to, in competition, request quotes from subcontractor. The contracting authority and the contractor then set a reference price based on those quotes. The reference price is subsequently used as calculation of an incentive clause. The clause allows for an increase of the contractors profit margin if actual costs runs below the reference price and it decreases profit margins if costs rise above the reference price.

Starting at year 5, the contracting authority has the option to assume facility management them self and to procure it from another supplier. If the contracting authority does take responsibility for the facility management, the authority has to follow the maintenance guidelines from the contractor. At year 15, 20 and 25 there is an exit clause for the contracting authority, giving it the right to purchase the facility. The price is set as the current residual value with the addition of a 'fair' profit margin. It is not defined what constitutes a 'fair' profit, but it is clear from the documentation it is not equal to the difference between the residual value and the current market value. The contractor can exit the contract by selling the facility to another firm, though this transfer has to be approved by the contracting authority.

During the design and construction stages of the project, it is mandated that the project will run under a partnering regiment (Eriksson 2010). The scope of the partnering collaboration is only set on a strategic level, no provisions on its implementation exists. The contracting authority also has the right to

reject other tenants, extensions and developments extending the use of the facility if it affects the operation of the facility. However, there is a stipulation that the parties should, during the operation, in collaboration develop the use of the facility in the interest of the parties.

## **ANALYSIS**

The contract do not exhaustively transfer control from the contractor to the contracting authority. The contracting authority does not have a right to make major changes to the facility. This would prevent the contracting authority to construct extensions and it probably also preclude the contracting authority from undertaking major renovation work. Further the authority has not the right to sublet parts of the facilities without the consent of the contractor. Accordingly, other tenants would at least have to be accepted by the contractor, and quite possibly have to negotiate a lease directly with the contractor. This could be a matter of concern if the contracting authority, for instance, would like to collaborate with another organization. On the other hand the contracting authority has the right to stop the contractor to lease parts of the facility to other tenants if the lease would affect the operations of the contracting authority. Even though the right to make major alterations or extending the facility is put on contractor, the authority still has the right to reject the plans if it would disrupt the day-to-day operations. The facility management can be transferred to the contracting authority, thus allocate some control to the authority, although, even under such conditions, the overall maintenance of the structure would still be left to the contractor. In consequence, there seem to be a considerable degree of residual rights left to the contractor. But most rights are partly dependent upon the contracting authority accepting the usage of those rights. The arrangement could open up for the contractor to benefit of moral hazard, or underinvestment, towards the contracting authority, and it does not seem to restrict the contracting authority's behaviour.

Counteracting the possibility for moral hazard is the exit points unilaterally allocated to the contracting authority. If the contracting authority would perceive a moral hazardous behaviour on the part of the contractor, it could simply assume all property rights from the other party by using those clauses. The cost for using this clause is not exhaustively defined, but it has some components worth considering. First, because 'fair' profit is not clearly defined, this cost will not include the actual established 'fair' profit only, but also cover the negotiation costs while establishing the level of the profit. Second, since the contracting authority would have to pay the current residual value, the cost of securing the funds needed would also have to be taken into account. Third, the raising of funds for the purchase of the facility will be

done within a political process, which's intrinsic nature of uncertainty would incur costs in the form of increased risk. It is clear that the cost for the contracting authority using an exit clause would be higher than simply calculate the residual value and a reasonable profit. In accordance with the theories of Maskin & Triole (1999) and Nash (1950b, 1951) cited above, the cost of using the exit clause will serve as equilibrium in the choice of using the clause. This construct should be accentuated. If the 'fair' profit is defined as the profit the contractor would make if everything held status quo until year 25, then there will be a possibility for the contractor to underinvest without any risk for retribution since the cost of using the exit clause would be higher than accepting the underinvestment. If the 'fair' profit would be detached from the projected profit, and instead be a 'fair' profit on a single transaction, then the contractor would be enticed to not underinvest. But if the profit would be below the total cost of employing the exit clause, then the contracting authority would actually gain by using the exit clause. As a result it seems to be important, for the contract in hand, that 'fair' profit is defined somewhere around a 'fair' profit on a single transaction, in order to prevent shading from the contracting authority or underinvestment from the contractor.

The contractor is locked into the contract until year 25 with the exception of it selling its rights of the property to another firm; this possibility is on the other hand depending on approval from the contracting authority. This situation limits the usability of the contractor's options. Nonetheless, the applicability of the authority's veto right may be less than it is *prima facie*. If the contracting authority would refuse an exit by transferring the rights to another firm, it might actually provoke underinvestment by the contractor. The underinvestment would be limited to the exit equilibrium because the transfer of rights could be done at a market price exceeding 'fair' profit of the exit clause. Even so, underinvestment could still be significant to the contracting authority and thus limit the applicability of the veto. In spite of this, there is still a, rather small, degree of opportunity for the contractor to escape the contract. This situation would, according to the theories of property rights, open up for underinvestment because the contractor cannot secure return on its investments given the lack of control<sup>3</sup>. In order to counteract this tendency the contracting authority would need to be rather liberal with allowing for development of the property and in such way allow for the contractor to get return on its investments.

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<sup>3</sup> One aspect is lacking from this reasoning and is not included in the analysis of this paper. If the contractor *ex ante*, perceive this risk of lack of control, and the risk coming out of the unilateral exit clauses, it can add risk premiums to its bids. Such practice would allow for compensation of risk by transfer the cost to the contracting authority, *ex ante*.

The equilibrium also deserves some consideration. If the point is reasonably high for the contracting authority, thus leaving a non-trivial opening for underinvestment on the part of the contracting authority, the contract can reach an interesting state. If the contractor underinvests too much, the contracting authority would use the exit clause. If the contracting authority is too restrictive with allowing for the development of the facility, it would force the contractor to underinvest, assuming that the information of each party's strategy is unknown to the other. Those assumptions would therefore presume a non-cooperative relationship between the parties. It is also argued that the structure of the equilibrium in this case, serves as Maskin and Trioles (1999) tax addition when using the exit clause. The cost of the political process and the cost of selling a property with extreme asset specificity would not benefit either party. In such circumstances it is possible that the equilibrium would reach a state where the parties would not gain on a non-cooperative relationship (Nash 1950a, b, 1951). Thus, this state would serve as an incentive on using a cooperative relationship, where the parties in a collaborative manner can find an optimal strategy. The contract facilitates partnering as a tool to run the project, while the forms of the process is not defined it could serve as a medium to facilitate a cooperate relationship between the parties. It would certainly allow for communication, and for transfer of information on the contracting authority's strategies and the contractors strategies. Provided this is done successfully in an optimal fashion, the contract could eliminate underinvestment completely.

## CONCLUSIONS

The contract situation in the case study seems to exhibit an environment which could provoke underinvestment. The facility in the case study has a high degree of asset specificity, further it will require large investments in the initial stages. Due to the long construction stage, the facility's quality will not be observable until a dominant part of the investments has already been made. This explains the contracting authority choice of a long-term contract on a cost-plus-like basis. However since the states of the world during the contract life over 25 year is unknown, the contracting authority has put in some provisions into the contract. In something that can be seen as an effort to counteract underinvestment, there are exit clauses in the contract allowing for the contracting authority to purchase the facility. Nevertheless, it has been shown that this practice can actually provoke underinvestment in some circumstances by reducing the contractor's possibility to earn return on its investments. It is suggested, that this situation can be counteracted by a non-trivial cost for the procuring authority of using those exit points together with a loss of profit for the contractor when the exit is used. This would cause a state between the parties where they would actually gain on cooperating

instead of maximising their own gain, without consideration of the other party. This is a thin line and since the contract is heavily weighted in control towards the contracting authority, it is probable that shifts in the state of the world outside this analysis would result in underinvestment.

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# PRIVATE FINANCE INITIATIVE: ROBUSTNESS MODEL

**Gerald Sundaraj and David Eaton**

*School of Built Environment, University of Salford, Salford, U.K.*

*Email: g.sundaraj@edu.salford.ac.uk*

Private Finance Initiative (PFI) procurement was introduced by the UK Government in the early 90s. Since its inception, PFIs have been received positively throughout the globe. It's fundamental principal of public service delivery through private sector expertise and private finance have been the driving forces in PFI gaining momentum. However limitations in public sector capital funding; an increase in socio-economic necessity demands; and the race towards global competitiveness have equally contributed to this rise. All of these expose PFIs to external and internal shocks caused by exogenous and endogenous factors which largely influence the performance of the procurement model. Furthermore the nature of PFIs having long term concession period increases the vulnerability of the project towards these uncertainties. A conceptual view that the element of Robustness is essential and that it needs to be built into operational PFIs is presented. Robustness is further argued to reduce adversarial actions when faced with uncertainties, hence creating a sustainable environment in which these PFI projects continue to perform. Consequently a proposed Robustness model is presented to primarily achieve two objectives. Firstly to gather feedback and comments on the model itself as a form of validation of the model and secondly to ascertain the conceptualisation of the Robustness model as being part of the PFI procurement model. The model will be further tested using case studies consisting of operational PFI projects. It is envisaged the Robustness model will provide an insight to the dynamics that occurs within a PFI project as well as identify the co-dependency factors towards robustness.

Keywords: Granting Authority, PFI, Procurement, Robustness, Sustainability

## INTRODUCTION

The objective of the study is to determine the significance and co-dependency of Robustness within a PFI project environment. The engineering definition of robustness is described as the ability for a particular system to maintain its

performance when subjected to internal and external uncertainty parameters (Carlson and Doyle, 2002). Furthermore robustness accentuates the close relationship between cost benefit trade-offs and system design to cope with uncertainties (Anderies *et al.*, 2004). By means of convergence from the context of a PFI initiative, it can be inferred that firstly, there are endogenous and exogenous factors that create a level of uncertainty by which PFIs are implemented. Withstanding these uncertainties, the ability to absorb the uncertainty whilst the project continues to achieve the objectives reflects the robustness of PFI. Secondly there exists a permissible level of trade-offs between and among the endogenous and exogenous factors. This permissible level can be referred to as the flexibility that needs to exist within the PFI model to create the element of robustness. Thus in the context of this study, Robustness is defined as the permissible level to which a PFI project continues to operate in the presence of uncertainties caused by the endogenous or exogenous factors.

## REVIEW OF LITERATURE

Ghobadian (2004a) put forth a fundamental question which contributes to the cornerstone of this research, '*whether there is a robust structure in place to enable Government to attain its objectives of delivering improved and sustainable public services?*'. The robust structure in this context refers to the processes and evaluation mechanism in place to justify the PFI route and one that leads to a more effective and efficient public service provision. It is further suggested that the '*robust structure for the delivery of high quality sustainable public services can be created through the best of both public and private sectors through partnering*' (*ibid*) meaning that the way forward towards a sustainable delivery of public services is through the public private partnership mechanism and in the context of this paper points to PFI.

The performance of PFI have been closely monitored by the independent 'watch dog' role played by the National Audit Office (NAO) and the Public Accounts Committee (PAC), whereby both had given positive and encouraging feedback on the implementation of PFI (Ghobadian *et al.*, 2004b). A review by O'Dowd (2011) of the NAO report published on 28 April stipulated that the VfM in PFI projects requires robust evaluation by government departments to demonstrate its presence. While the validity of VfM remains questionable, the learning curve from PFI projects can be extended into various forms of procurement. He further adds that the report emphasises: data collection; competent personnel; robust evaluation process; and market competition. Hence there is a great need for a more robust evaluation and monitoring system within PFIs.

On the contrary, the justifications put forth by the Government in projecting the achievement of the PFI have been criticised by Pollock *et al.* (2007) due to the methodology used in arriving at the conclusion reported in various Government publications. The evidence cited by Pollock (*ibid*) no doubt statistically justifies the author's claims; however, the evidence equally leads to the conclusion that there are gaps that require further probing into the robustness of the processes carried out in arriving at the Value for Money criteria and the Risk Transfer assessments. Pollock *et al.* (2011) indicated that the main deficiencies within PFIs in NHS projects are contract monitoring, compliance and contract enforcement. A lack of such control mechanisms would affect VfM causing serious implications in the quality and service levels of NHS care.

This emphasis towards a more robust PFI procurement has been drummed tirelessly by the Government. The Treasury (HM Treasury, 2008, 2010a, 2010b; NAO, 2010) has been the key instrument in demanding that procurement within the authorities are robust in terms of planning, costing, deliverables and value for money. Asenova *et al.* (2003) inferred that a lack of a robust process affects badly the VfM component of the PFI project as echoed by HM Treasury. Thus it can be inferred that a highly competitive atmosphere is compulsory for PFIs and the mechanism in which the bidding is evaluated needs to emphasise robustness with regards to VfM, Risk Transfer and Affordability assessments.

Shaoul *et al.* (2011) inferred that the contractual arrangements within NHS PFIs reduce the Trusts' flexibility due to fixed unitary payments over the lifecycle of the project. The study also raised issues pertaining to corporate structure; risk transfer; service delivery and performance monitoring and partnership relationship. Ball (2011) questioned the validity of the Public Sector Comparator (PSC) used to indicate VfM based on the level of transparency embedded within the assessment process. Thus there is a need to review the existing evaluation and monitoring mechanisms that are in place and to explore the rigour within these systems.

Wilson *et al.* (2010) demonstrated governance as an essential component of PPPs. The form of governance due to the complexities within PPPs varies from that of traditional procurements likewise in the case of PFIs. Furthermore the level of complexity within PFIs is evident, based on the governance structure that comprise of various stakeholders coupled with layers of contractual mechanisms to safeguard the interest of each entity. Wilson (*ibid*) points out the key characteristic in a successful PPP is communication among the stakeholders. Rufin and Santos (2010) on the other hand found PPP contracts less complete and more complex. The

complexity is viewed as a tool to complement uncertainties that exists in contracts. This approach may seem rather adversarial, pushing back the trust level within the partnership.

Grimsey and Graham (1997) had identified the underlying principles within a PFI to be VfM and Risk Transfer while stressing the need to look into a robust Affordability scheme due to the duration of PFI ventures when examining PFI in the NHS. Grimsey and Lewis (2002) further argued that a robust mechanism is vital to provide a sound and affordable financial plan to give sustainability to the PFI throughout its concession period. The complexity of PFI projects is without question a matter to be reckoned with, however with risks there are rewards coupled with effectiveness and efficiencies that the PFI has introduced in the delivery of public provisions (Grimsey and Lewis, 2007).

Kakabadse (2007) suggested that PFI does provide some advantages, including the risks that PFI projects contain such as political pressure, complexity in preferred bidder selection, bid size, alterations, contractual relationships, affordability and others. Brinkerhoff and Brinkerhoff (2011) agreed that PPPs offer advantages, subject to suitability, as well as the need to have the right composition between interests and incentives surrounding the partnership.

The mode in which robustness is present within PFI procurement is inconclusive and remains subjective. However the demand for a robust medium, be it a procurement process, evaluation, monitoring or structure leads to the conclusion that robustness is a significant characteristic of PFI. In order to appreciate robustness it is important to establish what reflects the definition of Robustness (ROB) within the PFI context.

## **SYSTEMS THINKING**

Systems thinking have been actively used in various scientific disciplines since the 1940s. The focus of this approach is to consider a system as a whole rather than the sub-systems which are parts of the whole (Daellenbach, 1994). A systems thinking approach is adopted as part of this research to identify the interdependency and co-dependency relationships (Mansouri *et al.*, 2009) that exist within the subsystems of Value for Money (VfM), Risk Transfer Assessment (RTA) and Affordability (Aff) in a PFI project environment. As systems thinking addresses the system from a holistic viewpoint (Rubenstein-Montano *et al.*, 2001), the relationships can be determined, however it is equally important to set the boundaries of which

the system operates and are influenced by (Rubenstein-Montano *et al.*, 2001), in other words the exogenous and endogenous factors.

## **ENDOGENOUS FACTORS - PFI PENTAGRAM**

The endogenous factors focuses on the processes used to evaluate the feasibility of a project being implemented via the PFI route by the Granting Authority (GA). The main processes identified are VfM, RTA and Aff. The two remaining factors are robustness (ROB) and resilience (RES). These five factors are envisaged to provide a significant impact on creating an environment that is conducive for a successful delivery of the PFI project. Furthermore these factors have been identified based on literature and expert group interviews conducted consisting of 14 people representing the public sector, private sector and academia. The format of the interviews was semi structured. The interviews were used to establish the core processes pertaining to PFI projects from the Granting Authority's view point (Sundaraj, 2011). Hence the endogenous factors and its co-dependencies is visualised in Figure 1.0.

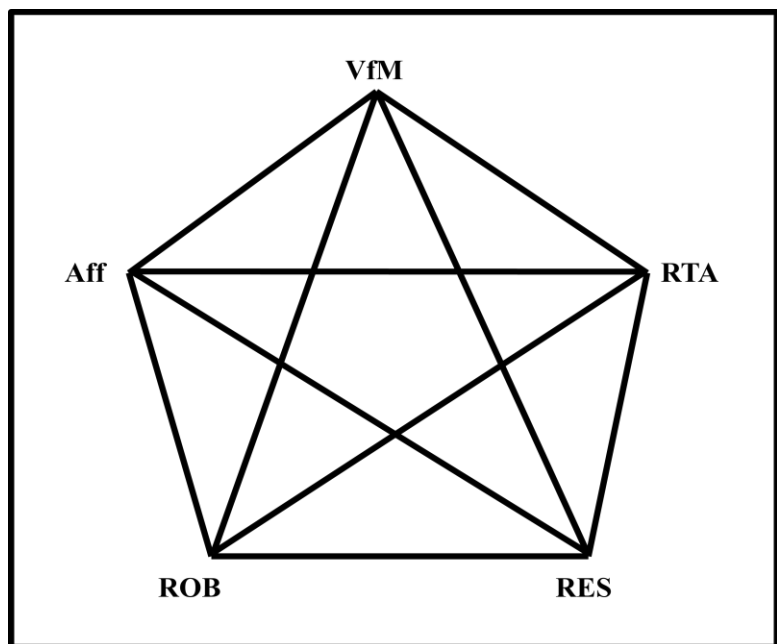


Figure 1.0 PFI Pentagram

## EXOGENOUS FACTORS - SLEEPT

The SLEEPT mnemonic consists of six factors which comprise of: Social; Legal; Economic; Environment; Political; and Technological. The factors provide a comprehensive exogenous environment in which the PFI operates. Initial work on SLEEPT was carried out by The Centre for Risk Management Research (CRMR) at the University of Salford as a device for categorising ‘drivers’ of a process or object (Eaton *et al.*, 2007). The mapping of SLEEPT on to PFIs was established using a quasi-Delphic approach which involved 25 case studies over a period of six years (*ibid*). The mnemonic has been adopted by various researchers to represent the exogenous factors in studies related to PFIs (Akbiyikli, 2005; Eaton, 2008; de Lemos, 2002; Gunnigan and Rajput, 2010; Gunnigan, 2007). The six components of SLEEPT are as follows (Eaton, 2007):

- *Social*: Public acceptance of private sector involvement.
- *Legal framework*: Standardised documentation.
- *Economic*: Access to significant private sector borrowing.
- *Environment*: Clearly defined sustainability and impact criteria.
- *Political framework*: International, national and local will or commitment.
- *Technological*: Access and availability of quality PPP practitioners and experienced project sponsors.

## ROBUSTNESS FRAMEWORK

The framework in Figure 2 will be used to develop a Robustness model for PFI projects in the UK. The framework contains four main elements which impact the model. The endogenous factors are factors that influence how the model reacts due to the processes within a PFI project. The exogenous factors describe the external environment that PFI projects are subjected to over the life cycle of the project. With PFI projects subjected to long term concession periods, time scale location is an important aspect whereby the model is required to adapt to the procurement stages and throughout the life-cycle of the project once it becomes operational. The final element to the framework is the partnership members, with each party having their respective organisational objectives and goals, coupled with the partnership’s mutual goal, Robustness will be largely influenced by the perspective in which it is being considered. The double head arrows that link the framework echo a systems thinking approach (Checkland, 1981) in developing the model. Thus the variation in one component would influence the outcome of the whole.

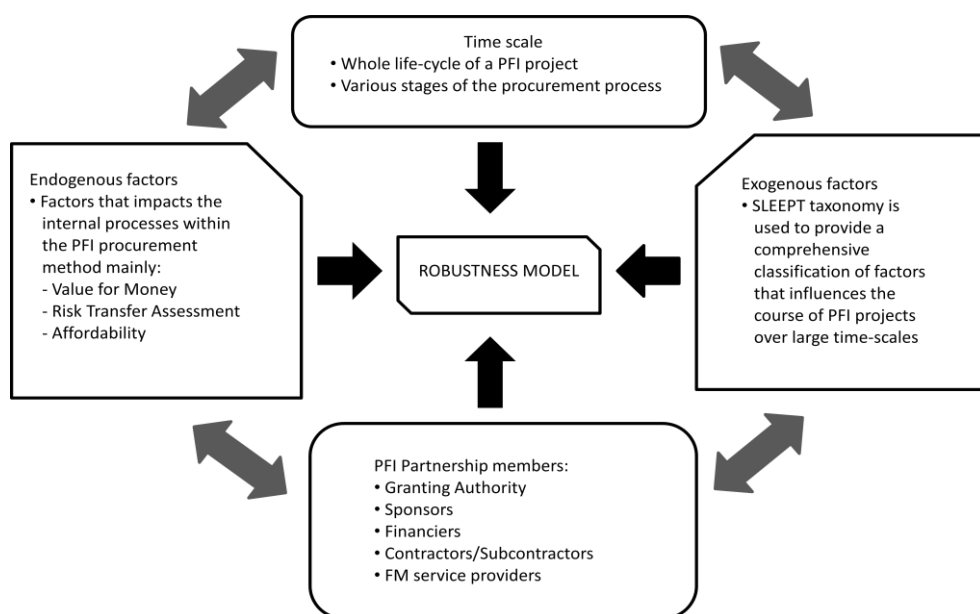


Figure 2: Framework to develop robustness model

## ROBUSTNESS MODEL

The PFI procurement method is just like any other procurement method which is built on a well structured procedure. This procedure incorporates the assessment and evaluation of inter-alia, the key elements: Value for Money (VfM), Risk Transfer Assessment (RTA) and Affordability (Aff). These three elements consist of further layers of procedures in order to attain the aims and objectives of each individual element respectively. This demonstrates that the PFI procurement is built on systems and that these systems co-exist in the PFI project environment. The necessity for resilience within a particular system to increase the reliability of the system has been established. This supports the argument that there is a need to determine the level of Resilience within the PFI procurement method by investigating each individual process: Value for Money; Risk Transfer; and Affordability. It is equally important to note that there are trade-offs taking place among the systems in a PFI project environment. Thus to ascertain the interrelationship that exists, a systems thinking approach is used.

Drawing from the PFI pentagram, a Robustness model is developed as shown in Figure 2.0. The model reflects the dynamic state constantly taking place in a PFI project environment. The three core elements, VfM, RTA and Aff from the pentagram forms the core pillars in the model. Since the model is

dynamic in nature, the length of Resilience (RES) varies based on the trade-offs that occur during the life-cycle of the PFI project. This means that the length between any two core elements changes in accordance with the PFI project life-cycle. The variations in length reflects the degree of flexibility that corresponds directly to the trade-offs that occurs within the PFI project environment. The state of equilibrium is a reflection of the stability of the system (Gersick, 1991) for a particular point in time of the project life cycle which is represented through the stability of the triangle.

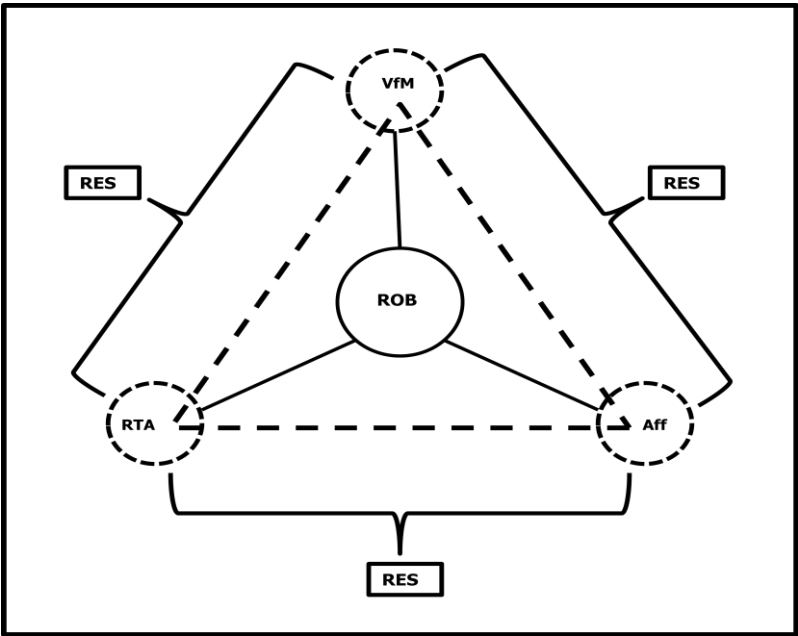


Figure 2.0 Robustness Model

In the event that the triangle formed by the three core elements becomes unstable, the equilibrium is affected, the PFI arrangement is no longer robust and the possibility of the PFI project becoming unsustainable is possible.

The interrelationship between Value for Money - Risk Transfer - Affordability - Robustness - Resilience is a complex one. The complexity is further enhanced as the back drop in which this relationship operates can be defined through the acronym SLEEPT which encapsulates the dynamism of the relationship. Subsequently the significance of Robustness within a PFI project environment can be viewed when incorporating both the exogenous and endogenous factors surrounding a PFI project environment as shown in Figure 3.0. This indicates that there are two levels of interaction taking place, firstly the internal relationship which is the former and secondly the external



relationship which is the latter. In order for the PFI to continue to perform its aims and objectives, an equilibrium state between the two environments is needed and this will contribute to a sustainable PFI procurement initiative. Thus the Robustness and Resilience characteristics provide a mechanism to manage uncertainties that exists throughout the PFI project life-cycle.

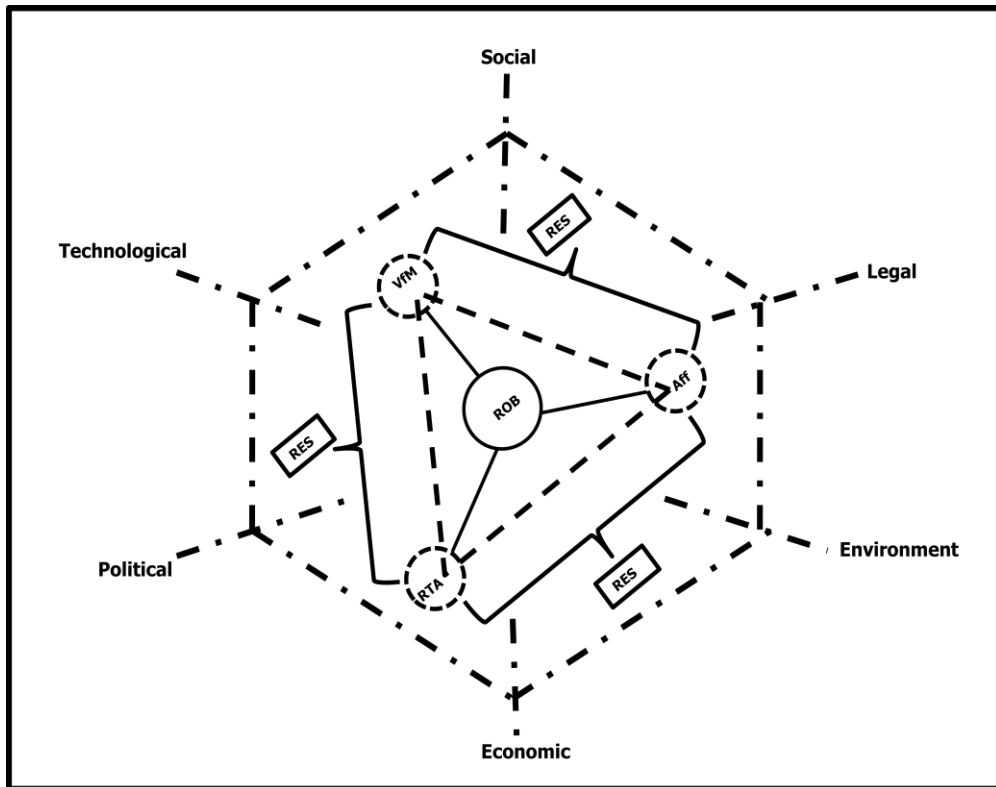


Figure 3.0 Robustness Model

## THEORETICAL FRAMEWORK

The Robustness model is one of the outputs of the research. This model has been developed based on the following theoretical framework.

Figure 4.0 depicts an ICOM diagram (IDEF, 1993) of a typical system. The system receives the necessary INPUT(s) in order to generate the desired OUTPUT(s). In order to achieve this, the system is supported by a specific set of CONTROL(s) which is implemented through a set MECHANISM(s). The system described here is a closed system (Checkland, 1981) whereby the external ENVIRONMENT is not in contact with the internal environment of the SYSTEM.

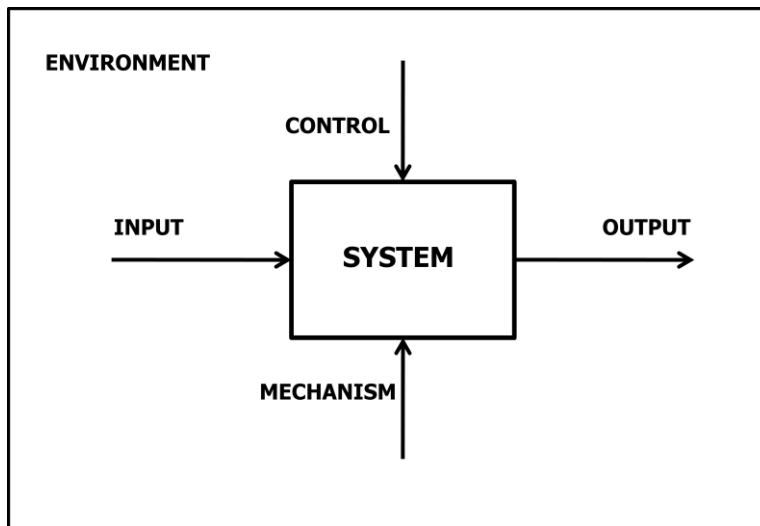


Figure 4.0 ICOM Diagram for a System

In a real life setting the **SYSTEM** is subjected to the impact of the **ENVIRONMENT** which is defined as an open system (Checkland, 1981). This is indicated through the permeable lines as shown in Figure 5.0. The interaction with the **ENVIRONMENT**, allows the **SYSTEM** to be subjected to **PERTURBATION** due to changes that might occur in the external **ENVIRONMENT** caused by uncertainties. Whilst the **CONTROL** and **MECHANISM** remain the same, there have been changes to the **INPUT** due to the **PERTURBATION**. Hence this results in a different **OUTPUT** being achieved as indicated in Figure 5.0.

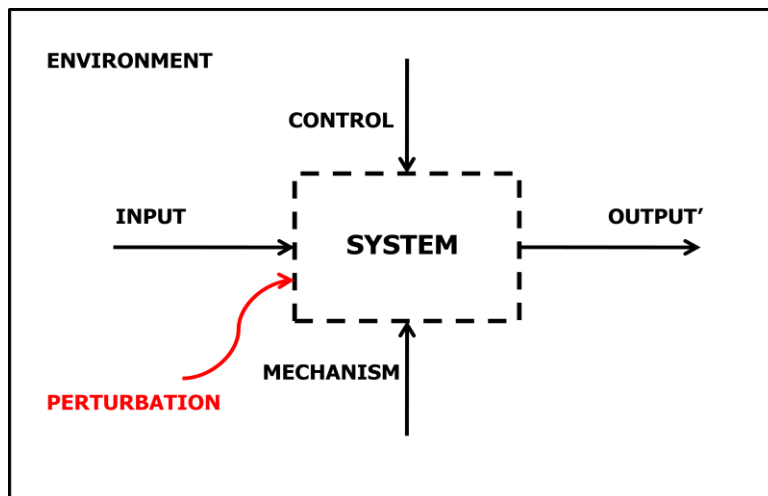


Figure 5.0 ICOM-P Diagram for a System

The ability of the open system to achieve the desired initial OUTPUT with the existing INPUT; CONTROL; MECHANISM; and PERTURBATION, the system would be required to be built with a certain characteristic or mechanism which will allow the SYSTEM to absorb the changes caused by the ENVIRONMENT. The ability of the SYSTEM to react in this manner would reflect the resilience and robustness of the SYSTEM when subjected to uncertainties. The incorporation of such an element or mechanism is shown in Figure 6.0

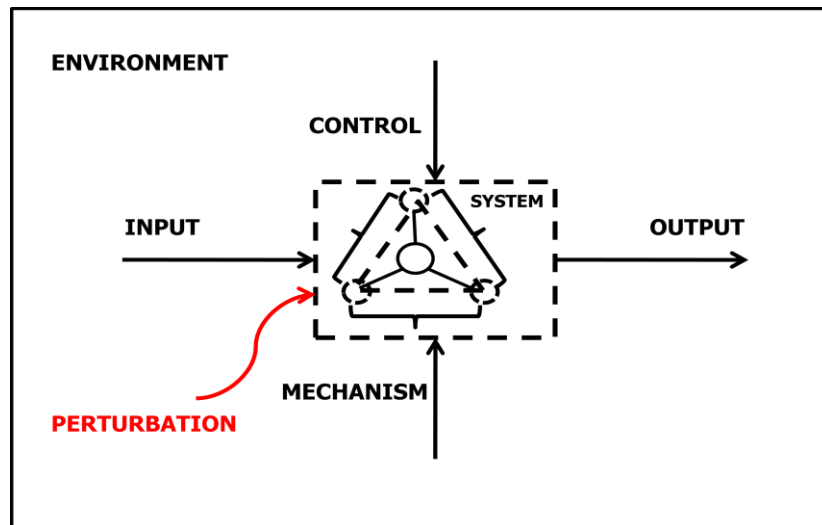


Figure 6.0 Mechanism integrate into the system

Therefore based on Figures, 4.0, 5.0 and 6.0, the reasoning is adopted onto a PFI project. The PFI procurement is viewed as a system which contains a set of inputs referred to as Output Specification. The specification is thus comprehensively detailed using a contract as the control and within this system the three main mechanisms are Value for Money, Risk Transfer Assessment and Affordability. These features are necessary to ensure that the PFI procurement is able to deliver the desired services through the specified asset. In Figure 7.0 the PFI procurement is subjected to PERTURBATION which might be caused by the SLEEPT exogenous factors used to represent the external environment. Furthermore in order to maintain the desired results, the Robustness Model is integrated into the system to provide the required resilience and robustness to achieve the objectives of the PFI procurement.

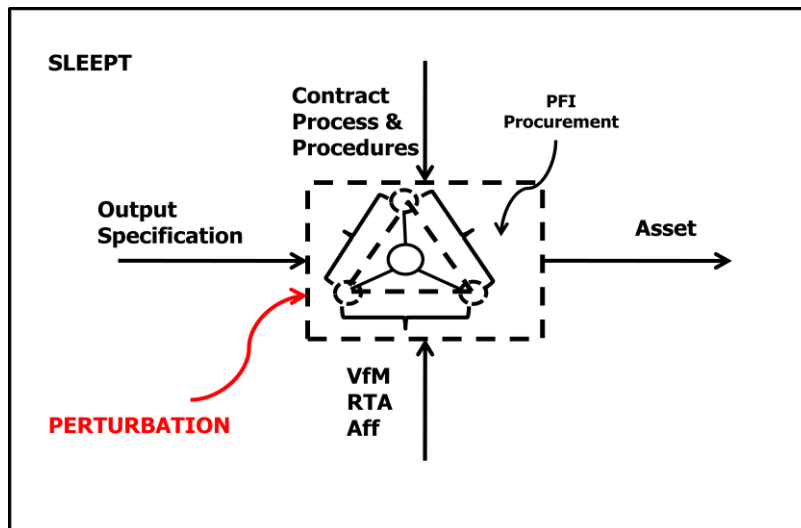


Figure 7.0 Robustness Model integrated into PFI project environment

This theoretical framework will be subjected to testing using multiple case studies to verify and validate the theory as well as the proposed Robustness model.

## RESEARCH PROGRESS

The research is currently in the data collection stage. A total of four case studies will be used in which the model will be mapped across the case studies. Each case study represents an operational PFI project. The projects constitute of two schools and two hospitals. Data collection comprises of semi-structured interviews, project related documents and literature review. The identity of the project and respondents within the case studies are kept anonymous as requested by the participants.

The theory behind the Robustness model will be tested using the case studies to ensure replication. Through this process, critical success factors (CSRs) for robustness within a PFI project environment will also be identified. This will contribute to establishing the environment in which robustness will be able to optimise its role for the benefit of the project.

The different case studies will provide an insight to variations in terms of contract management and project management with Granting Authorities during the operational stage of the project. Arguably prior to financial close, the implementation is standardised based on the process and procedures determined by HM Treasury. Hence the case study will be able to clarify if

changes do occur and what are the elements that influence and impact on the changes.

## CONCLUSIONS

Robustness is a significant and important characteristic in PFI projects. Nevertheless further research is required to completely understand how this element can improve the performance of the processes within the PFI procurement model in delivering services. This portion of the research will be explored using operational PFI projects in order to identify mechanisms used to manage uncertainty which is reflective of robustness. Subsequently the interdependency between robustness and the processes within PFI procurement will also be of primary interest. However significant findings have yet to be obtained to demonstrate the application of the proposed robustness model mentioned above. The model however is still at the initial stage and requires further testing using active projects as case studies. It is the objective of this PhD research to explore if the characteristic of robustness contributes to a sustainable PFI procurement.

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**Editors:**

Professor Akintola Akintoye  
Dr Champika Liyanage  
Dr Suresh Renukappa



School of Built and Natural Environment,  
University of Central Lancashire,  
Preston, PR1 2HE, United Kingdom.

Tel: + 44 (0) 1772 895785

Fax: + 44 (0) 1772 892916

Email: [schoolbne@uclan.ac.uk](mailto:schoolbne@uclan.ac.uk)

[http://www.uclan.ac.uk/schools/built\\_natural\\_environment](http://www.uclan.ac.uk/schools/built_natural_environment)

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