
Infrastructure Provisioning: An Overview of Procurement Approaches and Mechanisms for Effective Costing.

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Abstract

The research embarks on revealing the basic approaches and mechanisms that enhance efficient and effective cost management of infrastructure projects delivery. Using management control cycle, as a guide and appropriate case studies as illustrations, it elucidates the various phases of typical construction schemes, adopting the traditional as well as other contemporary public private approaches and the appropriate cost management techniques. The paper also spotlights essential steps that enhance financial and cost management models of public-private procurement options as value adding initiatives for infrastructure delivery. The research concludes that adopting essential steps of management control cycle and a framework for best practices can significantly improve the success rate of infrastructure delivery and thus a concomitant cost reduction. The research recommends as follows that reasonable and adequate time be spent at the conception stage on planning and analytics of variables, which influence the cost of infrastructure delivery. Deliberate and conscientious efforts are focused on providing answers to some pertinent issues. What management technique best suits specific infrastructure delivery. Does the procurement method suit the infrastructure type, amidst other variables. The project teams to explore the possible integration and benefits of an articulated templates and frameworks of best practices for infrastructure provisioning.

Keywords: *Infrastructure Provisioning, Traditional Approach, Public-Private Initiatives, Cost Management Systems, Best Practices.*

Introduction

Engineered infrastructure particularly refers to those stocks of macro capital goods usually collectively under-written that are necessary perquisites for any meaning economic development to be countenanced. It includes; roads, railways, waterways, airports, dams, electricity, telecommunication water, etc (Anago 2001). Physical construction services are those required for the physical creation of investment projects, through architectural, engineering and design services into concrete physical entities such as industrial plants, infrastructure projects and the likes (Alagidede 2012). Construction is the process of building and covers buildings, housing and infrastructure (such as roads, ports, oil rigs etc) (Oladapo 2003).

Infrastructure plays a crucial role in National development; there is a link between public infrastructure investment and productivity growth and economic growth (Udegbumam 2002). The role of the construction industry is crucial as it forms part of investment in form of infrastructure necessary for development (Kano 2003).

There exist a close positive relationship between public infrastructure and productivity

growth. Public capital increases private sector output both directly and indirectly. Public infrastructure investment affects growth rate of output through different channels: It stimulates private investment, it increases manufacturing output, it raises income and therefore per capital consumption, it expands the market and reduces average cost (Udegbunam 2002).

The construction industry plays an important and dynamic role in the process of sustainable economic growth and development of any nation due to its size, provision of predominantly investment goods and government as major client (Oladapo 2003).

An array of headings as characteristics of the construction which distinguishes it from general manufacturing industry, these include Large Contributor to GDP and employer, capital goods industry which sells means of production to other industries, long-term scale, relatively inelastic to supply and demand in short term. Products are custom built, the process of construction is not re-saleable (uniqueness), weather etc. (Eccles et-al 1999 cited in Oladapo 2003).

The place of national infrastructure in national development is beginning to be affected due to plethora of problems which the infrastructure delivery process. Anago (2001), noted that there is a current globalization tendencies which places emphasis on a market economy. Public source infrastructure funding agencies such as the World Bank, European investment bank and ADB etc in the form of development grants and loans are becoming rather scarce. Experience in Nigeria indicates that much of such cheap funds obtained and purportedly invested in infrastructure programmes suffered massive mismanagement and corruption. Hughes and Mudorch cited in Hughes (2012), noted some of the important characteristics that explain why construction is a difficult of deal with. Construction can be thought of as a complex, expensive, time-consuming fragmented process. National policy on PPP (2009), highlighted that one of the key development challenges constraining the Nigerian economy as huge deficit in basic infrastructure services.

The current emphasis internationally in infrastructure provisioning makes transparency a core process that assures cost efficiency in infrastructure procurement. Cost efficiency ensures optimal utilization of resources per capital and guarantees maximum value addition (Anago 2001). There is therefore a need to source for alternative procurement options which complement public financing. An appraisal of the traditional procurement approaches and other contemporary options (The PPPs), as well as the strategic steps/stages of cost management are undertaken with a view to adding value in infrastructure procurement. The Nigerian government has having considered the dearth of infrastructure requirement in the country has placed high premium on the adoption of (PPPs) for delivering public infrastructure and services (Oyewobi et-al 2012). The study provides a conceptional theories and definitions which form basis for theoretical framework. Further it presents the essential strategic steps of management cycles adopting the traditional method as well as the PPPs. A critique which elucidated the place of templates (frameworks) and the necessary legislative backups as essentials for infrastructure procurement and effective costing. Finally conclusions are drawn, using the outcomes of the theoretical framework as well as the critique. Recommendations arising from the conclusions are advocated.

There are some important characteristics that explain why construction is difficult to deal with. First, it is organizationally very complex, involving hundreds of specialized contractors, sub-contractors and advisors (Hughes and Murdorch cited in Hughes 2012). Second,

construction projects are large and expensive, typically representing a significant part of the buyer's and seller's annual turnover. This makes the risk of non performance very hazardous, with potential losses being sufficiently large to bankrupt the contractor or the client. Third, construction projects typically occupy years, with the need for extensive professional work prior to design, during design and in parallel with construction. Finally, the high degree of specialization in design disciplines and construction disciplines leads to high degree of fragmentation of the process, with high differentiated tasks being carried out in different firms, locations and times creating a strong demand for very sophisticated project management and co-ordination functions. Thus construction can be thought of as a complex, expensive, time-consuming, fragmented process.

Infrastructure Procurement

Project procurement represents the overall methods used by a client and/or representatives so as to arrive at a tender and other operation towards the selection of a contractor to deliver a project at an agreed time and other conditions (Network 2004 cited in Onwusonye 2006).

Procurement is a combination of different methods for purchasing construction objectives and includes such variables as source of funding, partners selection method, price basis, responsibility for design, responsibility for management and amount of subcontracting (Mudorch and Hughes 2008). Construction procurement in simple terms often refers to the strategic process of how contracts are created, managed and fulfilled. This involves all the steps from the establishment of the project or products to be procured, to soliciting and evaluating tender offers to awarding and administering contracts and confirming compliance with requirements. The procurement process in construction covers the stages where the details of a project are specified, a builder is selected and a contract awarded (Laryea 2012). Oladapo (2003), categories infrastructure into two broad groups: social and economic types. Economic infrastructure are means to further production of goods and services (factories, offices, chemical plants, gas platforms) additions for the improvement of infrastructure for the economy (power stations, pumping stations, sewage plants) and an investment good for direct utility housing. Social infrastructure, include investments in hospitals and schools. Infrastructure types can be categorized interms of the type of clients, public or private. Oladapo's (2003) headings provide a basis for discussion on various private sector infrastructure driven groups and the purpose for the infrastructure. The ownership group, the investment group and the property dealing group, the sources of funding for provides further means of categorization of infrastructure types. This involves public and private sector driven projects. Private sector client can be further divided into three groups.

Some public infrastructure facilities are designed to households alone and the basis for providing such facilities is not for their value in generating economic growth. These services are intended to provide direct benefits to households, with little regard for their effects in productivity growth (Udegbonam 2002).

Cost Reduction Mechanisms for Infrastructure Provisioning: (Cost Management Systems)

Infrastructure provisioning requires effective costing. This can be achieved through the adoption of appropriate approaches cost management and control systems. There are various methods for the procurement of infrastructure. Adetola (2004) notes the common types as the convectional or traditional system, integrated system, management orient systems and discretionary system and reiterates further that the procurement route. The project type influences the procurement routes; this in turn dictates the most appropriate contract type for chosen project. The procurement system available can be categorized using the following as

basis: The level of risk to be taken by each participating parties, level of information available or to be made available by the parties at the time of signing the contract, the way the contractor is to be paid or reimbursed for project when executed and the method of management of the procurement team. (The client, consultants, contracts, etc). Adopting the traditional procurement approach involves an array of processes, people and their functions needed to achieve them. The investment decision (appraisal/feasibility studies/budget) design, construction and occupancy/uses stages, and the people and their functions at the various stages (Oladapo 2003).

Public Private Partnership (PPP) Procurement Method on Infrastructure Delivery

Public private partnership procurement system is collaboration between the public and private sector to provide high capital intensive infrastructural project using private finance of which the spent fund is realized from the revenue generated by the use of the completed facility over a period of years (Morley 2002). Public private partnership according to Deloitte (2005) is simply a contractual arrangement formed between a government agency and a private sector entity that allows for greater private sector participation in the delivery of public infrastructure projects. There are various methods for the procurement of infrastructure. According to Akinsiku et-al (2014), the five key public-private partnership categories are:

- (a) Partnerships designed to accelerate the implementation of high priority projects by packaging and procuring services in new way.
- (b) Partnership that look to the private sector to provide specialized management capacity for large and complex programmes.
- (c) Partnerships focused on arrangement to facilitate the delivering of new technologies developed by private entities.
- (d) Partnerships drawing on private sector expertise in accessing and organizing the widest range of financial resources.
- (e) Partnership to allow and encourage private entrepreneurial development ownership and operation of highways and/or related assets.

The procurement process for PPP models varies according to the model that is used. Duncan (2009), highlights and discusses the various forms which are currently developed in the UK construction sector to suit the needs of particular sectors as: the private finance initiatives (PFI), Building schools for the future (BSF), NHs Local Improvement Finance Trust (LIFT), Frame works, Procure 21, PRIME, public private partnership programme, leasing, concession and franchise. Private financed contracts are referred to as concession contracts. The general procurement method for privately funded projects are: Build operate and transfer (BOT) and Build on Operate and Transfer (BOOT). Other derivatives and acronyms used to describe concession contracts include: DBFOT; (Design, Build, Finance, Operate Transfer), FBOOT; (Finance, Built, Own and Transfer), BOO; (Build Own Operate), BOL; (Build Operate Lease), DBOM (Design, Build, Operate and Maintain), BOD; (Build, Operate, Deliver), BOOST; (Build, Own, Operate, Subsidies Transfer), BRT; (Build, Rent, Transfer) and BTO; (Build, Transfer, Operate), (Omole, 2001).

Why Public-Private Partnership Model

In a country like Nigeria the reasons for PPP model in infrastructure stems from the desire to improve the nation's infrastructure and supporting services without over burdening the public funds. The choice of PPP is inevitable because of the weak infrastructure and the quest for enhanced firm level competitiveness. The huge and growing resource gap of government at

all levels. The adoption of PPP model in the Nigeria economy would deliver real value for money if property managed. PPP model will ride off corruption in infrastructure delivery as it encourages private sector participation and business like structure (Nnachi 2011). In partnering, risk allocation and financial rewards are more appropriately shared; risks are allocated to the party who is best placed to manage the risks (NICCO – ANNAN 2004). Government, all over the world has limited financial resources within its reach to finance increased capital expenditure for improving public services (Jones 2003, cited in Akinsiku et-al 2014). Pakkala (2002), as cited in Akinsiku et-al (2014), observed that though the traditional procurement approach has been used extensively in Austria, Canada, England, New Zealand, Sweden and the United States, due to bottle necks the Great Britain was the first to deviate substantially to embrace the public private PPP model. Based upon the guidelines, it is obvious that PPP initiatives in respect of the method adopted is a cost effective strategy and value adding imperative for infrastructure delivery. This it achieves through the adoption of cost management and control mechanisms that suit specific infrastructure types. Duncan (2009), reveals the chief characteristics of the traditional single-stage competitive tendering as follow: it is based on a linear process with little or no parallel working, resulting in a sometimes lengthy and costly procedure. Competition or tendering cannot be commenced until the design is completed. The tender is based on fully detailed bills of quantities. There is a lack of contractor involvement in the design process with the design and technical development being carried out by the client's consultants, unlike some other strategies. See fig (1) as illustrated by Duncan outlines the linear sequence (stages) of the financial and cost management model of the traditional procurement approach, while fig (2), outlines the stages of a PPP project cycle.

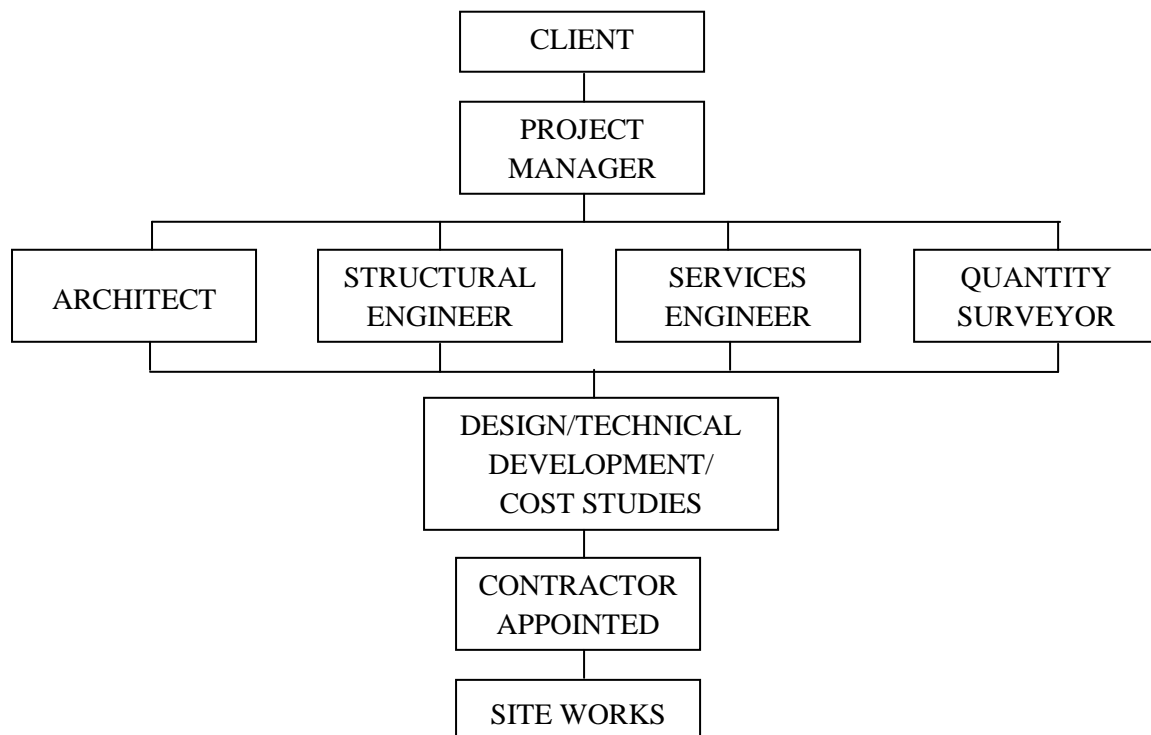


Fig 1: Illustrates the linear sequence of traditional method for procurement.

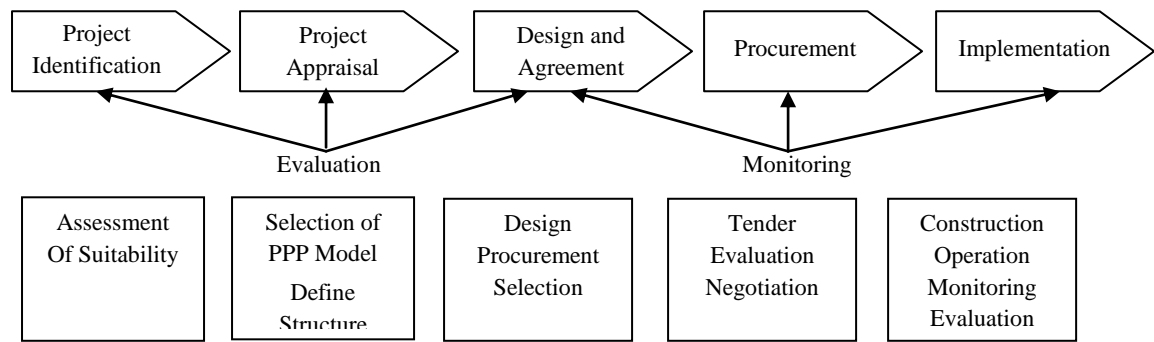


Fig 2: Illustrates the stages of a PPP Project Management cycle.

According to Oladapo (2000), the cost management functions together with issues on financial and contract administration are central to project implementation activities. It provides the analytic basis for monitoring project performance and ensuring that final costs or even operation and maintenance costs are within approved or acceptable financial limits. The selection for the modality for infrastructure development should be based on the understanding that there will always be a trade-off between service efficiency on the one hand and effective protection of investor's property rights on the other hand. The goal must be to attract the most investments possible, given the prevailing conditions and constraints in the country. It is based on the key premise that not all modalities are suitable to prevailing local condition. A user of the model can postulate whichever conditions he or she thinks are critical in their country. The prevailing local conditions must be analyzed prior to setting the project structure, prior to the normal due diligence which is done once the structure has been determined. Modalities must then be analyzed in the context of prevailing local conditions and the available risk mitigation tools to determine the most suitable project structure, which may involve different degrees of private sector participations (Nnachi, 2011).

In respective of the procurement methods, cost management system provides necessary mechanisms for effective costing. Oladapo's (2000) headings provides articulated discussions on the constituents/elements which form a basis of review for a typical project or contract strategy for either public or private sector funded infrastructure: project objectives, nature of projects, organization a structure; systems and procedures for design, cost management and implementation, type of contract, lump sum, bill of quantity etc, procurement and bidding procedures, conditions of contract (institution of civil engineers – ICE, federation international des ingenieurs conseils – FIDIC etc), construction operation and management, financing, revenue project environment etc. The aim of the project strategy is to provide a model for measuring and influencing the project characteristics for achieving success before the commitment of substantial resources and even designs. This involves extensive cost and financial analysis and management which should necessarily integrate series of iterations carried out by computers (IT). (Management cycle) as a cost control and management instrument provides a good basis for discussion on the requisite financial monitoring and control steps as well as the cost management procedures of each step involved, adopting the traditional procurement as well as public private procurement initiatives: for a PPP approach. The following are the steps feasibility studies, monitoring and control at design stage, monitoring and control of the construction process, monitoring and control of the maintenance and operations cost. There major sources of differences between the cost management techniques of PPP driven projects and those adopting the traditional methods of

procurement. Issues on the management of revenue returns on investment from the infrastructure take centre stage after completion and commissioning with PPP initiative driven projects. Established project cost estimate of PPP driven infrastructure projects also integrates well-researched cost of borrowing and the impact of inflation as integral components of the financial analysis at the feasibility study stage. The appointment of some of the key transaction advisers are also appointed at the feasibility stage (Oladapo 2008).

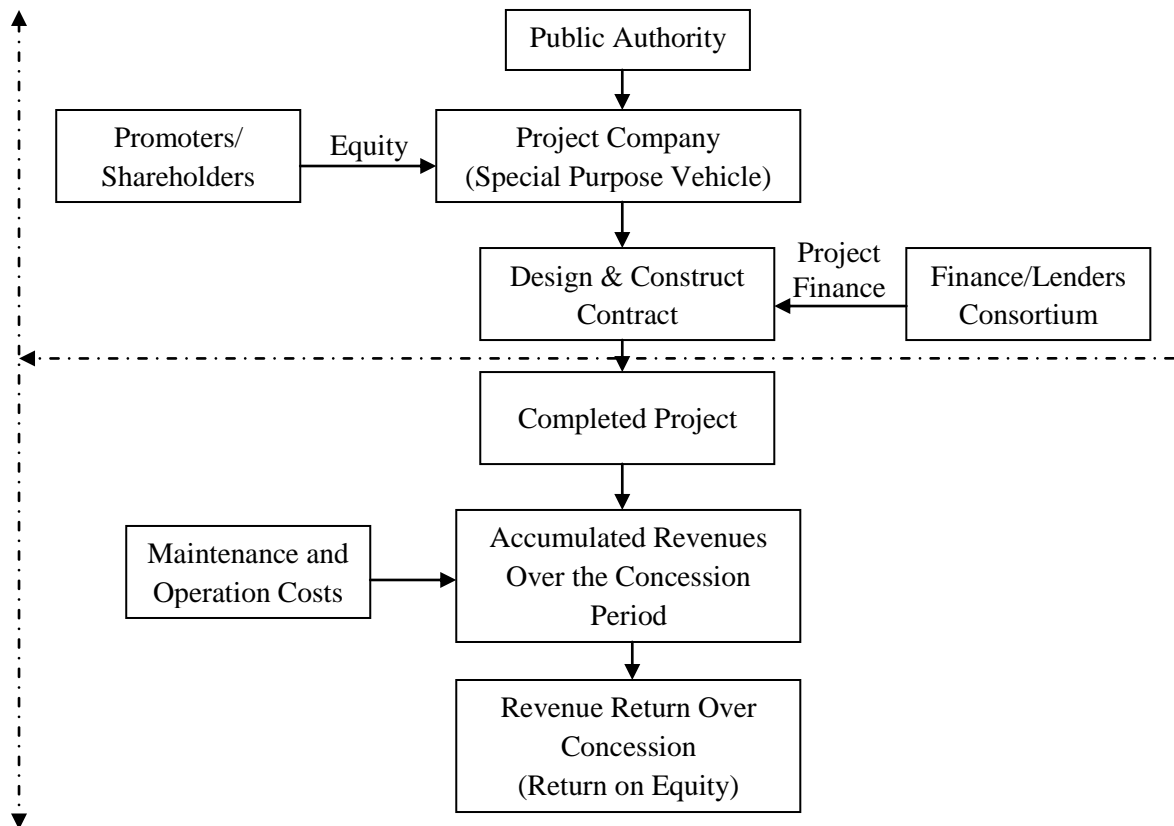


Fig 3: Illustrates the points of differences between the financial models of a PPP and Traditional Approach: Source: Oladapo 2008

The financial model of a PPP also incorporates monitoring and control of operation cost after completion. This is mandatory and is part of the concessioning. Financial arrangement after with completion is not necessarily compulsory. Drawing up of appropriate contract project cash flow is a vital cost effective mechanism. The projected cash flow an analytic review of the financial implication anticipated final cost, cost of boring and interest on boring of over the design and construction periods before the project starts yielding income. These steps as observed it is important to not be major sources of value adding actions and advantages of PPP models particularly with economic infrastructure. A cyclical review process with regular monitoring is an essential part of achieving best ethos. In other to show that best value and value for money are being achieved, it is essential to benchmark performance, including cost. BCIS provides a benchmarking service for contract prices for many through its tender price index, whereby a project can be statistically analyzed and compared with all other projects taking into account, influential factors such as location, size of contract, building function, and storey height (Pullen 2001 cited in Mogbo 2001).

Best Practice Procedure: A Management and Value Adding Mechanism for Infrastructure Procurement.

Best practice procedure provides opportunities for critical appraisal for procurement and management of capital infrastructure, which also include and integrate the evaluations on health, safety and environment conditions to enhance effective costing. Best practice mechanism (as a management technique) enhances cost efficiency. It is a value adding technique for capital infrastructure procurement. Best practice procedure provide opportunities for critical appraisals on designs, the personnel involved in the design and construction as well as HSE conditions and procurement routes for specific projects.

There is a great need for re-establishment of procurement procedure for government projects financed with public funds. Issues related to fairness and equity in consultancy patronage should be incorporated into procurement procedure. High ethical standards in public sector performance coupled with transparency and honest professional attribute is desirable (Anyadike 2000). Oladapo's (2000), headings provide basis for review of expected elements/constituents of a typical project or contract strategy for either public or private sector funded infrastructure: project objectives, nature of project, organizational structure, systems and procedures for design, cost management and implementation, type of contract, lump sum, bill of quantity etc. Procurement and bidding procedures, conditions of contract (Institution of Civil Engineers – ICE, Federation Internationale des Ingenieurs consils – FIDIC etc), construction, operation and maintenance, financing, revenue, project environment etc. The aim of the project strategy is provide a model for measuring and influencing the project characteristics for achieving success before the commitment of substantial resources and even designs. The cost management functions together with financial and contract administration is central to project implementation activities. This provides the analytic basis for monitoring project performance and ensuring that final costs or even operation and maintenance costs are within approved or acceptable financial limits. This coupled with current globalization trend, and worldwide infrastructure finance which were hitherto public sector sourced through public funding are becoming rather scarce and the systematic disincentives abound that discourage access to such cheap funds. Experience in Nigeria indicates that much of such funds obtained and purportedly invested in infrastructure programmes suffered massive mismanagement and corruption and disappeared into private accounts offshore (Anago 2001). Ndah (2004)'s list of strategic items provide good headings for articulating and enlisting best practices procedures for procurement of capital projects, using selective competition, open competition and negotiated means: pre-qualification, the invitation to tender, time for tendering, tender documents, break down of preliminaries, advance payment, return of tenders, examination of tender/preliminary report. Other headings include method of adjusting prices, successful tenders, the contract. According to Onwusonye (2006) timely notification of bidding opportunities, through adequate advertisement transparency in the prequalification of bidders, bid opening, evaluation and appraisal and the packaging of clients brief in the form of project documentation are the basic criteria/procedures relevant for transparency in the procurement process for capital infrastructure.

Government Agencies for the Procurement of Capital Infrastructure

The budget and price intelligence unit (BMPIU) (popularly called due process) as an agency was set up providing guideless for the procurement of capital infrastructure. According to Onwusonye (2008), due process as a mandate, invokes the simple mechanism of contract award, oversight and certification to the extent of ensuring that only projects that have passed

these tests enjoy public funding. The budget and monitoring and price intelligence unit got transformed into Bureau of public procurement of the National council on public procurement through an enabling Act. The public procurement Act 2007 (Anago 2011) highlights the responsibilities of the (BMPIU), as an agency of government set to ensure transparency, accountability and probability in the procurement of infrastructure. The Public Procurement Act 2007 addresses issues of transparency accountability and probity in the procurement and award of contracts for infrastructure. This it achieves through articulated clauses/elements that provide guidelines for the procurement process, which include: Due process builds a stable policy environment, in which investors can have reasonable expectations regarding their potential economic gains. Without due process, investors cannot be assured that the business playing field will not be arbitrarily or capriciously changed. If hidden costs are allowed to render a seemingly profitable project, a losing proposition, or if a contracting party is liable to run payment in areas with impunity, then the investors will, in all likelihood, look elsewhere (Carrington cited in Omole 2001).

A Case for Framework (Templates) for Best Practices for Capital Project Procurement: An Overview

Best practices procedure in my opinion provide the critical ingredients necessary for a project procurement package for purposes of achieving cost effectiveness and efficiency in the execution of contracts using as basis the stipulated clauses as expressed in the various conditions of contract trade preambles, specifications and also the forms and nature of contracts. Best practices mechanisms should also comply to health, safety and environmental conditions prevalent in project locations.

Anago (2001) articulation reveals that public sector financing from multilateral agencies (world bank, European investment bank, African development banks, etc) which hitherto had concessionary interest rates are rather becoming scare. The articulations further reveals that experiences in Nigeria indicates that much of such funds obtained and purportedly invested in infrastructure programmes suffered massive mismanagement and corruption. Current emphasis internationally in infrastructure provisioning is a transparent process that assures cost efficiency in infrastructure provisioning. The United Nations commission for international trade law (UNCITRAL) (1994), UNCITRAL model law, through legal framework also provides further basis for discussion on issues related to transparency and subsequently cost economy in the procurement of goods, construction works and services. Based upon this guidance, it is obvious that within this framework, nations are free to adopt specific legal instruments or regulations for the administration of procurement contracts. There would however seem a missing gap, as it relates to the compilation (articulations) of framework for best practices procedures, in the form of templates adapted for the Nigerian environment and subsequently for the West African sub and African region.

In my opinion the adaption of the World Bank Form (1995), articulations and iterations involving clauses of various conditions of contract, health, safety and environment (HSE) regulations and requirements of the professional consultants (the drivers) of projects form a good basis for the compilation of mechanism (templates) for best practices procedures. The Bureau for public procurement BPP (2014), ongoing articulations and adaptations provide constituents of the necessary domestic amendments that need to be addressed for use in Nigeria. See, Ezeh (2014).

The Royal Institution of Chartered Surveyor, RICS (2014) commences a request for inputs from various regional professionals bodies for purposes of reviews, articulating and adapting

appropriate clauses for the formulation of best practices mechanisms (templates), this serves as a relevant basis for effective costing.

Based upon this guidance, it would appear appropriate for the Quantity Surveyor Registration body of Nigeria (QSRBN) and the Nigerian Institute of Quantity Surveyors (NIQS) to explore the possibility to kick start and be involved in formulation of domesticated amendments as templates for best practices as well forward articulated inputs to RICS for inclusion on an ongoing process of compilation for best practices template. The professional bodies could achieve through the constitution of standing committees for the compilation and draw up of the template, a tool to enhance cost and management efficiency in the procurement of infrastructure. Hughes et-al (2006) as cited in Laryea (2012), have however argued that in theory there could be at least 15,625 different procurement approaches based on different permutations of various options within the six procurement variables: (i) sourcing of funding: owner-financed, public sector finance, developer financed, PFI, PPP; (ii) selection method: negotiation, partnering, framework, selective competition open competition (iii) price basis: works and materials in the bills of quantities (approximate or full), whole building, managed facility performance, (iv) responsibility for design: architect, engineer, contractor, novation in house design teams (v) responsibility for management: client, lead designer principal contractor, management contractor JV (vi) supply chain integration, single source, integrated, fragmentale), competitive and collaborative. If each of the possible 15,625 procurement approaches involves the three concepts of procurement, contracts and tendering, then it may be very difficult to establish a precise relationship. The use of experience and common sense would therefore seem to constitute the best approach for complex procurement decisions. The range of procurement strategies, contractual arrangements and tendering procedures used in projects in West African countries needs to be investigated in detail. This will help to understand the different kinds of projects undertaken, source of funding, roles and responsibilities involved and the nature of the project from a commercial, organization and financial point of view. In my opinion, it is reasonably deducible that articulating templates would seem a derivative and application of common sense, for arriving at best cost, price and value for procuring infrastructure. Common sense should therefore form a basis to analyze and provide answers on issues, like the management technique that best suits specific infrastructure delivery and what procurement method best suits specific infrastructure type.

Templates, it is however worthy to note are not legal instruments in themselves, they provide frameworks that provide basis for the execution of future projects. Cartilidge (2009) observes that a framework agreement is a flexible procurement arrangement between parties, which states that works, services or supplies of a specific nature will be undertaken or provided in accordance with agreed terms and conditions when selected or “called off” for a particular need. There is therefore a presupposition, that mechanisms/templates as frameworks for best practices should necessary have relevant legislative backing.

Conclusion

Infrastructure provisioning could be achieved through several procurement approaches, traditional methods as well as public private initiatives. The infrastructure type, the procurement strategies, contractual arrangements and tendering procedures are analytics which determine the procurement approach. The sourcing of funding, selection method, price basis, responsibility for design, responsibility for management and the supply provide necessary basis for the analysis and permutations towards arriving at a procurement approach

for infrastructure is a complex exercise that needs to be driven by expertise within the built environment; quantity surveyors (cost analysts) and other allied professionals. Cost management models, best practices procedures, due process agencies and the enabling legislative provisos are critical success factors for driving the procurement process of infrastructure.

The study recommends that the adoption of relevant procurement approach/methods, which integrate cost management models and strategies; templates of best practices, enabling legislative due process mechanisms and provisos by appropriate agencies (BPP, etc) are critical factors for effective costing in infrastructure procurement. The cost management models and project strategies should form a basis for analysis on what procurement approach suits, what infrastructure type amidst other variables. Due to the numerous procurement options, the application of “common sense” in the analytic process is a desirous.

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