

Conceptual Evaluation Ideas for the Infrastructure Delivery Improvement Programme in South Africa

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Abstract:

A doctoral study has been embarked upon with the intentions of addressing cost management problems encountered on Infrastructure Delivery Improvement Programme (IDIP) in South Africa. Given that poor cost performance constitute hindrance to the realization of project goals, it is imperative to eliminate it from IDIP construction projects. The theoretical paper highlights the idea that a target value design (TVD) as a concept is able to tackle cost performance issues when it is implemented appropriately. Therefore, a case study evaluation research design has been selected for the study so that better cost management decisions and actions could be promoted in IDIP projects. The focus of the evaluation will be on IDIP projects in the Free State province of South Africa. The focus favours depth as opposed to breadth of intended findings of the study.

Keywords:

Construction, Cost, Infrastructure, target value design, South Africa

1 Introduction

The construction industry has proven the significant role it plays in the economy of any country whether a developed or developing the country. Cooper and Slagmunder (2004) suggest that construction firms of today are faced with an immense competition and they must manage their costs aggressively if they are to survive the recent business environment. The decision to build is never an easy one and the cost of the building is an influencing factor on the sponsor's final decision whether to proceed or halt the project. However, all construction projects face similar problems of improving their cost performance. Ali and Kamaruzzan (2010) mention the importance of controlling construction cost because in developing countries, cost management approaches has proven to be the less effective when compared to time management (Ramli, 2003). Construction projects are unique and they tend to assume a greater dimension of complexity as they increase in size. Before the concept of TVD become popular in the lean construction lexicon, Nicolini *et al.* (2000) have reported the use of target costing in construction. Target costing is understood to be the cost management tool for reducing the overall cost of a product over its entire life cycle with the help of top management and active contribution of members of the supply chain (Nicolini *et al.*, 2000). According to Ballard and Reiser (2004), designing to target cost is a product development practice that converts cost into a design criterion rather than a design outcome. Target costing played a substantial role according to Ballard and Reiser (2004) on a case study project in United States of America (USA), which suggested that it contributed to delivering the project within budget and on time, more value was provided to the client than would otherwise have been provided, and the

provider, made a reasonable profit over time, TC metamorphoses to TVD, which was firstly introduced in 2002 and has since become more commonly used in construction industries in the USA (Zimina *et al.*, 2012). The first successful TC project was documented in 2004 by Ballard and Reiser in the USA (Do, Chen & Ballard, 2014). The case study project was delivered based on a Design-Build contract that integrates lean construction principles and practices, including target costing and Last Planner System (LPS) of production. Comparatively, a similar project constructed in the non TVD method was delivered 10 months late and costs 15% more than the case study project (Ballard and Reiser, 2004). The non-TVD project may have been delivered late because observation was that traditional practice of construction is contract centred and with assignments defining and balancing the objectives of various participants in terms of time, health and safety, costs, errors, and quality.

Within the South African context, little is known about the application of TVD although it has been applied to the construction industry abroad and provided tremendous value in improving cost performance (Ballard & Reiser, 2004; Ballard 2009; Ballard & Rybkowski 2009; Zimina *et al.* 2012). “the Main idea of TVD is to make a client’s value (design criteria, cost, schedule & constructability) a driver of design, thereby reducing waste & satisfying or even exceeding the client’s expectation” (Zimina *et al.*, 2012). Hence this study is important due to the need for the development of innovative practice in South African construction. The industry in South Africa appears to be lagging behind in implementing best cost performance practices. The paper will first clearly establish the various costing model in use in South Africa through an exploratory literature review. Then the study will go deeper into defining what TVD is, the process of TVD, and then describing why there is a need for change in construction practices. To support the expanded use of TVD, a research opportunity, therefore, exists to investigate how TVD can systematically be applied to public projects in South Africa. Literature Review

1.1 Challenges of existing cost management practices

Projects running over budget were reported in other developing countries but not yet in South Africa. Then Ramabodu and Verster (2010) first established a presence of cost overruns being a problem in South Africa but with emphasis on the Free State province. Furthermore, the study then went on to identify the factors contributing to cost overruns and rank them in order of importance to raise the awareness among professionals of the construction Industry. The study used the perception of professionals to identify those factors they deem to be contributing to cost overruns without being backed by any data to support the findings. In addition, the study does not suggest any remedy to try and minimise the reoccurrence of cost overrun in construction projects.

Nimbona and Agumba (2014) in their research conducted found out that the main cause of unsuccessful construction projects in South Africa was financial problems (clients’ financial capacity, late payment, unreliable source of finance), which comes back to the fact that cost is an important parameter of project success. Innovative ways of solving this problem such as TVD provide a great opportunity for the SA construction industry to deepen our understanding of the challenges in applying target costing in contracting as well as the necessary modifications and adaptation to the approach necessary to make it suitable for the South Africa construction.

1.2 Outcomes of existing cost management practices

Potts (2008) describes cost management, as the process which is necessary to ensure that planned development of a design and procurement of a project is such that the price for its construction provides value for money (VFM) and it is within the limits anticipated by the

clients. The management of costs in a project is a common thread running through the entire life of a project. The feasibility of a project depends on its cost and financial viability and the project is not complete until the last payments and paperwork have been completed. Caruthers *et al.* (2008) state that the management of costs begins with the financial feasibility study, progresses through all the costs that are required to purchase all the resources needed by the project, through to using cost control to ensure that all work that is done is properly completed

1.3 Outcomes of existing cost management practices

Cost estimation is utilised as a tool to forecast the probable cost of a project or as an indication guide of the approximate cost of a project before it can be constructed. Current costing models that are used in construction industry needs to be improved for better project performance. Jamieson (1971) highlighted the extra cost of construction in South Africa caused by clients in rushing to take a project out on tender and the repercussion of expediting the process is detrimental to the success of the project, due to extra costs in construction and bad design. Similarly, Dawson (1972) reiterated on the immense increase of escalation which appears to have been the outcome of the high tempo of development which has characterized the last ten years in particular in South Africa. In addition, Dawson (1972) elaborated further that tenders submitted for major works during those times appeared to be as much as 100 percent (and even more) higher than they would have been ten years ago, and how can such state of affairs be justified?

The cost of construction seemed to escalate immensely during the 1960s to the 1970s, Dawson (1972) made an example with the cost of the Orange River Scheme that has escalated approximately four times and that other works planned by the Department of Water Affairs involving original estimates amounting to R142 million in 1960 are likely to now cost in excess of R500 million then how can we possibly plan for the future with a degree of certainty? According to Flybjerg, Holm and Buhl (2002) cost are underestimated in almost 90% of the projects, and that on average actual cost are 28% higher than estimated costs. Due to this phenomenon of lack of forecasting, Flybjerg, Garbuio, and Lovallo (2009) further suggests that this can be attributed to three underlying reasons: 1) delusions or honest mistakes; 2) deception or strategic manipulation of information or processes; 3) bad luck.

1.4 Costs are shaped by action rather than result from action

According to Ballard and Reiser (2004), a traditional practice in construction propels the architect to provide a drawing to some degree of completion, estimate its cost and if that is not to the desired outcome of costs, alter the design so the costs can be brought up to the desired budget. Furthermore, Ballard and Reiser (2004) claim that arguably this approach is wasteful, yielding rework and frustration, and perhaps generates less value for customers and providers than alternatives. The adoption of TVD makes it possible to achieve the objective of the project where the cost act as an input to design and design process is a collaborative iterative process constantly updating cost to align client's requirement with their constraints. In past decade, TVD implementation has proved to be very successful in delivering client's needs in a set target cost below the market price (Ballard, 2009).

1.5 Negative influence of behaviour

Several forms of negative influence from cost management systems on behaviour have been identified in the literature, ranging from claim culture to manipulation of bids and performance measurements (Hanid *et al.*, 2011). Behaviour which relates to the attitude of planning for claims on construction projects for profit maximizing. This kind of attitudes is singled out by

Rooke, Seymour and Fellows (2003) whereby the idea that the industry has a culture which is opportunistic, prone to conflict and resistant to change is a byword in construction. To add to that, it is argued that price competitive tendering has resulted in a habitual tendency amongst contractors to expend more effort on generating profit from claims than from improved construction methods (Rooke, Seymour and Fellows, 2004). The same kind of attitudes can be seen in the procurement of contractors in the public sector. Accountability constitutes a central pillar to public procurement (Soudry, 2007). The construction industry has been identified as the most corrupt sector in the world (de Jong, Henry & Stansbury, 2009). Research undertaken by Bowen, Edwards & Catell (2012) reported that opportunities for corruption were found to arise across almost the entire range of activities involved in the building procurement process, but clustered mainly in the tendering and tender evaluation stages. In addition, Bowen *et al.* (2012) indicate that the process of appointing contractors and professional consultants are allegedly subject to manipulation at times. Tender interference and tender irregularities were reflected within most of the data in terms of corrupt practices.

1.6 Performance of traditional cost models

This section is intended to highlight mostly why current traditional cost models are performing poorly, but on the other hand, it also addresses again the importance of why this study is worth being undertaken. Bowen and Edwards (1985) point out that a need for a new paradigm shift or the ‘information explosion’ in the field of cost modeling and price forecasting will take place only from the pursuit of academic knowledge. This phenomenon is intriguing as Bowen and Edwards (1985) further reiterate that there has been no published evidence of a demand from consumers for more realistic price forecasting, nor of any recent development work on cost modeling being conducted by QSs in South Africa. Even to date, the status quo remains the same. However, the Association of South African Quantity Surveyors recently updated the second edition guide to elemental cost estimating and analysis for building works in 2013 after being used for 15 years unchanged. With costs spiraling out of control on so many projects globally, infrastructure projects of all types are experiencing cost overruns. Flyvbjerg Nils and Werner (2003) name this a “performance paradox”. What is interesting is the update of the guide to elemental cost estimating, is that in the foreword, the update was requested to examine whether there was a need to revise and possibly expand the 1998 and 2003 editions to accommodate changes that have taken place in the industry since those versions were published (ASAQS Guide to elemental cost estimating 2013). The reason posed by the committee on updating the previous editions of the guide to elemental estimating obviously noticed that change was necessary in order for the profession to be still relevant.

‘Traditional’ cost models have come under heavy criticism before, regression models, Bills of quantities (BOQ) and elemental estimating methods to not explain the system they represent (Bowen, Wolvaardt and Taylor 1987). Wilson (1982) cited by Nguyen, Tommelein, Ballard (2008) attest further criticism of the reliance of traditional models on the use of historical data to create deterministic estimates of building or components without explicit qualification of their integral changeability and improbability.

1.7 What is target costing and Target Value Design?

The woes recorded in subsections 2.1-2.6 is now been addressed by lean construction researchers with new concepts. Target costing (TC) is originally introduced in Japan under the name *Genka Kikaku* as an expression that clearly connotes it as an overall strategic approach to reducing costs and not only as costing technique (Nicolini *et al.*, 2000). TC in view of Ballard and Reiser (2004) is a product development practice that converts costs into design criterion rather than a design outcome. A description of TC in construction terms by the exact words of

Ballard (2007) is the practice of constraining design and construction of a capital facility to a maximum cost. However, Cooper and Slagmunder (2004) define TC as a technique used to manage the future profits of firms. Once this target cost has been established, value engineering (VE) is used to find ways to improve the product design so that the target cost can be achieved. The TC process reverses the traditional method of costing, whereby the market price is first determined if the product will sell and then the desired profit is then subtracted to give the designers the cost to which they must design the final product. The below formula clearly explains the concept better (Clifton, Bird, Albano, and Townsend, 2004). However, according to Shingo (2005), Toyota production team used a different formula to improve the cost performance of a product:

$$\text{Target cost} = \text{Target Price (revenues)} - \text{Target Margin}$$



Figure 2.1: The origin of target costing (Source: Feil, Yook and Kim 2004)

$$\text{Selling price} - \text{Cost} = \text{Profit}$$

Shingo (2005) explains that the customer is the one that decides the selling price, and profit is what remains after subtracting the cost from it. While TC proved very successful in new product development in the manufacturing sector, its application in a capital intensive sector such as the construction has been somewhat limited. Thus, target costing has metamorphosed into target value design (TVD) in lean construction. TVD became an adaptation of TC to project production systems (Nguyen *et al.*, 2010). TVD became more than just costs, added more value such as constructability, time, safety, work structuring, etc. (Lichtig 2005) cited by (Nguyen 2010). TVD is “a management practice that drives design to deliver customer value within project constraints it rests on a production management foundation and treats cost as an outcome of PSD, operation, and improvement” (Ballard 2009). TVD turns current design practice upside-down: (1) Setting the Target Cost for design: “Rather than estimate based on a detailed design, design based on a detailed estimate”, (2) Work Structuring: “Rather than evaluate the constructability of a design, design for what is constructible”, (3) Collaboration: “Rather than design alone and then come together for group reviews and decisions, work together to define the issues and produce decisions then design to those decisions”, (4) Set-Based Design: “Rather than narrow choices to proceed with design, carry solution sets far into the design process”, and (5) Collocation: “Rather than work alone in separate rooms, work in pairs or larger groups, face to face.” (Macomber *et al.*, 2008). TVD is not to be confused as a project delivery system on its own, but forms part of one of the important element of the lean project delivery system that is integrated project delivery (IPD).

2 Research Methodology

2.1 Research Problem formulation

Infrastructure delivery is the pillar of economic activity of countries, especially developing countries. The significance of infrastructure is responsible for the decision of the South African government to contribute substantial investment to developments through several programmes. In fact, in South Africa, infrastructure development is a vehicle for enhanced economic growth and social development. However, increasing infrastructure development investments appears to be moving in tandem with poor delivery performance, especially in relation to cost. Some of the challenges include under spending, poor planning, cost overruns, quality issues and clear project failure (National Treasury 2016). There are rigorous efforts to build greater delivery efficiency in the public sector. In brief, present costing models in use in South African construction are failing to assure the best cost performance. To attempt a remedy and forestall the continuation of poor cost performance, an evaluation of the state of affairs in a major delivery programme is required. The evaluation is intended to propose best practices discovered in the use of the principles of TVD (Ballard and Reiser, 2004; Macomber *et al.*, 2008; Nicolini *et al.*, 2000; Forbes and Ahmed, 2011) is the idea espoused in this study

2.2 Adopted Research Process

The design adapted for this study is evaluation research. The purpose of evaluation as a methodology is to serve the public good by improving policies and programmes through policy and data analysis that proceeded from carefully researched and accurate information (Alkin, 2013). The IDIP programme to be evaluated fits well with the sentiments of Alkin (2013), as it is an initiative by the public sector to improve infrastructure delivery for the good of the public and data is readily available for evaluation. The goal of evaluation research is a good fit for use regarding the IDIP programme. The goal of IDIP is to improve the efficiency and effectiveness of the delivery of public sector infrastructure through developing and institutionalizing best practice systems and tools and building capacity. IDIP supports the provincial departments that deliver infrastructure to effectively render and sustain infrastructure and contribute towards provincial growth and development strategies (National Treasury 2016). The main question of this study is: “How would Target Value Design impact the delivery of infrastructure projects”? The IDIP programme outlines how infrastructure projects can be improved holistically including pricing strategies recommended to complete projects within the stipulated budgets. However, the IDIP improvement concentrates specifically more on other delivery mechanism and deems costs to be improved as results of improving on other delivery mechanisms.

The research design is a technique that unites the data collected with the conclusion to be drawn on the initial research questions posed (Yin 2014). Alkin’s (2013) view on evaluation is explained as a “retrospective assessment of the performance of programs (policies, programs, projects, and processes) that have been implemented by the public sector or other bodies”. Evaluations are classified as either formative or summative (Weinberger, 2009). This study will be conducted using the summative evaluation as its purpose is primarily to provide information in assisting stakeholders to make a judgment about how to proceed with a program, that may include whether to adopt, continue, discontinue or expand the program (Weinberger, 2009). The evaluation intends to support innovative exploration of evolving approaches for addressing problems, and also adapting an existing programme to a new context in terms of cost certainty. The summative evaluation is appropriate since there is an annual assessment of

the IDIP's progress being conducted. The evaluation will be conducted on a case study of projects executed under the IDIP in the Free State province of South Africa.

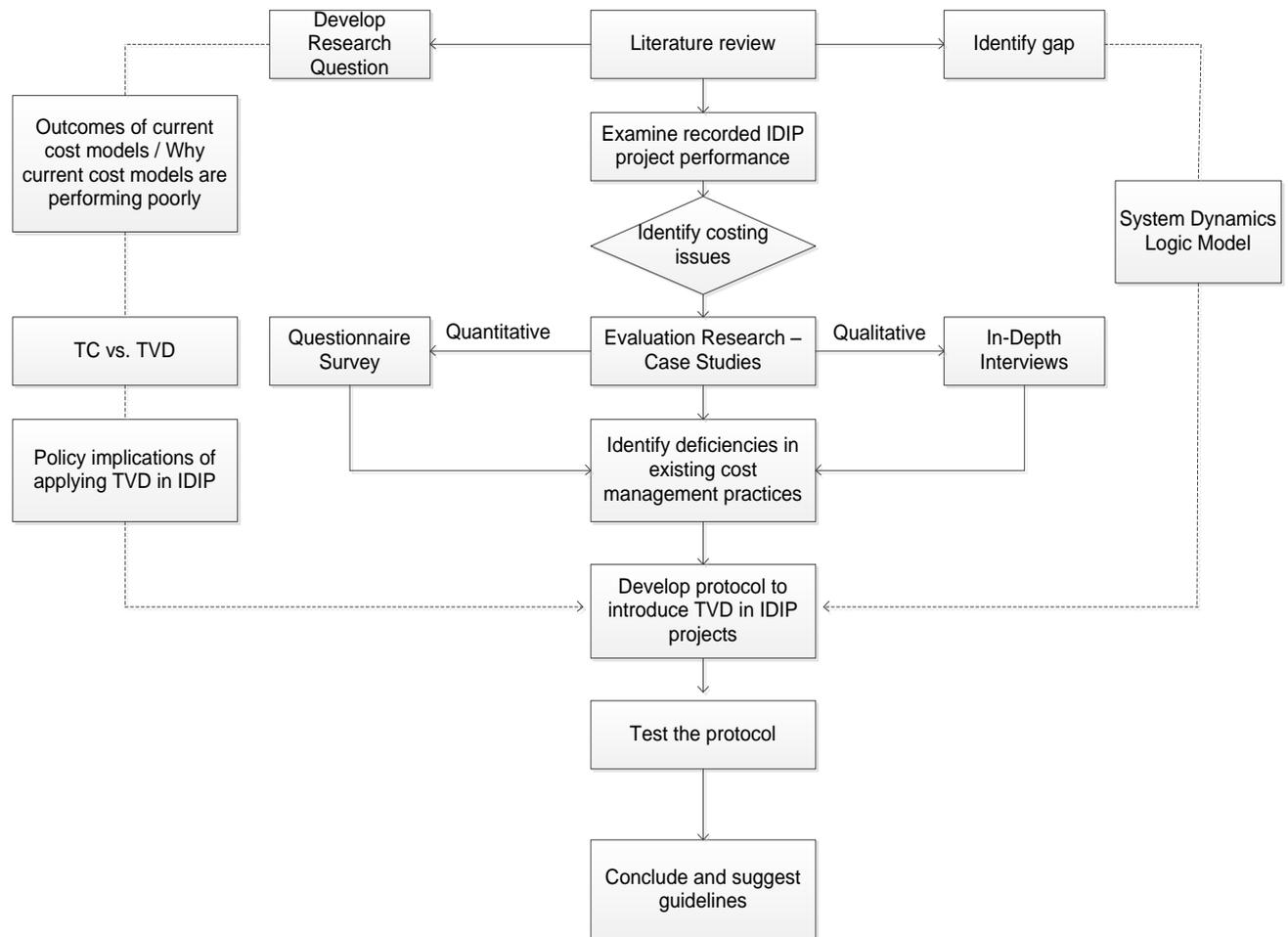


Figure 1: Proposed Research process for the evaluation of IDIP

Figure 1 presents the proposed research process for the study. The literature review will be conducted to develop the knowledge base of the research. A number of in-depth interviews will be conducted with the authors of the IDIP programme to gather information about how the program addressed cost improvement. Furthermore, a questionnaire survey of the authors of the IDIP assessment review committee, and professionals involved in IDIP projects will be carried out for an explanation of the effectiveness and efficiency of the IDIP on cost performance in order to help identify deficiencies in current cost management practice.

The issue of the first cost on construction projects will be examined and the traditional design and tender procurement will be looked at. The interviews and questionnaires will also provide a comprehensive understanding of what questions would have to be answered to overcome the barriers of implementing TVD.

The results of the interviews and questionnaire survey will be used to develop a strategy to introduce TVD in IDIP projects. That will also assist to develop a case study plan. Developing a strategy to introduce TVD was based on the deficiencies identified in the current cost management practices in the local construction industry at large. Interviews and questionnaires will be used to document the process and information flow of the current practices. The documentation will identify opportunities for improvement through TVD.

3 Conclusions

The South African government identified infrastructure delivery as a mechanism for enhancing the economy of the country. However, the delivery of infrastructure projects has been plagued with performance issues of which cost is a major component. To attain the goal of global competitiveness, the public sector had to improve the way infrastructure is delivered by various provincial departments. Although the government is addressing the noted problems through the IDIP, the poor cost performance remains a major problem. Rather, cost overrun is consistently reported on IDIP projects.

To address the cost management problems experienced on the IDIP projects, an evaluation research is proposed for this study so the possible use of TVD could be advanced for IDIP projects in South Africa.

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