

## **CHOOSING BY ADVANTAGES IN PROJECT TEAM DECISIONS: CASE STUDIES OF CONCRETE WORKS IN SOUTH AFRICA TO ICIDA 2016**

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Good decision-making is a fundamental element of improved project delivery in the construction industry. Such decisions determine the accomplishment of performance parameters in a given project. However, suboptimal performance, which is pervasive in the construction industry, has been linked to team decisions that undermine project actions. This problem exists in South African construction. To remedy decision-making pitfalls, the concept of Choosing by Advantages (CBA) is now promoted by lean construction. CBA is defined as the decision-making system, which must be based on the importance of advantages within a project team. The purpose of the proposed study is to explore the application of CBA in South Africa. The case-based method to be used for data collection is intended to reveal the characteristics of CBA system so that the advantages could be used to promote its application in South Africa. The impact of CBA on decisions and actions at the activity level shall be examined for improved project performance in South Africa. CBA method is preferred because it encourages decision, which focuses on the advantages of the project rather than the disadvantages of the project. These methods can be adopted when working either on large or small project.

**Keywords:** Construction; Choosing by Advantages; Decision-making; South Africa.

### **1 INTRODUCTION**

Riecke (2004) states that most construction specialists believe that the success of a construction project is determined by the selected project team assigned to initiate the project and that the decision-making process which they select adds value to the project life cycle. Construction project performance is influenced by the project team, which comprises clients, consultants, contractors, subcontractors, suppliers, etc. Construction development is branded by the procedure designed and adopted for the project, and the results represent and symbolise the project teams. However, the performance produced by the project team has been disapproved and criticized for failing to meet the expectations of clients and end-users (González, Shahbazpour, Toledo, & Graell, 2014). Such performance problems are endemic in developing countries such as South Africa (Emuze & Smallwood, 2012). The negative impact brought into the construction industry because of underperforming project team has created persistent time delays, cost overruns, payment problems, poor productivity, accidents, and negative image of the industry (Meng, 2012; Emuze & Smallwood, 2012). For examples, Meng (2012)

listed important factors influencing time delays relating to design changes (variation orders), poor labour productivity or management, and poor programme planning, etc.

All these time delay factors are underpinned by team decisions in construction. Bresnen and Marshall (2010) went further to state that poor performance influencing overall cost, time and quality can be eliminated if the project team can develop decision-making methods during the pre-construction stage.

It is therefore clear that the conceptualisation and realisation of construction projects is defined by the decision-making of the project team at the inception (design) and construction or implementation stage. During the inception phase, as consultants, the architects and engineers are responsible for the design and quantity surveyors are responsible for project cost estimates. Project planning is designed by consultants who are working as a team to create construction documents made up of bill of quantities, project scope and drawing plans, project contract, specifications, and supporting documents. Contractors compete through pricing, and the successful bidder is awarded the project based on the submitted proposal. The contractor will be responsible for the site and will work with the consultants throughout the construction stage. The responsibility of these consultants is to meet the requirements of the client and make sure that the client has enough funds for the project (Arroyo, Tommelein, & Ballard, 2012). Furthermore, Arroyo et al. (2012) mentioned the negative impacts caused by the project team and encouraged the project team to adopt CBA methods in construction.

So CBA is a sound method of decision in construction, which addresses the decision-making process by encouraging the project team to focus on the importance of advantages (Parrish and Tommelein, 2009). It is essential for a project team to design a decision-making system during the design stage because crucial decisions are taken during the design stage (Abraham, Lepech, & Haymaker, 2013). To this end, Suhr (1999) developed the CBA as a decision-making system that considers the advantages among alternatives and makes comparison by considering the advantages obtained. The CBA method is a decision-making system that comprises methods for almost all kinds of decisions taken during the construction process regardless of the scope of work. The next section provides an exposition on the method and highlights the rationale for its use as an optimum decision making tool.

## **2 EXPLANATION OF CBA METHOD IN CONSTRUCTION**

The CBA method was developed in the United States of America (USA) by Jim Suhr (Suhr, 2005). He started his research by observing and understanding the selection and application of national resources used in the USA (Koga, 2005). The central questions he developed for his research include (Suhr, 2005):

- How can we consistently make sound decisions?
- How can we clearly show that our decisions are sound?
- How can we simplify sound decision-making?
- How can we make our decisions congruent and effective?

His research study lasted for almost 22 years, and in 1981 he concluded his research study by being able to answer the four questions he had formulated. This was the birth of CBA, and the answer he found was as follows: “*decision-making of a project must be based on the importance of advantages*” (Suhr, 2005). The CBA method can be described as an idea that forms the base between two or more alternatives in projects as advantages of one or other alternatives (Joseph & Cleves, 2012). The CBA helps the project teams to reach their decisions-making goal when comparing alternatives (Legmpelo, 2013). The method is therefore used for decision-making purposes in project-based industries.

As described in Table 1, the application of the CBA method is characterized and defined by alternative factors, criterion, attributes, advantages and importance of advantages (Suhr, 1999). In terms of congruent definition, the CBA is “a decision-making method, developed by the entire project teams by summarizing and solving the equation of decision-making, CBA assist good decisions become excellent and excellent becomes perfect” (Koga, 2005). In essence, the CBA coordinates with desired value and culture of Lean / Integrated Project Delivery (IPD) and allows project team to highlights the value of the project to the clients (Lean Construction Institute (LCI), 2015). Lean / IPD are a reaction to project team displeasure regarding the construction performance (LCI, 2015).

Table 1: The common vocabulary of CBA

Terms	Definition
Alternative	Either one or more project decision adopted by a project team in terms of the use of materials, and other project inputs.
Factors	Is a section, parts, or mechanism of a decision making. When assessing performance, factors should represent period, cost and quality.
Criterion	Is a policy or decision law regulated by the project team, there is a ‘must’ criterion symbolizes circumstances each alternative must please, and a ‘want’ criterion symbolizes favorites of one or several decision makers (project team).
Attributes	Type of quality, results or characteristics of one alternative
Advantage	Are the beneficial factors between alternatives in the project

Source: Arroyo et al. (2014).

## 2.1 The Application of CBA in the Construction Industry

The CBA method is described as the same knowledge shared by project team working together to develop a decision-making method for projects, and the objective of the method is to create a platform for project team (Parrish and Tommelein, 2009). Abraham et al. (2013) discussed the application of CBA methods and stated that in order for CBA to work effectively, it must not be based on the interest of the client rather on the interest of the project. CBA methods are recommended because of its

power to produce visible or transparent decisions for design and construction works that recognize the difficulties of the projects and clients' programmes (Eynon, 2013).

Tommelein, Chiu, & Koga. (2009) explained the execution of CBA methods and how it can be used for defining the description of alternatives clearly, escalate the number of ideas, examine the modifications of alternatives explicitly, determine the importance of those modifications, appropriately consider cost modifications, and then anchor information with relevant facts. Tommelein et al. (2009) explained the purpose of CBA methods that project teams who are adopting this method must understand that CBA:

- Is a problem solving method not a weapon to be used by project team for their own benefit
- Is a sound system of description, principals (value), models and methods of construction project
- Allows project team's decision to peacefully bridge the gap between data and the decisions.

Project teams are advised to discuss the advantages of one or more alternatives because disadvantages of one alternative are advantages of the other alternatives (Parrish & Tommelein, 2009). The application of CBA is determined by project team decisions when selecting the alternatives, factors, and criteria of the projects (Rubric, 2012). The selection of a decision-making method can be successful only if the alternative meets the criterion selected for each project (Lee, Tommelein, & Ballard, 2010). Legmpelo (2013) describes the function of CBA methods and states that cost is not considered as a factor and there is no reason to investigate, which alternatives are cheaper. Yet, explained that the goal of project team is to establish the best alternative without bearing in mind the cost of alternative. The project team must address the cost components either before or after implementing CBA methods

In simple terms, CBA is designed to accommodate either large or small projects through either Simplified Two List Methods (STLM) or Tabular Methods (TM). STLM is designed for simple project comprising two alternatives of the equal cost estimate of the project. TM is suitable for complicated projects, mostly when the project decision comprises multiple alternatives, when there are different information's to be judged and the entire project team are involved in the decision-making process (Arroyo et al., 2014).

The application of TM is illustrated in Figure 1. As shown in the figure, the steps for TM method include: Step 1 tells that the project team should choose alternatives based on the important advantages over alternatives. Step 2, the project team must define the factors with the purpose of differentiating (breaking down) alternatives. In step 3, the project team agrees on a criterion that will be adapted on each factor to weight the attributes of alternatives. In step 4, the project team summarize the attributes of each alternative on the designed scale. In step 5, the project team establish the significance

ideal attribute for each criterion, and then decide on the advantages each alternatives attribute. In step 6, the project team implements the CBA method by deciding on the importance of advantages. The project team determine these steps; specifically the client needs to clearly and easily state their preference importance of advantages. In step 7, the project team weight the cost data and chose appropriate alternatives (Arroyo et al., 2014).

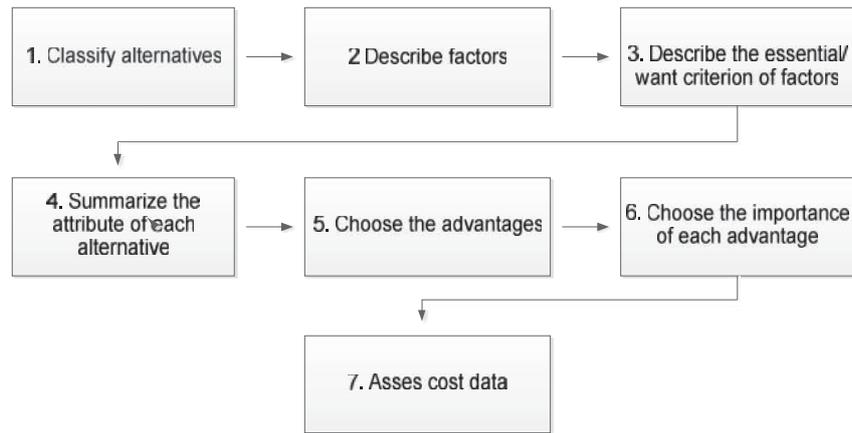


Figure 2.2: CBA steps (adapted from Arroyo et al, 2014).

## 2.2 Project Team Challenges in the Construction Industry

The number of components relating to project scope, project duration, and project difficulties determines the status of projects, but the most influential and common component is change in construction (Hwang & Low, 2011). Change or innovative thinking designed by project team benchmarks the construction industry. Emuze (2012) explained innovation could be the invention of new knowledge in the construction industry, made up of new projects, new construction methods, social change and structural change. In the faster-growing construction development, the majority of projects are constructed through the adoption of international methods and expertise, which calls for decisions by project teams that have diverse interests. The problems could emerge through the failure to apply methods appropriately, because local consultants and contractors fail to reach the standard of the adopted methods and this affect performance negatively (Zhang, 2013).

Project performance is determined by the construction procedure and methods adopted during the design and physical construction stage, and the study by Li et al. (2012) explain that site tasks are completed in a dynamic environment determined by budgets,

technology, and project delivery. Thus performance may be destabilised by increased size of the project, and Zhang (2013) stated that large and complex projects are the subject of changes because of the demand from project teams pertaining to diverse viewpoints of goal, large capital expenditure, and multiplicity of projects. The main cause of poor performance is the fact that consultants and contractors are falling to meet the project standard requirements (Li, Arditi, & Wang, 2012). The results of poor performance discovered by project team are not the same, and the study by Emuze & Smallwood (2013) explained and listed the clients' factors influencing poor performance pertaining to project documentation, procurement procedures, and organisation of variation orders, while consultants and contractors are thought to encounter the same factors such as poor product or service delivery.

Furthermore, the continual and unavoidable existence defects continue to be one of the primary causes of project schedule and cost overrun in the construction industry. Site managers do the quality management on site, and there are various challenges, which site manager, are failing to address (Kwon, Park, & Lim, 2014). Sasaki, Uno, Hashimoto, & Date (2016) says that site managers should take into consideration the approach from aspects of structure, design, and physical construction, materials to improve the productivity of construction tasks specifically for concrete works. However, reinforced concrete do influence construction cost and duration in country like South Africa, because the methods used to construct high rise commercial building involve mass of concrete as a major component of the building structure. Construction defects caused by concrete works are influenced by number factors and the study by Kwon et al (2014) describe the causes of defects in concrete works as the preparation of building materials such as, cement, reinforced steel bar, aggregates, sand and water. These defects origins are influenced by the decisions of project teams.

### **3 RESEARCH METHODOLOGY**

Research design is the procedure that connects the data to be collected and the conclusion to be drawn to the initial research question (Yin, 2014). As a result, the case study research design has been selected for this study, because it supports the nature of the research question, which asks "How and why is the decision-making mechanism within a project team influencing the outcome of concrete works in South Africa?" (Yin, 2014). The data of the study shall be collected through case study, and the case study will investigate the decision-making of project team while demonstrating the application of the CBA method.

The design support replication as it can be reused with similar results. Evidence of idea and practical assessment improves the theoretical understanding behind project decision-making methods – this can be operationalized through case study research design. The conclusion of this study can be widespread by understanding the impacts of CBA methods assumption in the case studies application. Hence, the study has adopted multiple case study design to investigate project team's decision-making method through concrete works in residential building, civil works, and commercial building.

The primary data will be collected through interviews based on the existing construction project in Free State Province of South Africa.

The interviews will follow semi-structured interviews, and a set of questions will be prepared for principal project team members: clients, consultants, and contractor, in selected projects. The unit of analysis of the study shall therefore stay at the project activity level. The research process can be explained by identifying different research milestone and mission related to each task. Figure 2 shows the general research strategy of this research. At the time of compiling this paper, only the background section of the research process has been completed. In other words, the iterative nature of the research process could still alter some sections before the study is completed

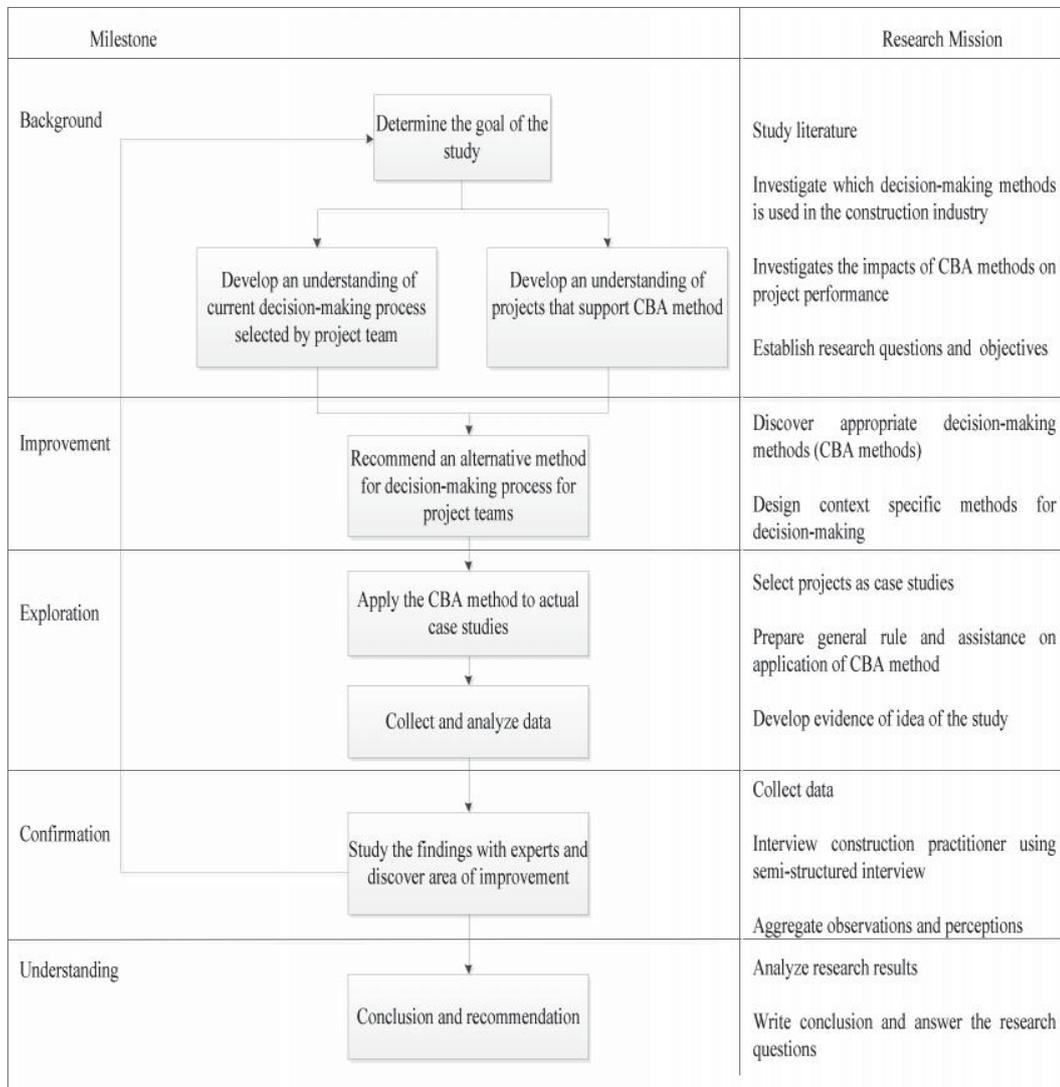


Figure 2: Proposed CBA research process for concrete works in South Africa

#### 4 CONCLUSION

The international construction management literature has confirmed the gravity of poor performance in the sector. Among other causes of poor performance in construction, the magnitude of project team decisions is significant especially as project complexity increases. South African construction is not protected from this phenomenon and the fact that poor construction performance has been documented at the activity and project

levels in the country provides the basis for this study that is gradually unfolding. For instance, project teams are failing to manage the project cost, schedule and quality consistently in South Africa, especially when working with concrete works. To remedy the situation, a decision making tool is needed to assist project teams and the CBA is reportedly a useful tool that has delivered major benefits in the USA. These benefits are the motivation for the use of CBA in the study in which the two well-known methods of STLM and TM shall be used to assess how improved project decisions can be engendered in South African construction.

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